COTTON CRISIS IN WARANGAL DISTRICT OF ANDHRA PRADESH

By
G. RAVI KIRAN

THESIS SUBMITTED TO THE
ACHARYA N.G. RANGA AGRICULTURAL UNIVERSITY
IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR
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August, 2004

CERTIFICATE

Mr. G. RAVIKIRAN has satisfactorily prosecuted the course of research and that the thesis entitled **"COTTON CRISIS IN WARANGAL DISTRICT OF ANDHRA PRADESH"** submitted is the result of original research work and is of sufficiently high standard to warrant its presentation to the examination. I also certify that the thesis or part thereof has not been previously submitted by him for a degree of any university**.**

Date : 08-2004

Place : Hyderabad

(Dr. G.V. KRISHNA RAO)
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CERTIFICATE

This is to certify that the thesis entitled "**HARNESSING THE POTENTIAL FOR HORTICULTURAL PRODUCTS IN ANDHRA PRADESH : AN EXPLORATORY STUDY**" submitted in partial fulfilment of the requirements for the degree of **MASTER OF SCIENCE IN AGRICULTURE** of the **Acharya N.G. Ranga Agricultural University, Hyderabad**, is a record of the bonafide research work carried out by **D. BALA PRAKASH** under our guidance and supervision. The subject of the thesis has been approved by the Student's Advisory Committee.

No part of the thesis has been submitted for any other degree or diploma. The published part has been fully acknowledged. All assistance and help received during the course of the investigation have been duly acknowledged by the author of the thesis.

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Place: Hyderabad

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This is to certify that the thesis entitled "**COTTON CRISIS IN WARANGAL DISTRICT OF ANDHRA PRADESH**" submitted in partial fulfilment of the requirements for the degree of **MASTER OF SCIENCE IN AGRICULTURE** of the **Acharya N.G. Ranga Agricultural University, Hyderabad**, is a record of the bonafide research work carried out by **Mr. G. RAVIKIRAN** under our guidance and supervision. The subject of the thesis has been approved by the Student's Advisory Committee.

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LIST OF ABREVIATIONS

@	:	At the rate of
%	:	Per cent
CGR	:	Compound Growth Rate
CMIE	:	Centre for Monitoring Indian Economy
CPD	:	Cattle pair day
CPO	:	Chief Planning Office
et al.	:	And others
etc.	:	Et cetra
FHP	:	Farm harvest price
fig.	:	Figure
ft	:	Feet
gms	:	Grams
ha	:	Hectare
i.e.	:	That is
kg	:	Kilogram
mkg	:	Million kilogram
MLR	:	Multiple Linear Regression
MPD	:	Man per day
MPP	:	Marginal physical product
MRO	:	Mandal Revenue Office
MSP	:	Minimum support price
MVP	:	Marginal value product
No.	:	Number
NS	:	Not significant
^{o}C	:	Degree Celsius
Qt	:	Quintal
Rs	:	Rupees
sq. mt	:	Square meter
viz.	:	Namely

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ABSTRACT

The present study was conducted in Andhra Pradesh with the following specific objectives.

1. To assess the performance of cotton in Warangal district.
2. To workout the economics of cotton cultivation.
3. To analyse credit use pattern of selected cotton farmers.
4. To identify factors responsible for the crisis.
5. To suggest measures to overcome the crisis.

Methodology

Warangal district was purposively selected for the study since it occupies significant position in terms of area and production. Further, the district has come to the lime light because of suicides committed by cotton farmers in the district. Secondary data was used for asscessing the production performance of cotton in the district. Primary data for the agricultural year was collected with the help of a specially devised set of schedules. The data was subjected to both conventional and functional analysis to obtain the results.

Main findings of the study

1. The area, production and productivity has shown significant growth for the period 1970-2000. During the decade 1991-2000 the area, production have shown significant growth but growth in productivity was not significant.
2. The total labour utilisation showed an inverse relationship with farm size.
3. The total cost of cultivation showed an inverse relationship with farm size
4. Gross returns showed a direct relationship with farm size. However net losses did not show a perceptible relationship with farm size.

5. Break even analysis revealed that cotton production was unprofitable on small farms. It also showed that the gap between break-even output and actual output was very high and can not be achieve and present condition and resource use.
6. The production function analysis showed decreasing returns to scale on small farms, increasing returns to scale on medium and large farms.
7. The production function analysis also revealed the unprofitable nature of pesticide usage on all farms.
8. The credit utilisation pattern showed that most of the credit was used for production purpose. However, the main reason for diversion was towards consumption.
9. The source of credit for most of the farmers was non-institutional sources. Among different size groups, the large farmers had better access to institutional credit.
10. Income from all sources, expenditure on production, family expenditure and other loans to be repaid were the main factors affecting repayment capacity.
11. The main reasons for crisis that emerged from the study were non-availability of timely and cheap credit, severe pest and disease attack, high cost inputs and low returns, spurious seeds and chemicals and personal problems of the farmers that led them to suicide.
12. The important suggestions to overcome the crisis are a change in cropping pattern, shifting to a non-cotton based farming system, strengthening of PACS to extend credit and supply quality inputs, strengthening of extension organisation for effective dissemination of technical know how and good agricultural practices, greater extent of institutional financing in agriculture and last but not the least was the government intervention in stabilizing prices and assuring remunerative prices to the farmers.

Policy implications

1. Reducing yield losses by pests and diseases by developing a forecasting system that forewarns on the incidence of pests and diseases.
2. Greater institutional financing should be implemented to offset the burden of high interest rates changed by Private money lenders.
3. Strict vigilance to arrest spurious seeds and chemicals.
4. Development of alternative cropping systems that do not involve cotton.
5. Effective steps need to be taken to make available quality fertilisers and plant protection chemicals at reasonable prices and control artificial hike in price due to hoarding by marketing agencies.
6. A remunerative price should be fixed based on realistic costs of cultivation.
7. Extension activities should be spruced up to meet the emerging needs in this crisis situation.

CHAPTER I

INTRODUCTION

Cotton is the most ancient and important commercial crop next only to foodgrains. It is being cultivated since 7000 years. India has a pride of place in the global cotton scenario with the largest growing area of 9.0 M ha and production of 160 lakh bales in 2003-04. India accounts for 25 per cent of area and 11 per cent of global output. India has brought about a significant transformation in quantitative and qualitative composition of the cotton crop; it is the only country that produces the widest quality range suitable for spinning 1's to 120's count yarn to fully support the requirements of the Indian textile industry. The production of cotton which was 27.9 lakh bales in 1947-48 was made spectacular progress to reach the level of 160 lakh bales in 2003-04, which constitute a 473.5 per cent increase. The import of cotton to meet the needs of the Indian mills which was a regular feature till 1978-79 is no longer required. On the otherhand India has emerged as a net exporter of raw cotton, including "extra long staple cottons" like DCH-32 and Suvin comparable to the best Egyptian and Sudanese types. An export quota of 5.15 lakh bales of cotton has also been released by the Government of India for 2002-03 cotton season.

Cotton cultivation, its trade, processing, manufacture, exports of raw cotton textile goods etc. provides the employment to an estimated 30 million people in India. The cotton growing areas of India fall within 8^{o}-32^{o}N latitude

and 70-80^{o}E longitude being characterized by elevation of 0-90 mt., annual rainfall distribution of 250-1500 mm and widely varying soil conditions in terms of colour, texture and nutrient status. India has the unique distinction of growing all the four species namely Gossypium hirsutum, G. barbadense, G. arboretum and G. herbaceum (Anony, 1990).

Cotton fibre is the best and irreplaceable natural fibre accounting for almost 70 per cent of the total raw material mix of the textile industry. Apart from fully meeting the growing clothing needs of the increasing population, the textile industry contributes over 31 per cent of foreign exchange earnings of the country through merchandise exports.

Frontline demonstrations in farmers fields sponsored by the Indian Council of Agricultural Research have been organized over 800 locations during 1995-96, to disseminate the latest technology on varieties, pest management, efficient water use and other crop management practices in the different cotton tracts. The Directorate of Cotton Development under the Department of Agriculture, Government of India, provides the basic support and direction for cotton development in the field through the State Department of Agriculture under Intensive Cotton Development Programme. The importance of the programme is reflected in the significant advancement in cotton production over the years.

Although the country has recorded an increase in production, the productivity level is hovering around 300 kg/ha lint, as against world average

of 580 kg/ha. This is largely due to nearly 70 per cent of the area being grown under rainfed conditions and seasonal incidence of insect pests and diseases in the irrigated areas, leading to instability in yields per unit area and fluctuating production levels.

The current status of cotton production and consumption pattern shows that India has made major strides since independence from net importer to self sufficiency and a marginal exporter of raw cotton. An exporter of raw cotton and importer of finished textiles India has come a long way and is presently net exporter of finished cotton textiles. With the ongoing globalisation, liberalisation and marketisation, new challenges are ahead as the state has withdrawn from the regulatory regime and is facing the international free market that has immense implications for the national economy through cotton, one of the main commercial crops.

The share of cotton in textile production is around 50 per cent globally, whereas in India, it is around 65 per cent. The global cotton scenario is one of stagnation since 1991-92, when production was at a peak, but since then any important event has not been recorded.

Man made fibres have substituted cotton consumption substantially the world over. In India, cotton still happens to be the major textile being used and will continue to be in the near future. There may be an increase in organic substitutes by way of blending jute, pine apple fibres and the like.

Although the overall production and productivity trend is increasing, there is long term decline in productivity in the intensively irrigated cotton belt, particularly in the Northern zone. Inadequate and untimely release of canal water, poor coverage under certified seeds, improper tillage and residue management, rise in water table and salinity in canal irrigated areas, soil crusting and decline in soil fertility due to inadequate application of organic supplements, nutrient imbalance particularly Zn deficiency, leaf curl virus and development of resistance among cotton pests especially the bollworm are some of the issues threatening the sustainability of cotton production in India.

Since soil, water and pests will continue to be the main constraints limiting cotton production, it is necessary to identify an ideal plant type for each zone. A short duration compact plant type with synchronous flowering and boll bursting, possessing resistance/tolerance to major pests and diseases and amenable to mechanical picking will be ideal for irrigated double cropped areas.

Watershed based in situ moisture conservation, runoff collection and recycling in rainfed cotton and integrated plant nutrient supply system are the other measures which may provide long term sustainability of cotton based cropping systems.

Agriculture in India is passing through a transitional stage from a traditional way of life to a modern enterprise i.e. from market orientation within the country to globalization. This has warranted increased investments

on improved equipment and machinery and hence enhanced use of capital inputs. This needs additional financial investment which can not be met from internal sources. The need, therefore, arises for external income resources.

Paucity of adequate financial resources has been a major constraint in agriculture, especially in developing countries like India. Credit is said to be the live blood of agriculture as it can generate accelerated economic growth. However, this is possible only when repayment is timely. To state in the words of M.S. Swaminathan, credit recycling will hold the key to rapid agricultural production.

1.1 COTTON BASED CROPPING SYSTEMS

Cotton is grown either as a sole crop or as a strip crop with pigeonpea or is intercropped with pulses and oilseeds, rotated with coarse cereals (sorghum) in rainfed regions and as a sequential crop with wheat, mustard etc. as in the irrigated northern zone and with rice in the irrigated tract of the south zone. Research and development in cotton will now have to focus on cotton as a component of a cropping system operating within a large farming system. The synergestic interactions operating at the farming system level should be harnessed to enhance productivity, reduce expenditure on external inputs and ensure sustainability of the system.

1.2 ECONOMIC IMPORTANCE OF THE CROP

Cotton is the most important commercial and oldest of all fibres used by human beings. As a commercial crop playing a key role in the economy of

the world, it is leading the textile fibre in the world accounting approximately 45.50 per cent of the global textile market. Cotton is produced in about 75 countries around the world and the important cotton producing countries are USSR, China, USA, India, Brazil, Pakistan, Egypt, Mexico, Sudan, Peru and Turkey. These countries account for nearly 85 per cent of the total cotton production in the world. Raw cotton is an important foreign exchange earner for many countries. For twenty countries, cotton export provides about 20 per cent of funds needed to import food. Infact, the developing countries account for 50 per cent of the exports of raw cotton textiles to industrialized nations like countries of Western Europe, Japan and USA. Cotton is also an employment oriented, industry. It is estimated that all over the world nearly 190 million people are dependent on growing and processing cotton. Further, cotton seed is also rich source of food since edible oil and cotton seed meal are the products of the cotton seed. In several cotton producing countries particularly the developed nations like USA and USSR, cotton seed products make a considerable contribution to the supply of human and livestock food resources. For instance, in USSR, cotton seed oil is the second largest source of the vegetable oil. Eventhough it is advocated that synthetic fibers gradually replace cotton, it is not in the interest of the developing countries for the following reasons.

1. Establishment of synthetic fibre plants in developing countries requires huge investment.

2. Since few developing countries have their own crude resources, it is not possible for them to import chemical food stocks required for synthetic fibre production at a high cost and limited foreign currency resources.
3. A worker in an average size synthetic fibre (polyster) producing plant displaces 33 people engaged in growing cotton.

1.3 IMPORTANCE OF THE COTTON IN INDIAN ECONOMY

Cotton industry had a tremendous impact on the economy of the country since early times. Indus valley civilization is believed to be the earliest civilization to weave cotton into fabric. The earliest record of a mechanical device for separating lint from seed was also from India being the primitive `Charkha' gin.

Cotton is one of the principal crops in India and enjoys a pride of place and unique position in Indian agriculture as well as Indian economy. It accounts for 7 per cent of GDP, 21 per cent of industrial production, 31 per cent of total export earnings, it is the largest gross and net foreign exchange earner. It also contributes 10 per cent of excise revenue. It is largely cultivated under rainfed conditions and nearly 70 per cent of the area is entirely dependent on rainfall, while supplementary irrigation existed for about 30 per cent.

The key role the cotton played in our economy can be gauged from the fact that nearly 13 million farmers spread out in more than 10 states are dependent on cotton cultivation. The cotton textile industry in India employs

more workers than in any other sector and 15 per cent of the total labour force of 200 million is employed in cotton textile manufacturing and associated industries. The processing and manufacturing of cotton from `kapas' to textile provides employment for more than 20 million people.

1.4 COTTON PRODUCTION IN INDIA

Cotton in India is largely grown during the tropical monsoon season. The major cotton growing states are Maharashtra, Gujarat, Karnataka, Madhya Pradesh, Punjab, Rajasthan, Andhra Pradesh, Haryana and Tamil Nadu. The cotton scenario in India is presented in Table 1.1. Area under cotton during 1990-2001 is given in Fig. 1.

The total area under cotton crop in India during 2001-02 is about 91.6 lakh ha with a production of 171.5 lakhs bales of cotton. The export of cotton which was 1.9 lakh bales during 1950-51 has reached to 6.95 lakh bales by 2001-02.

1.5 COTTON PRODUCTION IN ANDHRA PRADESH

Area and production of cotton in Andhra Pradesh from 1990 to 2001 is presented in Fig. 2.

The total area under cotton in A.P. was 99,500 ha in 1959 with a production of 1.26 lakh tonnes raised to an area of 102 lakh ha with a production of 17 lakh bales in 2000-01. The cotton cultivation has shown marked increase in terms of area and production.

During the year 1997 heavy rains followed by sever dry spell resulted in the out break of Heliothis and Whitefly which has resulted in the severe damage of the cotton crop in Andhra Pradesh. About 350 farmers had committed suicides throughout the state including cotton farmers. This has been continuing since but in lesser numbers.

During the year 2002-03, has observed drought condition due to inadequate and timely rainfall leading to large scale decrease in area under cotton. The yield was also considerably reduced.

The area under cotton crop in Warangal district of Andhra Pradesh from 1990-2003 is shown in Fig. 3.

1.6 PROBLEM SETTING

In the recent past, Warangal district has gained importance in cotton growing. The district has some reputed regions for cotton growing and the scenario has changed during the recent years. Further, the increased number and continuing saga of suicides by cotton farmers in the district due to heavy loss in cotton cultivation of the recent periods, because of tough pest menace, severe drought condition, non-coverage of even prime costs and consequent indebtedness to the money lenders and commercial banks are the main reasons for the selection of this problem on cotton production in Warangal district.

Apart from that the cotton production is facing challenges from many directions. The increased cost of inputs particularly the fertilizers, insecticides and labour has resulted in doubling or trebling its cost of production. Another

important challenge is the severe pest and disease infestation recently and consequent costly control measures boosted up the total cost of production. Despite high cost of certain inputs, some of the cultivators in their anxiety to control pests and diseases had indiscriminately used scarce resources just like adding fuel to the fire, inspite of all these efforts, the end result was not encouraging. Spurious seeds and chemicals have also contributed to the worsening situation. This resulted in heavy loss and indebtedness among many farmers. Because of unbearable strain and stress on the resources, small farmers have to resort on in disposing their immovable assets for clearing the debts incurred mainly in cotton cultivation.

Secondly, eventhough the area under cotton crop has increased in the recent years, the farmer is not able to cope up with the increased expenses per unit of production. All these factors individually to some extent and many factors put together are bringing crisis in cotton cultivation to a larger extent and making the farmers unable to bear the situation. Hence, it is felt desirable to probe into the economic aspects of cotton production in Warangal district which has a large potential hither to. Thus, an attempt has been made in this study to probe into the economic aspects of cotton production, productivity, profitability and credit use pattern of selected farmers in Warangal district of Andhra Pradesh.

1.7 OBJECTIVES

Keeping in view the problems discussed earlier the present study has been under taken with the following specific objectives.

1. To assess the performance of cotton in Warangal district.
2. To workout the economics of cotton cultivation.
3. To analyse credit use pattern of selected cotton farmers.
4. To identify factors responsible for the crisis.
5. To suggest measures to overcome the crisis.

1.8 SCOPE OF THE STUDY

In the past very few studies were conducted on cotton owing to a spate of farmers suicides. In recent times, there has been little effort to study take up the in cotton. Particularly in Warangal district where the concentration of the problem was very high. The suicides of cotton farmers in the district resulting from high indebtedness due to low yields and high costs of cultivation is continuing, and can be called a crisis. This study aims to bringout the reasons for such continuing tragedies.

An attempt has been made in this study to go in depth into the cost of cultivation, returns, profitability, remunerative prices and production problems associated with cotton cultivation in Warangal district under current conditions of farming. The present study is confined to Geesugonda, Shayampet, Duggondi and Atmakur mandals of Warangal district.

Further, the study may be useful to the farmers as well as policy makers to know the exact reason and associated factors which made the farmers to fall in frustration and ultimately committed suicides.

1.9 LIMITATIONS OF THE STUDY

This study has constraints of time, limited size of sample and inadequate resources at the disposal of the investigator.

The conclusions drawn are based on the data collected for the agricultural year 2002 which is very short period for extending concrete recommendations. Further, the information obtained and presented in the study is based on the recall memory of the sampled cultivators which has certain inherent limitations.

Since the present study has been undertaken in only 4 mandals of the 51 mandals in Warangal district, the conclusions drawn are specifically applicable to the area of the similar agro climatic conditions.

1.10 PLAN OF THE THESIS

The thesis is presented in six chapters.

The first chapter presents the importance of cotton industry and scope of the study besides specific objectives.

The second chapter attempts a critical review of the past work done on the economic aspects of crop production, credit use pattern and reasons for the crisis with particular reference to cotton.

In the third chapter the material and methods adopted for the study including sample procedure and the techniques adopted in the analysis are incorporated.

In the fourth chapter, the agro-economic features of the study area are discussed.

The fifth chapter encompasses a critical analysis of the results and discussion.

The last chapter throws light on the summary and conclusions emerged from the study with the policy implications.

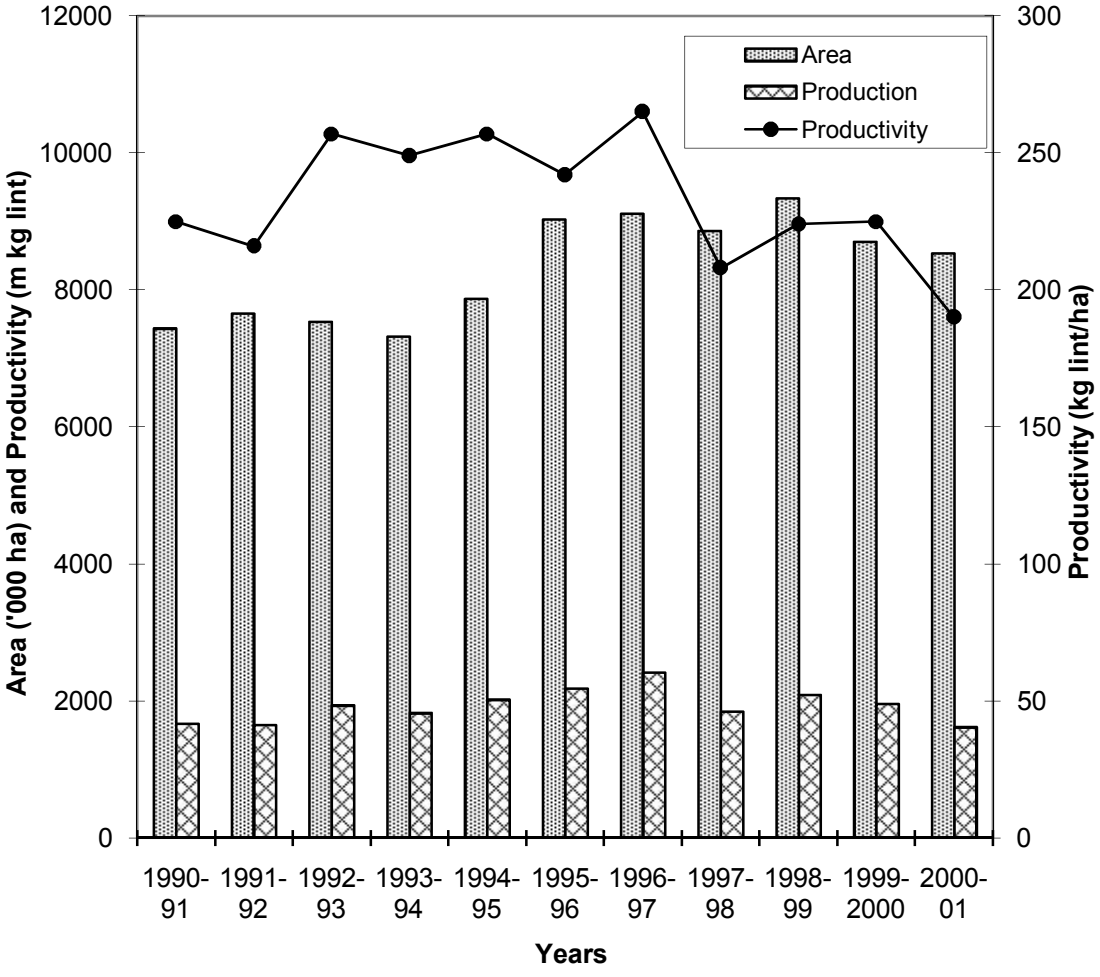


Fig. 1 : Trends in Area, Production and Productivity of cotton in India

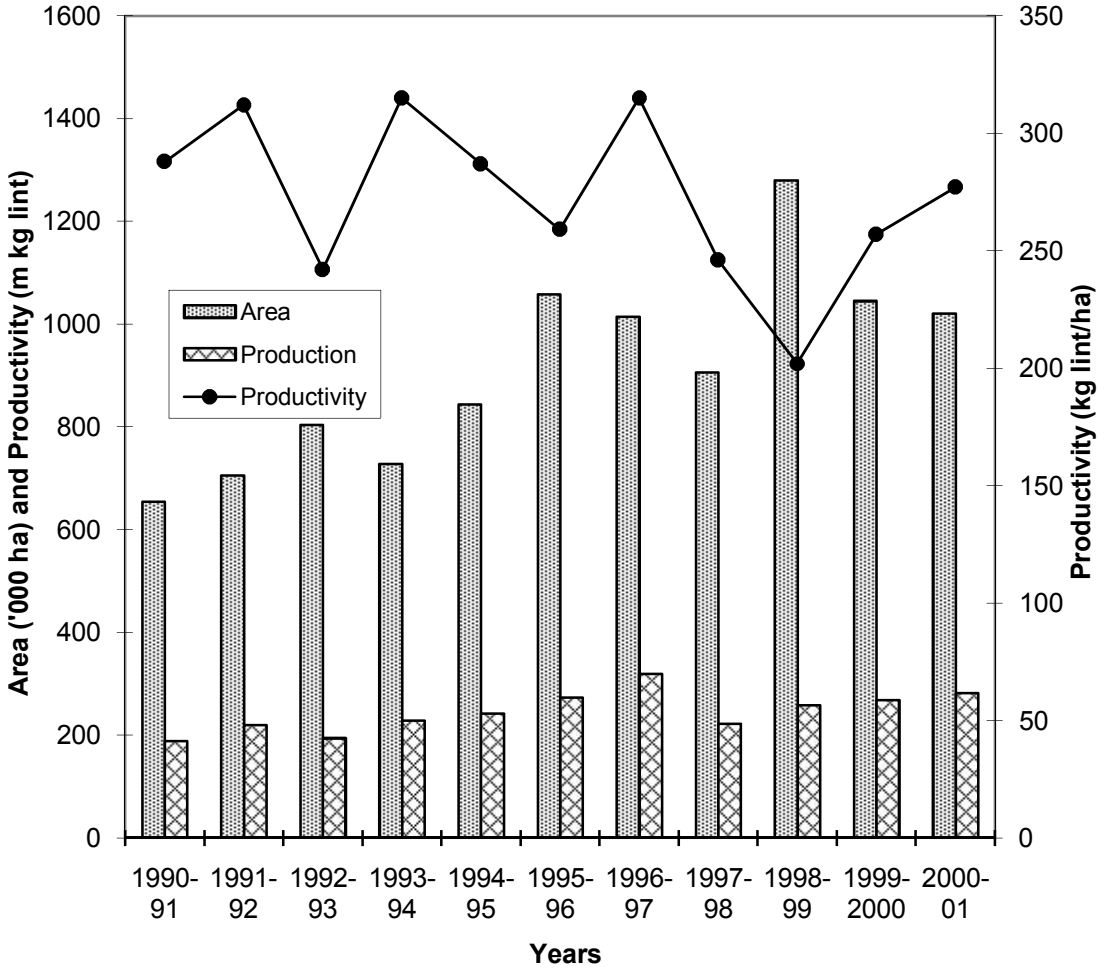


Fig. 2 : Trends in Area, Production and Productivity of cotton in Andhra Pradesh

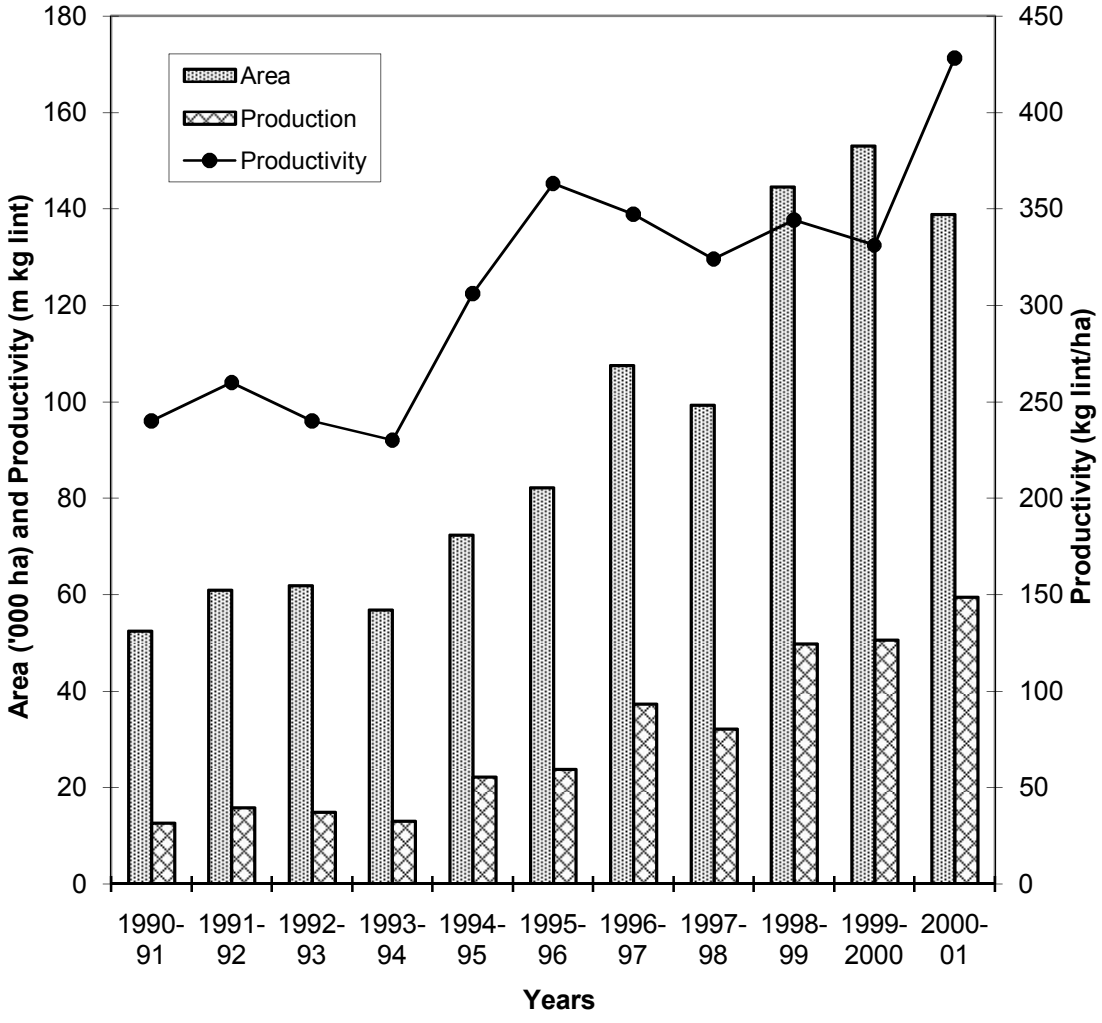


Fig. 3 : Trends in Area, Production and Productivity of cotton in Warangal

CHAPTER II

REVIEW OF LITERATURE

In this chapter an attempt has been made to review the available literature on the subject which provides an opportunity to the investigator to acquire fairly comprehensive knowledge in this field of work. For clarity and convenience the review is presented under the following sub-heads.

2.1 Studies on compound growth rates in agricultural production

2.2 Studies on costs and returns

2.3 Studies on resource productivity, returns to scale and resource use efficiency.

2.4 Studies on credit utilisation pattern of farmers.

2.5 Studies on reasons for crisis

2.1 STUDIES ON COMPOUND GROWTH RATES IN AGRICULTURAL PRODUCTION

Growth rates are measures of performance of economic variables. In order to assess the performance of agriculture production over time in different geographical regions, researchers studied the growth behaviour of crop production covering different time periods. In fact growth behaviour is one of the most extensively studied aspects in Indian Agriculture.

Growth rates are commonly used as summaries of trends in time series data. Of the several ways of computing growth rates, estimating through

fitting a linear or exponential time trend equation using ordinary least squares (OLS) method is commonly followed method. It is proved that while computing growth rate from a linear time-trend equation, the division of regression coefficient (b) with respect to time by harmonic mean of the variable (y) would give the growth rate which is closest to the exponential growth rate (Minhas, 1966). Weighted least squares (WLS) regression and resistant line regression are the techniques that help reduce the effect of extreme values on growth rates (Wiktor and Manning, 1985). A relatively recent development is use of Kinked or piecewise regression, where the time series under consideration is divided into sub series of uniform growth based on some statistical criteria (Jeromi and Ramanathan, 1993; Reddy *et al*., 1998).

Sirohi (1983) observed a mild rising trend in productivity of cotton and rice in India.

Jain and Singh (1983) computed compound growth rates for periods of 1950-65 and 1968-79 and found deceleration in yield growth rates of rice, groundnut and cotton for the period 1968-79 compared to earlier period. In case of cotton yields were found to decrease at an annual rate of 2.7 per cent as against annual growth rate of 4.5 per cent during 1950-65.

Narender *et al*. (1984) measured the growth of area, production and productivity of principal crops in Andhra Pradesh, India for the period of pre-green revolution, green revolution and post green revolution (1956-57 to

1980-81). They concluded that the tempo of growth rates during the green revolution period had not maintained the same trend during the post green revolution.

Using state level data for the period, 1960-84, Sharma and Singh (1986) estimated and decomposed crop production growth in Punjab. A significant expansion of area under rice and cotton and a fall in area under Desi cotton was observed.

Satyasekhar (1987) projected area and production for the year 2000-01 in Andhra Pradesh based on previous performance. He projected a significant growth in yield of rice and cotton.

Sharma (1988) analysed the performance of crop production in the districts of Punjab during 1965-85 and found that cotton and groundnut were losing area to rice.

Raju and Rao (1988) observed the performance in Agriculture in Andhra Pradesh during 1956-82 to be creditable. There was an acceleration in growth of output after 1970.

Tomer (1989) concluded research on growth in area, production and productivity of important crops in Haryana. He concluded that rice, wheat, cotton and rapeseed and mustard were the only crops which registered an increase both in the area and productivity during 1974-86.

Janaiah *et al.* (1990) conducted study on area response of major commercial crops including cotton in Andhra Pradesh and suggested that the

area under the crop is likely to be expanding in presence of sound and assured price situation coupled with easy market clearance.

Singh *et al*. (1993) observed a deceleration in the growth of area and production of cotton and an acceleration in yield growth during the period after 1965 compared to the earlier one.

Lal *et al*. (1994) calculated CGRs of area, production and productivity of cotton in major cotton growing states of India and found that CGR of Area Production and Productivity for Andhra Pradesh were 2.99, 11.51 and 8.27 respectively for the period 1969-70 to 1987-88 and 0.37, 5.80 and 5.39 respectively for the period 1951-52 to 1987-88. They attributed such high growth rates to the impact of green revolution.

Padmanabhan *et al*. (1996) studied the rate and sources of growth in cotton production in Tamil Nadu showed that yield gain was major source of growth though the contribution of area was also significant. Increase in farm harvest prices of cotton was also found to have a bearing on production.

Chowdhary *et al*. (1998) concluded that the potential profitability of the crop lures the farmers to invest heavily using funds borrowed at high interest rates. This coupled with indiscriminate use of inputs, pest resistance and resurgence leading to yield losses and the wide price fluctuations leave the farmer heavily indebted, which is one of the reasons behind the suicides of farmers.

Rama Rao (2000) estimated compound growth rates in Area, production and productivity of cotton in districts of Andhra Pradesh. For the period 1990-91 to 1996-97 he found that the CGR for area, production and productivity were 12.04, NS and NS for Warangal and 5.20, NS & NS for Andhra Pradesh, respectively. He also reported that the area expansion did not result in any appreciable production growth in Telangana region. Further, the state did not experience any significant growth in production and yield of cotton during the period 1991 to 1996-1997

Ramarao (2003) conducted a study on growth and instability of agriculture in Andhra Pradesh and concluded that during the period 1980-81 to 2000-01 highest growth in Area, production and productivity considering total agriculture was noticed in Vizianagaram, Karimnagar and Warangal respectively. He also found that area has shown negative growth rate in Telangana region while production and productivity showed a positive growth rate.

2.2 STUDIES ON COSTS, RETURNS AND PROFITABILITY

Production costs play an important role in decision making of farmers. In general, at a given level of prices, cost statements are desirable to point out the places where production costs can be reduced and the extent to which the operations can be expanded profitably. The reduction in production costs and thereby increasing the efficiency of resource use plays an important role in a competitive market. A knowledge of cost of different inputs and practices

would enable the farmer to have a least cost combination of inputs and practices to maximize the farm profits as a whole. The existing literature with respect to costs, returns and profitability are revisited in this section.

Shukla (1966) categorised costs into cost A1, cost A2, cost B and cost C. Cost A1 included all cash and kind expenses actually incurred less rent. Cost A2 included cost A1 plus rental value of owned land plus interest on fixed capital minus land revenue on owned land. Cost C included cost B plus imputed value of family labour.

Sharma (1969) divided the cost of production of farm crops into fixed costs and variable costs. The fixed costs includes cash expenses on permanent human and animal labour, depreciation on farm implements and machinery, land revenue and cesses, rental value of own land and interest on permanent investment excluding the land value. The variable costs covered wages paid to hired human labour, cost of seed, manure and fertilizer, irrigation charges and levy and miscellaneous costs like plant protection charges, cost of gunny bags and interest on variable costs.

Johl and Kapoor (1971) defined gross returns as the total production multiplied by the price. Returns to fixed farm resources were equal to gross returns minus variable costs. These were also known as returns over variable costs. Net returns were equal to gross returns minus all costs (fixed and variable : cash and kind).

Samuelson (1973) divided costs into fixed and variable costs. Fixed cost represented the total expenses that are incurred when a zero output was produced. It was often called overhead cost and usually included contractual commitments for rental, maintenance, depreciation, overhead salaries, wages etc. It was a sunk cost quite unaffected by any variation in output in the same period of which it was sunk.

Rani (1984) indicated from her study that there was no perceptible relationship between total cost of production and farm size in case of mixed, local and hybrid cotton. The proportion of operational costs to total costs varied from 54 to 69 per cent in general. The cost of cultivation per hectare was Rs. 3060, Rs. 1869, Rs. 4787, while the gross returns per hectare was Rs. 2620, Rs. 1542 and Rs. 4450 in case of mixed, local and hybrid cotton respectively indicating negative net returns in all the three cases.

Shobha (1984) observed that the average yields obtained on different farm size groups for different varieties of cotton were less than that of break-even output indicating loss in cotton cultivation.

Reddy (1985) indicated that the hectare cost of cultivation of MCU-5, Varalakshmi and Suvin amounted to Rs. 8600, Rs. 10794 and Rs. 8045 respectively.

Richardson *et al*. (1985) pointed out from their study on cotton farms that large farms had lower average production costs, higher average cotton lint prices and a greater asset base from which they can meet cash flow deficits.

Seethaprabhu (1985) observed per hectare expenditure of cotton to be Rs. 5,821.07, Rs. 15,832.43 and Rs. 5,826.83 for varieties Varalakshmi, MCU-5 and Varalakshmi and MCU-5 mixed respectively. The value of output per hectare for the same was Rs. 13,515, Rs. 10,216.76 and Rs. 11,912.75 respectively.

Raha *et al*. (1986) found cotton to be more profitable than its competing crops. They concluded that despite efforts of the cotton development board, the production and acreage targets were not achieved because of lower price of cotton, inadequacy of funds, technical know-low and lack of irrigation facility.

Ramamoorthy (1987) observed that total cost of cultivation of MCU-5 variety was Rs. 8471 as against Rs. 7886 and Rs. 12,809 for Varalaxmi and Suvin varieties respectively. Pesticides constituted 29, 23 and 33 per cent of total operation costs in the above three varieties of cotton.

Aheran *et al*. (1988) observed the specialized cotton farms those with atleast 50 per cent of the value of their total production from cotton, had relatively high net returns compared with other specialised field crops. However specialized cotton farms experienced more financial stress than most other types of farms. Large farms had the most favourable returns and cost structure.

Gadre and Mahalle (1988) estimated the cost of cultivation of cotton (Cost C) per hectare to be Rs. 3848 for hybrid cotton and Rs. 1541 for desi

cotton while the net returns were Rs. 1062 and Rs. 888 for hybrid and desi cotton respectively.

Kishore (1989) indicated that the total cost of cultivation per hectare of cotton was Rs. 11,594.09 on pooled farms and it showed a direct relationship with the farm size. The gross returns from the same was Rs. 5,263.17 indicating tremendous loss. The total costs per hectare varied from Rs. 10,939.83 on small farms to Rs. 11,809.69 on large farms while the gross returns on the same varied from Rs. 4,292.43 on small farms to Rs. 5,927.56 on large farms.

Nageshwara Rao *et al*. (1990) indicated that higher initial profits from cotton in early seventies attracted the farmers to apply higher doses of fertilizers and to use pesticides indiscriminately which resulted in losses from cotton production in later years. Though the returns from cotton production were established in the early eighties, the same started declining from 1984-85 onwards due to improper use of modern inputs, increased cost of labour and declining yield.

Pandurangadu and Raju (1990) observed an alarming increase in cost of cultivation largely attributable to the increased use of expensive and broad spectrum chemicals such as synthetic pyrethroids. Cultivation of equally remunerative crops like maize and soybean was recommended.

Lokhande *et al*. (1995) based on all India data, concluded that, although the net returns to hybrid cotton varieties are more, the costs of cultivation are

greater resulting in relatively low cost benefit ratios compared to other crops. The major cost components of cost of cultivation are labour (about 60 %) followed by fertilizers and pesticides constituting about 22.33 per cent cultivation costs are relatively higher for irrigated cotton in both north and south zones compared to the rainfed cotton of central zone.

Reddy (1997) found in a study conducted in Guntur district that farm size was positively related to total costs and net returns.

Reddy *et al*. (1997) revealed that the total cost of cultivation of cotton is positively associated with farm size, implying more adoption and accessibility of modern technologies for large farmers. Pesticides, labour and fertilizers are major cost components accounting for 60-65 per cent of total costs. Similarly productivity of cotton was directly related to farm size.

Reddy *et al*. (1997) reported that the total cost of cultivation of cotton is positively associated with farm size, implying more adoption and accessibility of modern technologies to large farmers. Pesticides, labour and fertilizers are major cost components accounting for 60-65 per cent of total cost.

Parthasarathy and Shameem (1998) in their study on suicides of cotton farmers in Andhra Pradesh estimated the cost of cultivation to be approximately Rs. 15,000 per hectare.

Subbarayudu and Seshadry (2000) conducted a case study on costs and returns of cotton cultivation in Andhra Pradesh and reported that insecticides are the most costly among inputs. However, the reduction in the number of

sprays was accompanied by a reduction in yield and returns. Insecticides constitute largest proportion of the total production costs (25.4 %) followed by land lease (22.1 %).

2.3 STUDIES ON RESOURCE PRODUCTIVITY, RETURNS TO SCALE AND RESOURCE USE EFFICIENCY

Mitscherlich (1909) has taken the credit for defining the algebraic nature of production function.

An infinite number of functional forms are possible in productivity scheme such as Cobb-Douglas, power function, spillman function, quadratic forms etc.

The earlier workers Leibig (1955), Bondeuff (1924), Plessing (1943) and Boresch (1930) have formulated the functional relationing between input and output and expressed in the form of

$$Y = a + b^x$$

Exponential type of production functions which are non-linear in character were developed substantially by Biggs et al. (1928). Working independently spillman (1923) fitted an exponential type of production function in the form of

$$Y = M - AR^2$$

Cobb-Douglas (1928) developed in the industrial field an exponential type of production function in the form of

$$Y = ab^x$$

This equation can be changed into linear form by using logarithms and can be represented as

$$\text{Log } Y = \log a + b \log x$$

This type of production function is widely used in the field of agriculture because of its great flexibility and applicability.

Rani (1984) used Cobb-Douglas Production function to estimate resource use efficiency and scale returns on cotton farms. She had indicated the diminishing factor returns in general. Scale – coefficients indicated predominance of constant returns to scale in cotton cultivation. Further the marginal value products to opportunity cost ratio for various resources indicated high degree of resource use inefficiency and indicated scope for reorganization of resources so as to increase the profitability of cotton cultivation.

Seethapraphu (1985) using Cobb-Douglas Production function revealed that MVPs of pesticides and hired labour were less than unity and that of fertilizers, manures and irrigation were substantially higher than unity, implying sub-optimal levels of use of these inputs in cotton.

Basha and Dakshina Moorthy (1986) from their study in Guntur region observed that production credit had significant impact on yield of cotton in the developed region. They also found that the results of MVP and resource use efficiency implied wider scope for employing production credit further.

Pandurangadu (1988) revealed from Cobb-Douglas Production analysis in cotton that a one per cent increase in expenditure on pesticides, manures and fertilizers, human labour, tractor power and other capital services would inflate the gross income to the extent of 0.11, 0.28, 0.47, 0.09 and 0.08 per cent, respectively. Negative factor returns was observed in case of pesticides on medium and large farms.

Chitra (1995) in the study on profitability of important fruits, orchards in and around Hyderabad indicated increasing returns to scale in guava and decreasing returns to scale in ber. The MVP to opportunity cost ratio indicated a high degree of scope for readjustment and re-organisation of resources so as to obtain higher returns.

Resource use-efficiency

In India, Singh (1940) was the first to fit a production function for the prediction of the total productivity of all the farms. Sukhatme (1941) and Panse (1951) fitted quadratic production functions to estimate optimum dose of nitrogen for production of paddy and cotton.

Heady (1946) had done a pioneering work in this field who derived an aggregate production function from a random sample of Iowa State farms (USA), using real estate labour in months, value of machinery equipment, value of livestock and cash operating expenses as explanatory variable. He also (1954) fitted two more production functions using same data, one for crop enterprise and other for livestock enterprise to measure marginal value of

productivity of the resources used and predicted the influence of each resource on the value of the product produced.

Singh (1975) fitted Cobb-Douglas production function in backward agricultural to work out the elasticities of inputs which in turn, were used to calculate their marginal value products for average farms. The result of the study supported the hypothesis of constant returns to scale for both small and large farms in the selected regions.

Alshi *et al*. (1983) in their study on "Technological change and factor shares in cotton production : A case study of Akola cotton farms", fitted Cobb-Douglas production function and indicated constant returns to scale in case of Hybrid, American and Desi cottons. The varieties viz., human labour, fertilizers, farm yard manure and capital indicated 72 per cent variation in case of Desi cotton, 50 per cent variation and 90 per cent variation in case of American cotton and Hybrid cotton, respectively.

Prasad (1983) in their study on groundnut in Chittoor district indicated increasing returns to scale on the whole. The study also revealed high degree of resource use efficiency.

Naidu and Thirupathaiah (1992) found that there is scope for reorganization of resources so as to achieve higher profits in terms of MVP and opportunity cost, all three size groups of farms appears to be grossly inefficient.

2.4 STUDIES ON UTILISATION OF AGRICULTURAL PRODUCTION CREDIT

A salient review of earlier studies on agricultural production credit is furnished here under.

Planning Evaluation Organisation of planning commission, Government of India (1959) in it's evaluation report on the working of the large and small size co-operative societies revealed that 2.3 per cent of the short term loans obtained from PACS were diverted on such purposes other than for which they were granted. It was also revealed that 23 per cent of the short term loans and 36 per cent of the medium term loans obtained from primary agricultural credit societies were spent on purposes other than for which they were granted.

Kailasan (1980) found that majority of big farmers were diverting the credit for repayment of old debts, paying interest to old debts, marriage and purchase of vehicles where as small farmers were using it for purchase of inputs.

Deshmukh (1981) stated that credit utilisation pattern was influenced by the family size.

Deshmukh (1981) found that majority of respondents (60.0 %) completely repaid their loans, whereas (28.33 %) of them had all rapid and the rest (11.67 %) of the respondents partially repaid the loans.

Sandhya (1983) found that all the credit borrowers (100 %) have utilized the credit for agricultural purposes for which it was sanctioned.

Singh *et al*. (1985) in his study revealed that the diversion of crop loans from the cash components were more than those of kind component.

Sardesai (1985) opined that the internal and external factors are responsible for overdues. Organisational matters, loaning policies and procedures, fixation of due dates taking into account the harvest reason and duration of loan and quantum instalment are the internal factors.

Panda (1985) reported that the diversion of credit towards non-productive purpose was more among medium and large farmers than among small farmers.

Pandey *et al*. (1986) concluded hat the total amount of loans due for repayment exceeded the repaying capacity on the small and medium farms which was reverse on the large farms so the default of large farmers was mostly willful which can be reduced by forcing the large farmers through appropriate legal actions.

Balishter *et al*. (1987) in the study observed that marginal farmers may be defaulting due to low repayment capacity and the medium and large farmers may be defaulting willfully.

Reddy *et al*. (1987) opined that bank authorities should give importance to the educational status, farm size, social participation, urban contact, scientific orientation, economic motivation and initiative of farmers while

disbursing credit as these characteristics are having considerable bearing on repayment performance of peasants.

Guptha (1988) reported that recovery performance of term loan was better than the crop loan because of the factors of increasing cropping intensity, increase in irrigated area and increase in the per capita income. He also observed that 41.69 per cent of the loan was repaid by the sample farmers and the over dues accounted for 58.31 per cent of the total loan advanced.

Oberoi *et al*. (1988) reported that 63 per cent of farmers experienced low yields. 59 per cent opined that low non farm income is the reason. Fifty five per cent referred that the loan was deviated from the purpose for which it was granted. 35 per cent respondents cope up with the problem of untimely supply of loan. Fourteen per cent of loanees were of the view that their loans would be waived by the government.

Vaikuntha (1988) opined that 90 per cent of defaulters are mainly due to crop failures i.e. natural calamities such as severe drought, floods, cyclones and pests.

Subbiah *et al*. (1989) in their study on "Credit repayment performance of the Ralayaseema Grameena Bank Borrowers" found that low yields, low market price for produce, absence of other sources of income and lavish expenditure were the major factors responsible for partial and non-repayment of loans.

Ballishter *et al*. (1989) concluded that while about 40 per cent and 81.79 per cent of the number of families and amount of loan respectively were used for productive purposes by landless labourers, 24 and 70.89 per cent of the number families and amount of loan respectively were used by small farmers. The rest of the amount was used for unproductive purposes.

Palanisamy (1989) suggested giving of separate consumption loans especially to small farmers to prevent diversion of agricultural credit.

Punnarao and Satyanarayana (1989) in their study on credit utilisation pattern of small and marginal farmers of Chaitanya Grameena Bank found that majority of small farmers (71.25 %) and marginal farmers (85.0 %) completely utilized the credit for the purpose it was sanctioned. 28.75 per cent of small farmers and 15 per cent of marginal farmers had partially utilized the loan for other purposes.

Ramakrishna (1990) reported that the major portion of borrowing from agriculturist money lenders, the main source of non-institutional credit, is used for consumption by both the types of borrowers. The repayment of institutional credit is relatively lower as compared to non-install loans.

Balishter *et al*. (1990) noticed that out of 150 total borrowing farmers marginal farmers accounted for the highest share both in terms of number of defaulters and amount of overdues.

Rambabu *et al*. (1991) reported that 80 per cent of borrowers repaid the borrowed amount in time. 12 per cent paid partially and only 2 per cent did not repay at all.

Rathod (1991) reported that there was an increasing relationship between overdues and credit advances in different sizes of farms.

Goyal and Pandey (1991) conducted an analysis of default of crop loan in PACS in Haryana and reported that the majority of defaulters were small farmers (78 %) and accounted for 69 per cent of total overdues.

Singh and Mruthyunjaya (1992) conducted a study on credit utilisation and repayment pattern of small and marginal farmers in Aligarh district of Uttar Pradesh and found that the overdues increased with increase in size of holding. The farmers on the whole repaid 74 per cent loans of which nearly 6.3 per cent was repaid by selling farm produce and remaining 11 per cent from other sources like off farm income and reborrowing. The small farmers, though had higher repayment capacity did not repay the loans accordingly.

Ravi Verma (1992) opined that the failure of crops, exorbitant increase in the cost of cultivation, ineffective use of credit, inadequate amount of credit for intended purpose are some of the reasons affecting the repayment of the loan.

Raghunanda Reddy (1994) concluded that the main reasons for non-repayment of loans in time expressed by defaulters were diversion of income to repay private loan, higher family expenses, lack of finance for working

capital and periodical announcements by the government of waiving off agricultural overdues.

Lazarus (1995) reported that the proportion of loan amount used for production purpose was high (97 %) in large farmers as compared to small farmers (91 %). Further the loan amount diverted for consumption purpose was 5 per cent in small farmers and 2 per cent in case of large farmers. He also found that the repaying capacity of large farmers was significantly higher over small farmers.

Mohapatra and Mishra (1995) conducted a study on acceptance of farm credit by small farmers in Orissa and concluded that majority (76.4 %) of respondents utilized the loan amount for cultivation purpose.

Biswas and Dash (1997) in their study on recovery phenomenon of rural bank credit in Orissa found that 60 per cent of the defaulters had misutilised the loan of which 32.35 per cent had diverted towards consumption purposes, 14.7 per cent towards repayment of old debt.

Parthasarathy and Shameem (1998) reported that only Rs. 20 crore (18.18 %) of agricultural credit was extended by commercial banks and co-operatives, whereas Rs. 90 crore (81.82 %) of agricultural credit was obtained from money lenders.

Rahman (1999) in a study reported that borrowers from Grameena Bank in Tangail district most of the timely repayments were not made out of

incomes flowing from assets gained but through further borrowing from private money lenders.

Ramamoorthy and Venkataswamy (1999) in a study on credit marketing linkages among cotton farmers reported that of the total crop loan borrowed by the sample farmers, nearly 68 per cent was from commission agents/input dealers, 6 per cent from cooperatives, 12 per cent from commercial banks, 10 per cent from relatives and 4 per cent from others. Nearly 98 per cent of small and marginal farmers borrowed credit from commission agents/input dealers. It is also found that of the total cotton produced only 28 per cent was traded through the regulated market while remaining 72 per cent was handled by traders outside the regulated market.

Lavanya (2000) reported that the public financial institutions are able to meet only 15-20 per cent of credit requirement of farmers and the farmers are forced to seek private sources to meet the remaining 75-80 per cent of loan.

Deshpande (2002) found that the preference to borrow from money lenders was greater as compared to formal institutions and hence opined that the opportunity cost of going through the process of getting loan from formal institutions was approximately equal to the difference between the rates of interest between formal and informal lenders.

Ramola (2002) concluded that recovery percentage of farm sector is less (75.27%) compared to non farm sector (86.03) during 2000-01.

Shravan (2002) concluded that the size of the holding, family expenses, gross income and other loans due for repayment were the major factors that affected the repaying capacity among all the farm size groups. He observed that the size of the holding and gross income had a positive and significant relationship while family expenses and other loans due had a negatively significant relationship with the repaying capacity.

2.5 TO FIND REASONS FOR THE CRISIS

Veeraraghavan (1985) has found in his study of suicides and attempted suicides that no single factor could be delineated. The causes of suicides revealed that it is not a single stress but a cumulative effect of various stresses over a period of time that results in a suicidal act.

Reddy (1988) reported that as many as 27 ryots committed suicides owing to heavy indebtedness, in 8 mandals of Prakasam district of Andhra Pradesh.

Sriramulu (1988) reported an alarming spurt in suicides by cotton growers in Prakasam district. He reported that the cotton growers are groaning under the burden of heavy debt, are resorting to suicides increasingly to escape from the humiliation in the face of their inability to clear their debts to money lenders.

Lazarus (1995) concluded that the agril. Production credit was unequally distributed among sample farmers and that it was skewed towards large farmers.

Peoples Tribunal (1998) revealed that the suicides of farmers in Andhra Pradesh were due to heavy incidence of pests and diseases, failure of Agricultural Department in timely advice to farmers about control measures, spurious pesticides in the market and high interest rates by the private money lenders.

Shameem and Parthasarathy (1998) reported that the peasant in Warangal district is subjected to deep stress mainly due to inaccessibility of institutional credit and dependence on money lenders at high rates of interest.

Prasad (1999) conducted a study to retrace the connections between Indian cotton and the mechanized textile industry were first established, a direction that has led to the present crisis in cotton farming. He concluded that faith in Indian cotton varieties must be restored and more needs to be done to deal with over use of pesticides and to reestablish the quality of Indian cotton.

Krupakar (2001) sorted out eight chief factors through content analysis which were lack of knowledge of cotton cultivation, over investment, inadequate irrigation facilities, drought, pest damage and inadequate credit facilities. Over indebtedness was the major factor, according to the respondents, for driving the farmers to commit suicides.

Kumar and Rao (2002) in a study conducted to find reasons for farmers suicides in Warangal district found that the farmers perceived loss of crop due to infestation of bollworm and whitefly, debts to moneylenders, tenant farming were the primary reasons for suicide. Also the farmers and family members of

the deceased suggested that provision of institutional credit, advance information regarding pest and disease incidence, checking quality of pesticides and provision of irrigation facilities will prevent such tragedies in the future.

Deshpande (2002) studied on the distribution of victims by size classes of holding and found that majority of the farmers committed suicides fall in the size class of 2-4 acres (30 %) followed by 4-10 acres (27 %) and 1-2 acres (24 %).

CHAPTER III

MATERIAL AND METHODS

The present study was carried out in Warangal district of Andhra Pradesh. The chapter deals mainly about sampling design, nature and mode of collection of data and analytical tools employed in achieving the objectives of the study. Further, different concepts and methods followed in the study are also outlined.

SAMPLING DESIGN

Selection of the district

Warangal district was purposively selected for the study as it occupied good position both in terms of area and production in cotton cultivation in A.P. Apart from that the district has come to lime light because of its suicides committed by the cotton farmer in the district.

Selection of mandals

Among the mandals of the district, four mandals namely Geesugonda, Shayampet, Duggondi and Atmakuru were selected for the study based on the highest concentration of the area under cotton cultivation.

Selection of villages

All villages in each mandal were arranged in an ascending order based on its area and the top two villages were selected so as to make a total of eight villages for the detailed study.

The final selected villages are given below :

1. Geesugonda
    1) Ganga Devipally
    2) Kommala
2. Atmakur
    1) Gudeppahad
    2) Takkallapahad
3. Shayampet
    1) Mylaram
    2) Mandarapet
4. Duggondi
    1) Nachenapally
    2) Girnibavi

Selection of cotton farmers

The list of all the cotton farmers in each selected villages was obtained from the revenue records of the respective villages. The farmers were selected according to the stratified random sampling taking operational holding as the basis.

All the cotton farmers in each selected village was grouped into 3 size groups viz., small farms (less than 2 ha), medium farms (2-4 ha) and large farms (> 4 ha) on the basis of operational area under cotton. 24 growers from each mandal were selected at random making a total sample of 96 farmers and

post classified into different size groups i.e. small farmers (44), medium farmers (30) and large farmers (22). Thus, one district, 4 mandals, 8 villages 96 cotton farmers formed the material for the study.

DATA COLLECTION

The reference period for the data collection was 2002 agricultural year.

Secondary data was collected from various sources like the CPO, Warangal, Season and Crop reports, Agricultural Statistics bulletins etc.

Primary data for this study were collected by personal interview with the help of specially devised set of schedules. Four schedules were developed, one pertaining to village information, second for holding particulars, third for credit use pattern and the fourth for opinion analysis on reasons for crisis and suggestions to overcome the crisis.

Under the village schedule, information regarding cropping pattern, irrigation sources, transport and communication facilities, credit and marketing institutions were collected. Information pertaining to farm holdings i.e. resource endowments and cost of cultivation and returns were collected with the help of holding schedule. The third schedule covers the information about the credit behaviour and repayment pattern.

TOOLS OF ANALYSIS

Conventional as well as functional analysis have been used to analyse the data and to arrive at valid conclusions. Conventional analysis (Tabular Analysis) have been used to arrive at capital investment, labour requirement,

costs and returns which were estimated according to farm size irrespective of variety.

`Break-Even analysis' has been used to find out the profitability in cotton production.

3.3.1 Computation of Compound Growth rate

Compound Growth rate were employed to know the growth performance of cotton in respect to area, production and productivity and price in Warangal district and the state.

$$Y = ab^t$$

Where,

Y = variable (area, production, productivity, price)

a = constant

b = Regression coefficient

t = time variable

In log form b was calculated by using

$$\text{Log } b = \frac{(\Sigma\, t \log y - \Sigma t\, \Sigma \log Y/N)}{(\Sigma\, t^2 - (\Sigma t)^2 / N)}$$

where

b = reg. coefficient

y = variable (Area, production, productivity, price)

ti = time variable in years

N = number of years

% CGR

% r = (Antilog b-1) x 100

The compound growth rate was tested for their significance by using the following formula.

$$t = \frac{r}{SE\,(r)}$$

Where,

$$SE\,(r) = \frac{100\,b}{\log_{10}^{e}} \times \sqrt{\frac{\Sigma \log Y^2 - (\Sigma \log Y)^2/N - (\log b)^2\,\Sigma T^2}{(N-2)\,\Sigma T^2}}$$

3.3.2 Resource productivity, returns to scale and resource use efficiency

Resource productivity

The production function analysis explains the relationship of each variable with the output. The analysis is done at the farm level since optimum allocation of resources is relevant at the farm level. This helps in planning and adjusting the resource utilisation to optimality. An attempt has been made in this section to discuss the resource returns, returns to scale and resource use efficiency on all farms with the help of production function analysis.

The Cobb-Douglas production function model chosen to estimate the resource-use efficiency and returns to scale. This is a power function which is extensively used in research because of it's ease in computation, simplicity in interpretation and feasibility in depicting the relationship of input to output.

The first derivative of the production function gives the marginal physical product. When the marginal physical product is multiplied with the unit price of the output it gives marginal value product. The ratio of MVP to opportunity cost is considered as the measure of resource use efficiency.

The general form of the model is

$$Y = ax_1^{b1}\, x_2^{b2}\, x_3^{b3}\, x_4^{b4} \ldots\ x_n^{bn}\, U$$

Where,

Y = Output of the crop.

a = Constant

$x_1 - x_n$ = Independent variables considered in the function.

$b_1 - b_n$ = The respective production elasticities from this function the marginal, physical product is derived by differentiation.

U = error

From this function, the marginal, physical product is derived by differentiation.

$$MPP = \frac{dy}{dx_i} = a\, b_1 x_1^{\,b1-1}\, b_2 x_2^{\,b2-1}\, b_3 x_3^{\,b3-1} \ldots b_n x_n^{\,bn-1}$$

$$\frac{dy}{d\,x\,i} = bi\ \frac{\bar{y}}{x_i}$$

Where,

$\bar{y}$ = Output at the level when all the inputs are kept at geometric mean levels.

x_i = Respective independent variables at the geometric mean level.

b_i = Partial regression coefficients of the respective inputs.

The MVP for each factor is obtained by multiplying the MPP of each factor with the unit price of the output.

MVP = MPP x Py

Py = Price / Unit of output.

For judging the efficiency of the resources use, the MVP of an input is compared with its marginal cost. In the present study the marginal cost, opportunity cost has been referred to as per unit acquisition cost of resource. The significant differences between MVP of a resource and its acquisition cost is tested by computing `t' values. The formula for the `t' test is as follows.

$$t = \frac{MVP_i - Px_i}{\text{SE of } MVP_i}$$

Where,

MVP_i = marginal value product of i^{th} resource,

Px_i = Acquisition cost of the i^{th} input.

If MVP_i / Px_i is greater than one, it indicates that the output can be maximized by increasing the use of the i^{th} resource. Thus, it would be profitable to reduce the use of i^{th} resource if MVP_i / Px_i is less than one.

3.3.3 Linear function

Multiple linear regression was made use of for estimating the relationship between dependent variable (Repaying capacity) and independent variables.

Linear function was expressed in the general form

$$Y = a + b_1x_1 + b_2x_2 + b_3 x_3 + b_4x_4 + b_5x_5 + U$$

Where

Y = Dependent variable i.e. Repaying capacity

x_1 to x_5 = parameters or independent variables affecting the amount Y.

x_1 = size of holding

x_2 = Income from all sources

x_3 = Expenditure in production process

x_4 = Family expenditure

x_5 = Other loans to be paid

a = population constant

b_1 to b_5 = Partial regression coefficients

U = Error term

The effect of individual independent variable was tested with the help of `t' test whereas the significance of R2 adjusted for degrees of freedom was verified with F ratio.

$$F = \frac{R^2}{1 - R^2} \times \frac{n - k - 1}{n}$$

where,

n = no. of observations

k = no. of independent variables

and the calculated value of F was compared with the table value of F at K with n-k-1 degrees of freedom.

The possibility of multicollinearity among the variables was tested and its level was found to be non significant.

3.3.4 Breakeven analysis

Profitability was studied with the help of the management tool viz., break-even analysis. The breakeven charts were drawn where in breakeven output located by using the formula.

$$B.E.O = \frac{\text{Total fixed costs per farm}}{\text{Price per quintal} - \text{variable costs per quintal}}$$

3.4 CONCEPTS

3.4.1 Operational holding

It is hat point of the holding which is actually under operation.

3.4.2 Size of holding

In the present study, the total cotton farmers in the sample were classified into 3 size groups based on their operational holding.

Small farmers : < 2 ha
Medium farmers : 2-4 ha
Large farmers : > 4 ha

3.4.3 Farm assets

Under farm assets such as land, farm building, wells, implements, machinery and livestock were included.

3.4.4 Mandays

It is the work turned out by a male adult in a duration of eight hours per day. Female days were converted into mandays on the basis of the existing wage rates for standardization of mandays.

3.4.5 Cattle pair days

It is the work turned out by a pair of cattle during the duration of eight hours per day.

3.4.6 Fixed costs

Fixed costs include rental value of the owned land, deprecation, land revenue and interest on fixed capital excluding land value.

3.4.7 Variable cost

The components of the variable costs include costs incurred on human labour, bullock labour, seeds, manures and fertilizers and plant protection.

3.4.8 Total costs

Fixed cost and variable cost together constitute the total costs.

3.4.9 Cost concepts

Cost A1 → This includes the cash and kind expenses actually incurred by the owner/cultivator. This includes costs of a) Manures and fertilizers b) cost of seed c) cost of plant protection chemicals d) Charges for hired human labour e) charges for both hired and owned bullock labour, f) land revenue g) depreciation and h) interest on working capital

(Cost A2 has not been taken since there is no tenant farmer in the sample. Cost A1 is represented by Cost A in this study).

Cost B1 → Cost A + interest on owned fixed capital assets

Cost B2 → Cost A + Rental value of own land + Interest on fixed capital

Cost C1 → Cost B1 + imputed value of family labour

Cost C2 → Cost B2 + imputed value of family labour

Cost C3 → Cost C2 + 10 % of Cost C2 to account for managerial input of farmers.

Cost C2 was mainly considered to represent the cost of cultivation in the present study.

Paidout costs : These are the value of purchased inputs and all cultivation expenses incurred and paid for in cash.

Unpaid costs : They are cost which are not actually paid by farmer but the payments made in kind like grain and prerequisites.

Prime costs : Cost A_1 minus land revenue plus imputed value of family labour constitute the prime cost.

3.4.10 Farm returns

Farm returns, comprise gross and net returns.

i) **Gross returns** : This pertains to the total value of cotton (main and by-product) presented on the farm during the year valued at the market price.

ii) **Net returns** : These are worked out on the basis of cost C and prime costs.

3.4.11 Measures of farm income

Besides gross and net returns in the study certain other income measures are also used. They are :

i) Farm Business Income

This is the return to the cotton cultivator for himself and his family labour and investment on owned land and owned fixed capital. It is obtained by deducting cost A_1 from gross returns.

(Gross returns –Cost A_1)

ii) Farm family labour income

It is a measure of return from cotton cultivation to family labour. This is obtained by deducting cost B from gross income.

(Gross income – Cost B)

iii) Farm investment income

It is a measure of return from cotton cultivation to the fixed capital investment of the farm.

This is obtained by adding the imputed rental value of owned land and interest on fixed capital to net income.

(Gross income – cost C) + (cost B – cost A_1)

3.4.12 Break-even output

This is the output where there is neither profits nor losses in production of particular enterprise. Break even out put is estimated by taking total fixed costs per farm, price per unit and variable cost per unit.

3.4.13 Repaying capacity

Repaying capacity = Gross income - (living expenses + working expenses + other loans and payments overdue)

3.5 PROCEDURE ADOPTED IN COMPUTING COSTS

3.5.1 Human labour

Family labour is imputed at the general wage rate prevailing for the payment of labourers in the villages. In the case of permanent labour, payments made in kind like grain and other perquisites were evaluated at the prevailing market rates. Payments made in cash were added. In case of casual labour the actual wages paid had been taken into consideration. In all the cases a manday of 8 hours has been taken as the basis to arrive at total labour days.

3.5.2 Bullock labour

The cost of maintenance per work day is adopted in case of owned cattle labour. The prevailing hire rates were taken as the basis for the hired cattle labour.

3.5.3 Seed

The farm produced seed is charged at the prevailing local rates. Purchased seed is charged at the rates actually paid.

3.5.4 Manures and fertilizers

Farm produced manures are charged at the prevailing local rates. Chemical fertilizers and other manures purchased are charged at the rates actually paid.

3.5.5 Plant protection chemicals

The actual prices paid for the plant protection chemicals by the cultivation are considered.

3.5.6 Interest on working capital

The interest on working capital is charged at the rate of 12.5 per cent for half of the crop period value of owned land.

3.5.7 Rental value of land

The total rental value of the owned land has been estimated as per the prevalent rents in the villages for identical types of land where leasing activity was predominantly seen. In places where leasing activity was not observed, 30 per cent of the value of the gross produce was considered.

3.5.8 Land revenue

The actual amount paid as considered with respect to land revenue.

3.5.9 Depreciation

Depreciation on the farm structures like cattle shed, stores and implements shed is workedout at 3 per cent of price and 5 per cent for katcha structures. Depreciation on implements and machinery is computed using the

straight line method (10 % of the acquired value per year). Depreciation on farm buildings and wells worked out at 5 per cent of acquired value plus repairs.

3.5.10 Interest on fixed capital

Interest on fixed capital excluding land is charged at the rate of 10 per cent per annum. The interest was apportioned on crop acreage basis.

3.5.11 Gross returns

These are the total receipts obtained by selling the main and by products.

3.5.12 Net returns

These are the profits left with after deducting the total cost of production.

3.5.13 Input output ratio

This is the ratio of gross returns and total cost. It is estimated by the formula.

$$\text{Input - output} = \frac{\text{Gross returns}}{\text{Total cost}}$$

Table 1.2 : Trends in Area, Production and Productivity of cotton in A.P. (1990-2001)

Year	Area ('000 ha)	Production ('000 kgs lint)	Productivity (kg lint/ha)
1990-91	655.39	188751.74	288
1991-92	706.50	220427.00	312
1992-93	804.80	194760.63	242
1993-94	728.112	229355.20	315
1994-95	844.53	242379.82	287
1995-96	1058.72	274208.48	259
1996-97	1014.98	319715.55	315
1997-98	906.29	222948.00	246
1998-99	1280.94	258750.00	202
1999-2000	1045.70	268755.18	257
2000-01	1021.72	283016.71	277

Table 1.1 : Trends in Area, Production and Productivity of cotton in India (1990-2001)

Year	Area ('000 ha)	Production ('000 bales of 170 kg)	Productivity (kg lint/ha)
1990-91	7440.0	9840.0	225
1991-92	7661.4	9710.0	216
1992-93	7541.9	11400.0	257
1993-94	7320.5	10740.0	249
1994-95	7871.0	11890.0	257
1995-96	9035.3	12860.7	242
1996-97	9120.5	14231.3	265
1997-98	8868.4	10851.4	208
1998-99	9342.4	12287.1	224
1999-2000	8709.7	11529.6	225
2000-01	8534.6	9523.8	190

Table 1.3 : Trend in Area, Production and Productivity of cotton in Warangal district during the period 1990-91 to 2000-01

Year	Area ('000 ha)	Production ('000 kgs lint)	Productivity (kg lint/ha)
1990-91	52.5	12612.0	240
1991-92	60.92	15840.0	260
1992-93	61.9	14860.8	240
1993-94	56.8	13075.5	230
1994-95	72.4	22154.4	306
1995-96	82.2	23826.4	363
1996-97	107.6	37337.2	347
1997-98	99.3	32183.0	324
1998-99	144.6	49749.2	344
1999-2000	153.0	50662.8	331
2000-01	138.9	59474.8	428

Source : CPO, Warangal

CHAPTER IV

AGRO-ECONOMIC FEATURES

The agro-economic and social conditions of a region reflect on the nature of crops grown, irrigation potential, technical know how, extent of adoption of new technology etc. which manifest the economy of the region. The economic appraisal of any region requires knowledge of physical, environmental and agro-climatic features of the area like location, rainfall and soil type, climate, irrigation facilities, extent of mechanisation etc. Since the present study is confined to Geesugonda, Shayampet, Duggondi and Atmakur mandal of Warangal district, a general view of agroclimatic features of the region will be very useful to have a comprehensive idea of the tract.

4.1 THE DISTRICT IN BRIEF

4.1.1 Boundaries and Topography

The Warangal district lies between the latitude of 17^{o}-19′ and 18^{o}-36′ North and longitudes of 78^{o}-49′ and 80^{o}-43′ East, and is above mean sea level by. It is bounded on the North by Karimnagar district on the West by Medak district, on the South by Nalgonda district and by Khammam district on East and South-east. The geographical area of the district is 12846 sq km. For the purpose of administration the district was divided into 3 revenue divisions and 51 revenue mandals. The entire area is studded with isolated hills, hill streams, rainfed tanks and large lakes. The district possesses an interesting picture of

geographical formations and contains minerals of economic importance. The principal formations are classified into two divisions, i.e. Archaean puranas and Gondwas. The soils of the district comprises of sandy loams with patches of shallow black cotton soils, and at places even medium and deep black cotton soil. As the district generally tends to be dry and there is not much fluctuation in the temperature, it gets quite warm during the summer months of April, May and June and also continue to be warm in the rest of the year except during December and January, when the temperature drops slightly. The maximum and minimum temperature have been recorded as 50.5^{o} and 13.5^{o} centigrades, respectively.

4.1.2 Demographic status

Demographic features of the district are given in the Table 4.1.

It is seen from the table that the total population in the district is 32.31 lakhs (2001) comprising 16.52 lakhs males and 15.79 lakhs females. It is observed that the rural population is 26.10 lakhs and urban population is 6.21 lakhs. Literacy rate was 50.84 per cent. Density of population worked out to be 252 per sq/km. Sex ratio indicates that there are 960 females for every 1000 males.

4.1.3 Occupational pattern

The details regarding the occupational pattern of Warangal district are presented in Table 4.2.

From the given table it can be observed that 47.8 per cent were the total main workers in the district. Cultivators account for 14.5 per cent for the total population and agricultural labourers 32.1 per cent and other workers 15.7 per cent only.

4.1.4 Climate and rainfall

The average rainfall of Warangal district is presented in Table 4.3.

The rainy season sets in the district with the on set of south-west monsoon. The normal annual rainfall of the district is 1048.1 mm. The maximum rainfall occurs in the months of July, August, September and the highest rainfall was recorded in Mulug, Parkal, Mahabubad and Narsampet mandals.

Actual rainfall of the district is 820.1 mm. The southwest monsoon season extends upto the end of September, while October and November constitute the post monsoon or retreating monsoon season. The period from December to the middle of February is generally marked by fine weather. South west monsoon brings maximum amount of rain accounting 82.6 per cent of the total normal rainfall of the district.

4.1.5 Land utilisation

The analysis of land utilisation in any area is very important as it gives a wide picture of land use pattern including the net area sown and the resultant economics contributing to the economic growth of the zone.

The land utilization details of Warangal district (2001-02) are presented in Table 4.4.

The detailed components of land utilisation in the district shows the forests account for 28.7 per cent of the total geographical area, while 4.6 per cent of the area was occupied by land put to non-agricultural use. Miscellaneous crops grown not included in the net area sown accounts for about 0.3 per cent. Net area sown constitute about 38.9 per cent of the total geographical area.

4.1.6 Soils

The soils of the district comprise of sandy loams with patches of shallow black cotton soils and at places even medium and deep black cotton soil.

The total area under different types of soils in the district is 4,52,706 ha. Under this, most of the area was covered by red soils which constitutes 55 per cent (2,49,732 ha) of total area. The area under black soils was 98,989 ha which constitutes 22 per cent. The area covered by loamy soils was 63,552 ha which accounted for 14 per cent. The area under sandy soils was 40,433 ha which constitutes 9 per cent only.

4.1.7 Irrigation

The important irrigation sources in the district are Ramappa, Ghanpur (m), Pakhal and Lakhnavaram and Salivagu project under which considerable area is irrigated. The other sources of irrigation in the district are rainfed tanks,

wells and hill streams which require good showers in the season. Distribution of area under different sources of irrigation is presented in Table 4.5.

It is evident from figure in the table that other wells cover 50.07 per cent of the gross irrigated area followed by tanks with 17.9 per cent. Tube wells account for only 4.61 per cent of gross irrigated area other sources account for only 0.9 per cent, canals cover least share of 0.68 per cent. Further the net area irrigated is 287171 hectares out of gross irrigated area 345468 hectares.

4.1.8 Cropping pattern

The principal cereal crops grown in the district are rice, jowar, maize, greengram and groundnut. In its production of rice the district occupies 4th place in Telangana region and 11th place in Andhra Pradesh. According to the consumption of food grains the 90 per cent population of the district are rice-eaters.

Cotton in Warangal district is covering an area of 9 per cent of the total cropped area. Major crops grown in the district are paddy, jowar, greengram, groundnut etc.

The details of the cropping pattern in the district are given in Table 4.6.

4.2 SELECTED MANDALS

4.2.1 Location

1. Geesugonda : It is located at a distance of 16 km from the district head quarters. It has 18 villages. The total geographical area is 15 868 ha.

2. Shayampet mandal : It is located at a distance of 20 km from district head quarters. It has 13 villages. Total geographical area is 1285 ha.
3. Athmakuru mandal : It is located at a distance of 19 km from district head quarters. It has 22 villages. Total geographical area is 23077 ha.
4. Duggondi mandal – It is located at a distance of 25 km from district head quarters. It has 18 villages. Total geographical area is 11780 ha.

4.2.2 Demographic features

The Geesugonda mandal has a total population of 60,054 composing of 30,547 males and 29,537 females. From the given Table 4.7, it can be seen that 18044 there are literates, 9,321 cultivators, 12,965 agricultural labourers, 2,057 other workers and 30,585 non workers from a total population of 60,034. The density of population was 232 persons per sq. km.

With respect to Duggondi mandal, there are 24,154 literates, 8,813 cultivators, 14,513 agril. Labourers, 2,815 other workers, 35,325 non workers form a total population of 69,256. The density of population was 387 per sq. km.

Climate and rainfall

The average rainfall is 1186.3 mm in Geesugonda, 678.8 mm in Shyampet, 839.5 mm in Athamakur and 845.6 mm in Duggondi. South west monsoon account for nearly 60-65 per cent of the total rainfall in all the mandals.

The rest of the rain is covered by north-east monsoon and winter period.

Land utilization

Land utilization details of the selected mandals are given in Table 4.7.

It is found that there is no forest land in Geesugonda, Atmakur and Duggondi, Shayampet has forest land of 2770 ha out of total geographical area of 12851 ha. In Geesugonda mandal, an area of 841 ha are under land put to non agricultural uses while 597 ha are pastures and grazing lands. In Shyampet mandal 2770 ha are under forests 1224 ha under land put to non agriculture use and 452 under barren and uncultivable land and 307.8 ha are under pastures and other grazing lands.

Duggondi mandal, permanent pasture and other grazing land and other fallow lands are quite high. Net area sown in this mandal is 9611 ha out of the total geographical area of 11780 ha.

Soils

Black cotton soils occupy major portion in all mandals. Red soils are found to occupy nearly 30 per cent of the total area.

Sources of irrigation

The details of various sources of irrigation in the selected mandals are given in Table 4.8. In Geesugonda canals account for minor share of irrigation. Tanks account for major share in Geesugonda mandal. Total net area irrigated through different sources namely canals, tanks, tube wells, other

wells and other sources is 8153.2 ha in Parkal mandal. In the same way net irrigated through different sources is 1604.4 ha.

Cropping pattern

The total area under different crops are given in Table 4.9.

From the given Table 4.9, it can be observed that predominant crops grown in there mandals are paddy and cotton. In addition to these crops, some of the other important crops are groundnut, chillies.

Selected villages at a Glance

The demographic features and holding particulars are presented in Table 4.10 and 4.11, respectively.

1. Kommala

The village is situated at a distance of 25 km from the district head quarters. The total population was 3,400 out of which 1790 were males and 1610 were females. These are 388 cultivators, 540 agricultural labourers and 85 other workers in the village. Small farmers were 570, medium farmers 347 and large farmers 193.

2. Gangadevipally

The village is situated at a distance of 12 km from the district headquarters. The population is 2508 out of which 1272 are males and 1236 females. These are 380 cultivators, 525 agricultural labourers and 80 other workers.

3. Gudeppahad

The population is 2209 out of which 1127 were males and 1082 were females. There are 387 cultivators, 520 agricultural laborers and 83 other workers. Small farmers are 384, medium 239 and large 159 farmers.

4. Takkella pahad

The population is 2104 out of which 1094 were males 1010 were females. There are 391 cultivators and 515 agricultural laborers. Other workers are 76. Small farmers are 430, medium farmers are 278 and large farmers are 145.

5. Mylaram

The population is 3110 out of which males are 1524 and females 1536. Total cultivators are 380 agricultural laborers are 560 and 90 other workers. There are 555 small farmers, 355 medium and 193 larger farmers.

6. Manderapet

The population is 3008 out of which males are 1528 and females 1480. Total cultivators are 374 agricultural laborers are 555 and 90 other workers. There are 448 small farmers, 307 medium and 224 larger farmers.

7. Girnibavi

The population is 2990 out of which males are 1502 and females 1488. Total cultivators are 370, agricultural laborers are 548 and 94 other workers. There are 430 small farmers, 312 medium and 237 larger farmers.

8. Nachinapally

The population is 2889 out of which males are 1476 and females 1413. Total cultivators are 365, agricultural laborers are 546 and 95 other workers. There are 425 small farmers, 315 medium and 226 larger farmers.

Table 4.1 : Demographic features of Warangal district (2001 census)

S.No.	Particulars	Population
1.	Total population	32.31 lakhs
	Males	16.52 lakhs
	Females	15.79 lakhs
2.	Rural population	26.10 lakhs
3.	Urban population	6.21 lakhs
4.	Literacy rate	50.84
5.	Density of population (per sq. km)	252
6.	Sex ratio	960
7.	Population growth rate	15 (%)

Source : Census of India, 2001
District Census Hand book, A.P.

Table 4.2 : Occupational pattern in Warangal district

S.No.	Particulars	Population (lakhs)	% to total population
1.	Cultivators	6.25	14.5
2.	Agril. Labourers	9.05	32.1
3.	Other workers	4.42	15.7
4.	Total main workers	13.47	47.8
5.	Total population	32.31	

Source : Hand book of Mandal Statistics, Warangal district (2001-02)

Table 4.3 : Average rainfall of Warangal district (1995-96)

S.No.	Month	Normal rainfall	Actual rainfall
1.	**South West monsoon**		
	June	137.0	142.0
	July	288.0	138.0
	August	238.0	233.1
	September	136.0	140.6
	Total	799.0	653.7
2.	**North west monsoon**		
	October	86.0	110.3
	November	27.0	6.9
	December	6.0	Nil
	Total	119.0	117.2
3.	**Winter period**		
	January	5.0	14.8
	February	6.0	0.1
	Total	11.0	14.9
4.	**Hot weather period**		
	March	13.0	0.8
	April	15.0	0.8
	May	37.0	32.7
	Total	64.0	34.3
	Total for the year	994.0	820.1

Source : Hand book of statistics, Warangal district (2001-02)

Table 4.4 : Land utilization in Warangal district (2000-01)

S.No.	Category	Area in lakhs ha	% of total area
1.	Forest	367197	28.7
2.	Land put to non agril. Uses	57058	4.6
3.	Baren and on cultivable land	53797	4.2
4.	Permanent pastures and other grazing lands	50401	3.9
5.	Cultivable waste	33919	2.6
6.	Misc. crops grown not included in the net area sown	3876	0.3
7.	Current follows	71304	7.1
8.	Other follows	116604	9.7
9.	Net area sown	498394	38.9
	Total		

Source : Chief Planning Office, Warangal district

Table 4.5 : Source wise gross area irrigated in Warangal district (1999-00)

S.No.	Source of irrigation	Average of area (ha)	% to gross cropped area
1.	Canals	2634	0.68
2.	Tanks	69334	17.9
3.	Tube wells	17799	4.61
4.	Other wells	193116	50.07
5.	Lift irrigation	714	0.18
6.	Other sources	3570	0.90
7.	Net area irrigated	287171	-
8.	Area irrigated more than once	58297	-
9.	Gross area irrigated	345468	-

Source : Chief Planning Office, Warangal district

Table 4.6 : Cropping pattern in the district

	Crop	Area in hectares (Average of preceding 5 years)
1.	Paddy	136035.6
2.	Jowar	105038.8
3.	Maize	36859.6
4.	Bajra	14330.8
5.	Ragi	19.2
6.	Small millets	250.8
7.	Greengram	89250
8.	Horsegram	3303.2
9.	Redgram	8650.4
10.	Other pulses	460.8
11.	Cereals and millets	292705.2
12.	Food grains	395997.6
13.	Chillies	16075.2
14.	Fruits and vegetables	2330.4
15.	Total food grains	414623.2
16.	Groundnut	65933.6
17.	Sesamum	22362.8
18.	Castor	10842.8
19.	Total oil seeds	19401.2
20.	Tobacco	1382
21.	Cotton	56236
22.	Sugarcane	76000
23.	Total non food	125579
24.	Total cropped area	540202.8
25.	Net area sown	444648.4

Table 4.7 : Land utilization in the selected mandals (2001-02)

Classification	Geesu-konda	Shyampet	Atmakur	Duggondi
Forests	0	2770	0	0
Barren and uncultivable land	389	452	865	347
Land put to no agricultural use	841	1224	1011	673
Permanent pastures and other grazing land	597	226	3078	388
Mis. Trees, crops etc.	32	4	35	45
Cultivable waste	102	2	651	166
Other follow lands	3273	121	3367	200
Current fallows	308	349	318	350
Net area sown	10326	7703	13752	9611
Total cropped area	11081	8229	14598	10782
Area sown more than once	755	526	846	1170
Total geographical area	15868	12851	23077	11780

Source : Chief Planning Office, Warangal district

Table 4.8 : Sources of irrigation in selected mandals

S.No.	Source	Geesukonda	Shayampet	Atmakur	Duggondi
1.	Canals	98	241	180	108
2.	Tanks	1820	2107	3215	3102
3.	Tube wells	-	-	-	-
4.	Other wells	4700	3100	2402	1604
5.	Other sources	482	352	443	426
	Net area irrigated	7100	5820	6240	5240

Table 4.9 : Cropping pattern (Area in hectares) in selected mandals

Crop	Geesu-konda	Shyampet	Atmakur	Duggondi
Rice	3112	2739.6	4104	2909
Jowar	116.8	495.2	212.8	27
Bajra	-	-	-	12.2
Maize	547.2	755	762.8	920.1
Greengram	217.2	449	405.2	152.2
Redgram	44	52	144	120.1
Horsegram	5.2	-	22	-
Chillies	12.08	199.2	2461	1001.4
Food crops	5547.2	4589.0	8112.2	5152.0
Groundnut	1002	811.2	1510	214.4
Sesamum	475.2	119.2	875	382.0
Castor	-	2	21	-
Tobacco	-	-	-	-
Non food crops	6742.2	4115.4	6236.1	4648.2
Cotton	3102.2	2820	3214	3621
Gross area sown	12289.4	8704.4	14348.3	9800.2
Net area sown	10326	7703	13752	9611

Source : Chief Planning Office, Warangal district

Table 4.10 : Demographic features of the selected villages (2001 census)

Particulars	Kommala	Gangadevi-pally	Gunde-pphad	Takkalla-pahad	Mylaram	Mande-rapet	Girni-bavi	Nachera-pally
Population	3400	2508	2209	2104	3110	3008	2990	2889
Males	1790	1272	1127	1094	1574	1528	1502	1476
Females	1610	1236	1082	1010	1536	1480	1488	1413
Literates	1218	742	740	743	1005	1050	1010	1004
Cultivators	388	380	387	391	380	374	370	365
Agricultural labourers	540	525	520	515	560	555	548	546
Other workers	85	80	83	76	90	90	94	95

Source : Hand book of Mandal and village selected in selected mandals

Table 4.11 : Structural distribution of holdings in selected villages

Particulars	Kommala	Gangadevi-pally	Gunde-pphad	Takkalla-pahad	Mylaram	Mande-rapet	Girni-bavi	Nachera-pally
Small farmers less than 2 ha	570	525	384	430	555	448	430	425
Medium farmers 2-4 ha	347	291	239	278	355	307	312	315
Large farmers 4 and more than 4 ha	193	170	159	145	193	224	237	226

Source : Records of the VDOs

CHAPTER V

RESULTS AND DISCUSSION

This chapter is devoted to focus results and to discuss those results obtained from the study. This chapter has been divided into five sections viz.,

5.1 Production performance of cotton in the district

5.2 Basic characteristics of the selected farmers

5.3 Costs and returns on the selected farms

5.4 Resource returns, returns to scale and resource use efficiency

5.5 Credit utilisation pattern of selected farmers.

5.6 Opinion analysis on production problems and reasons for the crisis.

5.7 Suggestions / measures to overcome the crisis.

5.1 PRODUCTION PERFORMANCE OF COTTON IN THE DISTRICT

This section mainly focused on analyzing the compound growth rates of Area, Production and Productivity of cotton in the district and compared with the state.

Warangal district is one of the major cotton growing districts in the state with 118 lakh hectares under cotton and a production of 3 lakh bales during 2002-03. The trend of area growth has been inconsistent over the past 5 to 6 years. However, the area under cotton has increased from 0.52 lakh hectares in 1990-91 to 1.18 lakh hectares in 2002-03 with a high of 1.53 lakh

hectares during 1999-00. The production has also increased from 0.7 lakh bales in 1990-91 to 3 lakh bales in 2002-03. Productivity has also showed a marked increase from 230 lint kgs /ha to 428 kgs lint per hectare in 2000-01. It is in this scenario that the growth rates for Area, Production and Productivity were analysed.

The compound growth rates of area, production and productivity of cotton were estimated to analyse the production performance of cotton in Warangal district and Andhra Pradesh state. The growth rates were estimated period-wise for the periods 1970-71 to 1979-80, 1980-81 to 1989-90 and 1990-91 to 1999-2000 and presented in Table 5.1.

The compound growth rates for the period 1970-71 arrived at for area (7.20), production (11.10) and productivity (3.64) for the district were non significant. The growth rates for area (2.18) and production (11.78) were non significant for the state as well. However, the growth rate for productivity (11.39) was significant at 5 per cent level of significance. The results showed that the cotton production was at its nascent stage of growth in the district. The significant increase in productivity can be attributed to evolving of and introduction of new varieties.

It can be inferred from the results of growth rate analysis for the period 1980-81 to 1989-90 that though the growth in area (2.08) in the district was not significant, the growth in production (16.37) was significant at 1 per cent level of significance showing a gradual increase in productivity. However the

growth in productivity (13.99) was not significant. For the state the growth rate in area and productivity (11.39) were significant at 1 per cent level of significance and 5 per cent level of significance, respectively. The growth rate of production (3.11) was not significant. A growing trend towards taking up cotton as a commercial crop due to greater profits was observed for the state as a whole. In the district also the trend was observed but not significant.

The compound growth rates for the district reveal that the area (12.43) and production (25.87) experienced a growth rate significant at 1 per cent level of significance. While productivity (3.6) has shown a growth rate significant at 5 per cent level of significance. The growth rates for the state also show similar results with significant growth rates in area (5.42) and production (5.36) but the growth rate for productivity (-1.72) of the state was negative and non-significant. This period assumed importance due to the tragic events of suicides committed by cotton farmers especially in the district (nearly 40 per cent of the suicides of cotton farmers in the state were recorded in the district) during the latter part viz., 1996-97 and 1997-98. From this year, suicides by farmers have been recurring almost every year not only cotton farmers but other farmers also.

This is especially so since the district experienced a significant growth in productivity and also the prices (presented in Table 5.2) also increased. It is observed that the prices increased by 53 per cent during the year 1993-94. Consequently the area under cotton in the district increased by 27.5 per cent

during the agricultural year 1994-1995. Further the prices increased consecutively the next year by 34 per cent. The area under cotton was also increased by 14 per cent in the subsequent agricultural year. The farmers sensed huge profits from the continuously increasing prices and increased area under cotton and also invested heavily on inputs when vagaries of weather and pest and disease attack threatened the yields. However the prices decreased by 8 per cent during the year 1995-96. Farmers faced losses during this year. Inspite of this, the lure of big money made many farmers increase the area under cotton and the area under cotton in the district was increased by 31 per cent. Similarly the costs also increased. Artificial hike of input prices and spurious inputs further complicated the situation. As a result the farmer suffered huge losses when the prices did not take off as expected. Infact the price of cotton showed a downtrend continuously for three years with a decline of 17 per cent in 1997-98 over 1996-97. These continuous losses coupled with the burden of debts taken at high interest rates to procure inputs had driven the farmers to an unenviable position. The tragedy of suicides were a fallout of this situation.

Thus it can be inferred that the tragic events may be due to high costs of cultivation. Also the debt burden due to such high investments especially when borrowed at high interest rates from private money lenders and low productivities and low returns are also the possible reasons. Hence the need to

study the reasons for the crisis situation closely and objectively is fulfilled in the further aspects of this study.

5.2 BASIC CHARACTERSTICS OF THE SELECTED HOLDINGS

This section is mainly focused on the farm assets, family size and composition, family labour and holding pattern of the selected farmers.

5.2.1 Family size and composition

The size of the family and it's composition are presented in Table 5.3.

The average size of family members on small, medium, large and pooled farmers was 7.7, 7.55, 10.06 and 8.19, respectively. The composition of the family on pooled farms was 2.88 males, 2.55 females and 2.76 children.

5.2.2 Family labour

The family labour particulars are furnished in Table 5.3.

It is observed that the number of family members involved in agricultural work was 5.96, 5.33, 3.07 and 5.10 on small, medium, large and pooled farms, respectively. The composition of family labour on pooled farms was 2.10 males, 1.55 females and 1.75 children.

5.2.3 Holding pattern of the selected farmers

The holding pattern of selected farmers is presented in Table 5.4.

The size of holding on was 1.65 ha, 3.80 ha and 9.75 ha on small, medium and large farms respectively. On pooled farms, it was 4.18 hectares. The net area sown was found to be 1.42 hectares, 3.18 hectares, 7.54 hectares on small, medium and large farms, respectively. Out of this, irrigated area was

less on all farms and ranged from a negligible 0.05 hectares on small farms to 2.9 hectares on large farms. On pooled farms it was 1.05 hectares. This reveals the fact that majority of the farms are rainfed. The cropping intensity was 105.60, 110.69 and 114.05 per cent on small, medium and large farms, respectively which indicates single cropping. The area under cotton was 80, 86, 65 and 70 per cent of the gross cropped area on small, medium, large and pooled farms which indicates that the farmers are dependent on cotton cultivation as their livelihood.

5.2.4 Asset structure of the selected farms

The study of farm assets reveals the economic background of the farms and the risk bearing ability of the farmer largely depends on the value of the assets owned by him.

The asset structure of the selected farms according to farm size are presented in Table 5.5.

The table reveals that land constitutes nearly 80 per cent of the total value of farm assets on small and medium farms and 66.5 per cent and 78.5 per cent on large and pooled farms respectively. The asset next in value was livestock on small (11.52 %), medium (12 %) and pooled (11.04 %). Machinery and implements were the assets next in value to land on large farms (21.75 %) value of livestock on large farms was 9.63 per cent of total assets. Machinery and implements constituted 2.62, 3.3 and 8.24 per cent

value of total assets on small, medium and pooled farms, respectively. Value of farm buildings and wells were the next in order on all farms.

The value of total assets per hectare with land was highest on large farms at Rs. 110200 followed by medium farmers (Rs. 85115.38) and small farmers (Rs. 81434.47). These details imply that the large farms have a greater asset base and hence greater risk bearing ability.

5.3 COSTS AND RETURNS ON THE SELECTED FARMS

In this section, an attempt has been made to present the cost of cultivation according to cost items and labour requirement / hectare according to farm size. Further, the cost of cultivation has also been discussed according to cost concepts developed under farm management studies.

5.3.1 Labour requirement

Labour plays an important role in the production process. The quantity of labour engaged on the farm depends on the size of the farm, nature of the crop, nature of the operation and availability of labour.

Labour can be classified into three types based on the source viz., human labour, cattle labour and machine labour. Machine labour is put to less use due to constraints of availability and costs. The cattle labour is generally being employed for summer ploughing, preparatory cultivation, intercultivation and transporting manures and fertilizers.

The labour requirements of cotton per hectare are presented in Table 5.6.

The figures revealed no perceptible relationship between human labour utilization and farm size in cotton cultivation. It is observed that on an average cotton crop utilized 46 mandays per hectare for the sample as a whole. Among the size groups, small farms employed 47 mandays, medium farms employed 48 mandays and large farms employed 43 mandays.

Among the operations plant protection operation constituted a major part of human labour utilization with 17.05, 17.74 and 17.09 mandays respectively on small, medium and large farms. The labour utilization for plant protection operations was almost 37 per cent and had a positive relationship with the farm size. This indicates the intensity of pest attack during the year of study. This has also reflected in the increased plant protection costs which has been discussed later in this section only. Intercultivation is the next important operation that consumed 8.61, 8.32 and 7.82 mandays of labour on small, medium and large farms respectively. It is observed that there existed a inverse relationship between labour utilization and farm size.

Picking operations utilized 7.75, 7.67 and 7.45 mandays on small, medium and large farms respectively. The next operation nearly in the same ranking was preparatory cultivation which utilized 6.42, 6.05 and 4.39 mandays on small, medium and large farms respectively. Sowing and manure and fertilizer application utilized the least human labour. Manure and fertilizer application operations utilized 3.5, 3.76 and 2.92 mandays for small, medium

and large farms respectively. Sowing operations consumed 3.44, 3.21 and 2.98 mandays on small, medium and large farms respectively.

Cattle labour utilization was observed in preparatory cultivation, manure and fertilizer application and intercultivation operations. The total cattle labour requirement was 12.69, 11.94, 9.94 and 11.83 on small, medium, large and pooled farms respectively. Preparatory cultivation accounted for 46.52 per cent of total cattle pair days (CPD) on an average.

5.3.2 Cost of cultivation according to cost items

The total cost of cultivation per hectare of cotton presented in Table 5.7 showed a positive and direct relationship with farm size (Kishore, 1989). The actual cost of cultivation for small, medium and large farms was Rs. 18061, Rs. 18353.49 and Rs. 19350.68 respectively. The cost of cultivation of cotton for pooled farms was Rs. 18457.98 per hectare.

The total variable costs, distinctly showed that the costs have increased with increase in farm size. In terms of percentage, it is evident that variable costs formed about 80 percentage of the total costs in all the farm size groups.

The costs incurred on plant protection chemicals was the highest and showed an increasing trend with increase in the farm size. These costs constituted about 41 per cent of total cost in all the farm size groups and ranged between Rs. 7617.95 (42.22 %) on small farms and 7690.67 (40.13 %) on large farms. For pooled farms it was Rs. 7674.05 (41.6 %).

Similar observations were made by Pandurangadu and Raju (1990) and Subbarayudu and Seshadri (2000).

Manures and fertilizers made up nearly 18-20 per cent of total costs in all the farm size groups.

Next in the order of importance was manures and fertilizers followed by human labour, machine labour, seed, cattle labour and lastly interest on working capital in the descending order. In case of human labour, more hired labour was used on large farms.

In case of fixed costs, the different components existed in the order of rental value of owned land followed by depreciation, interest on fixed capital. Rental value of owned land constituted 16 per cent of the total cost in different size group of farms. The rental value of owned land ranged from Rs. 2905 (16.09 %) on small farms to Rs. 3146 (16.27%) on large farms. On pooled farms it was Rs. 2977.42 (16.13 %).

The above analysis clearly indicated that plant protection was the major cost followed by manures and fertilizer and rental value of owned land in all the size groups of farms. This indicates the importance the farmers had given to protect their crops from pests and diseases. Majority of the farmers are using more than recommended dosages of plant protection chemicals indiscriminately with the hope of saving their crop which has resulted in increased costs and unfavourable results.

5.3.3 Cost of cultivation according to cost concepts

The cost of cultivation was calculated adopting the cost concepts used in farm management studies undertaken by the Government of India. Cost A, Cost A2, Cost B1, Cost B2, Cost C1, Cost C2, Cost C3 which are the prime costs have been adopted. Cost A2 was discarded since there was no tenant farmer in the sample. The cost concept `C2' is the most comprehensive one. It includes all costs both fixed and variable including paid and unpaid costs. Therefore, cost C2 provides a basis for comparison between different sizes of operational holdings.

The costs worked out on the basis of cost A1 were the variable costs incurred in cash or kind by a owner farmer excluding the imputed value of family labour. Under cost B1 besides cost A, we have indirect costs of interest on value of owned fixed capital assets (excluding land). Cost B2 includes cost B1 and rental value of owned land and rent paid for leased in land. Under cost C1 besides cost B1, it includes imputed value of family labour. Cost C2 is the sum of cost B2 and imputed value of family labour. Finally, cost C3 includes cost C2 and 10 per cent of cost C2 to account for managerial input of the farmers.

However, cost C2 has been considered as the cost of cultivation since the significance of cost C3 is negligible in depicting the real costs of cultivation.

The concept of prime cost was introduced to indicate variable cost incurred for raising a particular crop. As such, it does not include land revenue and cess, rent paid on leased in land, rental value of owned land and interest on owned fixed capital. The imputed value of family labour was included in prime costs because even though family labour was considered to be fixed for the farm as a whole, it varies from crop to crop, depending upon it's labour requirements and the necessity of using more family labour.

Cultivation costs according to cost concepts per hectare is presented in Table 5.8.

The results indicated similar relationship on all costs i.e. cost A1, cost B1, cost B2, cost C1, cost C2, cost C3 and prime costs. All these costs had direct relationship with farm size.

The cost A (taken as Cost A1) ranged from Rs. 14074.03 on small farms to Rs. 15703.69 on large farms. Cost A for small farmers was less because they have limited resources at their disposal to invest on inputs. The same for pooled farms was Rs. 14589.56. Cost B1 behaved in a similar manner as cost A. It ranged from Rs. 14148.29 on small farms to Rs. 15960.54 on large farms and it was Rs. 14611.13 on medium farms. The same for pooled farms was Rs. 14708.23.

Cost B2 increased with increase in farm size. It is observed to be Rs. 17054.19 on small farms, Rs. 17564.489 on medium farms and Rs. 19107.05 on large farms. The cost B2 on pooled farms was Rs. 17685.66.

In the case of cost C1, it was estimated to be Rs. 15128 on small farms, Rs. 15395.16 on medium farms and Rs. 16204.17 on large farms. The average of all farms for cost C1 was Rs. 15470.59. There is a greater increase from cost B1 to Cost C1 on small farms because more of family labour was involved in case of small farms.

Cost C2, which was more representative of all the total costs of cultivation, worked out to be Rs. 18061.14 on small farms, Rs. 18353.489 on medium farms and Rs. 19350.68 on large farms. The average on all farms worked out to be Rs. 18447.86. Cost C3 was calculated as Rs. 19867.254, Rs. 20188.83, Rs. 21285.75 and Rs. 20292.64 on small, medium, large and pooled farms respectively.

The prime costs indicated a similar relationship as that of other costs. The prime costs or actual costs for small, medium, large and pooled farms were Rs. 15080.98, Rs. 15313.64, Rs. 15947.32 and Rs. 15352.22 respectively. The small farmers were investing lesser on variable inputs as compared to medium and large farmers which resulted in low productivity on small farms.

It is clear from the above discussion that the cost of cultivation per hectare of cotton according to various cost concepts indicated a direct and positive relationship with the farm size.

5.3.4 Cost of production per quintal of cotton

The cost of production per unit of the produce would be an ideal measure to gauge the trends rather than following the average costs blindly. The per unit costs can be made use of in decision making at micro level and policy implications at macro level. The cost of production per quintal of cotton are presented in Table 5.9.

From the table it can be inferred that the total cost of production of cotton per quintal (cost C2) was Rs. 2695.69 on small farms, Rs. 2603.33 on medium farms, Rs. 2669.06 on large farms and Rs. 2658.19 on pooled farms. This clearly indicated that on medium farm the cost of production per quintal was less due to better productivity also lesser costs involved on medium farms.

Cost A ranged from Rs. 2100.60 on small farms, Rs. 2060.94 on medium farms and Rs. 2166.02 on large farms. The average on pooled farms was observed to be Rs. 2102.29. No perceptible relationship was noticed with increase in farm size.

Cost B1 was computed as Rs. 2111.68, Rs. 2072.50, Rs. 2201.45 and Rs. 2119.35 on small medium, large and pooled farms respectively. Cost B2 ranged from Rs. 2492.12 on medium farms to Rs. 2635.45 on large farms. The cost B2 for pooled farms was Rs. 2548.37. There was not much difference between small and medium farms, however large farms showed a marked

increase in cost B2 because of the higher rental value of owned land received by the large farmers.

The cost C1 behaved similarly to that of previous cost concepts. It was Rs. 2257.9 on small farms, Rs. 2183.70 on medium farms, Rs. 2235.05 on large farms and Rs. 2229.20 on pooled farms. In cost C2 a change was observed over the trends observed in other cost concepts. It was Rs. 2695.69 on small farms, Rs. 2603.33 on medium and 2669.06 on large farms. On pooled farms, it was Rs. 2658.19.

The prime costs were calculated to be Rs. 2250.89 on small farms, Rs. 2172.15 on medium farms and Rs. 2199.62 on large farms. It is clear that the prime cost per quintal was the highest on small farms followed by large farms and medium farms. The prime cost on pooled farms was Rs. 2212.14.

Productivity of cotton

The average yields of cotton according to farm size are presented in Table 5.10.

It can be noted that the productivity of cotton has increased with increase in farm size and hence direct relationship with farm size. The yields per hectare on small, medium, large and pooled farms was observed to be 6.70 quintals, 7.05 quintals, 7.25 quintals and 6.94 quintals respectively.

5.3.5 Returns from cotton cultivation

Income measures like gross income, net income, farm business income, family labour income and farm investment income were calculated according to farm size and presented in Table 5.10.

Gross income

The gross income is the income received through the sale of cotton produce in the market.

The gross returns per hectare was Rs. 15075 on small farms, Rs. 15862.5 on medium farms and Rs. 16312.5 on large farms. The gross returns on an average for the whole sample was Rs. 15604. It can be clearly observed that gross returns had a direct and positive relationship with farm size indicating the presence of economics of scale in cotton cultivation. Similar results were reported in cotton crop in Guntur district (Reddy, 1997).

Net income

The net income was computed both in respect to per hectare and per quintal over

a. Cost C2

b. Prime cost

The net income obtained from cotton cultivation per hectare is presented in Table 5.10.

The results clearly revealed that the magnitude of net returns over cost C was negative indicating a loss. The extent of loss per hectare was high in the case of small farms.

The net loss over cost C for small, medium and large farmers was Rs. 2986.14, Rs. 2490.99 and Rs. 3038.18 respectively. The average loss per hectare for the whole sample was Rs. 2843.86. The net losses can be attributed to high costs and low productivity.

The net returns over prime cost was negative for small farmers indicating losses. However, gains over prime cost are observed in medium and large farms. The losses over prime cost on small farms was Rs. 5.98. The gains over prime cost on medium, large and pooled farms were Rs. 548.86, Rs. 335.18 and 251.78, respectively.

Net returns per quintal over cost C was negative in magnitude on all farms indicating losses. The extent of losses was highest on small farms (Rs. 445.69) followed by large farms (Rs. 419.06) and medium farms (Rs. 353.33). The average losses over cost C for the sample as a whole was Rs. 408.19.

The net returns per quintal over prime cost turned out to be negative for small farms and positive for medium, large farms and pooled farms. The losses per quintal over prime cost were Rs.0.89 on small farms. The gains per quintal over prime cost was Rs. 42.86, Rs. 36.44 and Rs. 37.86 on medium,

large and pooled farms respectively. The negative trend on small farms was mainly due to poor crop management that resulted in low yields.

5.3.6 Profitability of cotton cultivation

The details are presented in Table 5.11.

Farm Business Income

Farm business income is a measure of the returns to the farms for his family labour and investment on owned land and fixed capital. Farm business income was obtained by deducting cost A from gross income. Farm business income is a measure of decision making with respect to the continuation of cultivation of a particular enterprise.

Farm business income was computed to be positive in all groups. It was highest (Rs. 1332.89) on medium farms followed by small farms (Rs. 1000.97) and lastly large farms (Rs. 608.81). The average farm business income for the sample as a whole was Rs. 1018.25. The high farm business income on medium farms over small and large farms was due to better productivity over small farms and more family labour over large farms.

Family Labour Income

Family labour income is a measure of the returns to the labour of the operator and his family. It was obtained by deducting cost B from gross returns. Family labour income was negative on all farms. The losses were maximum on large farms followed by small farms. The least losses were

observed on medium farms. This indicated that the medium farmers have used the family labour more efficiently.

Farm Investment Income

Farm investment income is a measure of returns from cotton cultivation to the fixed capital investment of the farm. It was obtained by adding rental value of owned land and interest on fixed capital to the net returns. Farm investment income was negative on small farms (Rs. 5.98) and positive on medium (Rs. 548.86) and large (Rs. 335.18) farms. This showed the same trend as net returns over prime cost.

5.3.7 Profit analysis of cotton cultivation

Two methods were employed to estimate the profitability of cotton cultivation viz., cost-benefit ratio and break-even analysis. The later tool is considered a better tool as it gives the level of production at which the farmer will break-even i.e. no loss no profit while the input-output ratio suggests the returns for every rupee invested.

Input-out put ratio/cost-benefit ratio in cotton cultivation

This ratio gives the returns per every rupee spent on inputs. The cost-benefit ratio was calculated based on gross returns and cost C2 and also gross returns and prime cost. The input-output ratio based on cost C2 was worked out to be 1:0.835 on small farms, 1:0.864 on medium farms, 1:0.842 on large farms and 1:0.845 on pooled farms.

The details are presented in Table 5.12.

The input-output ratio based on prime costs were worked out to be 1:0.999 on small farms, 1:1.035 on medium farms, 1:1.020 on large farms and 1:1.016 on pooled farms. This shows that there was more loss on small farms based on both cost C2 and prime cost. The net income based on prime cost on medium and large farmers also turned out to be higher than small farms. The net loss per every rupee invested based on cost C2 was highest for small farms (Rs. 0.165) followed by large farms (Rs. 0.158) and medium farms (0.136). The analysis has clearly showed that the cotton cultivation is an unprofitable enterprise in this region under the present conditions.

Break-even analysis

Break-even analysis is a better measure of the profitability of an enterprise. The break-even output per hectare was calculated using the formula.

$$\text{Break-even output per hectare} = \frac{\text{Total fixed cost per hectare}}{\text{Price per quintal} - \text{Variable cost per quintal}}$$

Break-even output gives the level of production at which the enterprise will break even or there is neither profit nor loss. The details in Table 5.13, show that all the farm size groups are producing much below the break-even output level. The break even outputs were 71.05, 26.07 and 25.135 quintals on small, medium and large farms respectively. It is also observed that the difference between the break-even output level and current output level is quite large on all size groups and not possible to reach the break-even output

level with the existing resources and conditions. The farmers are cultivating cotton inspite of not even getting marginal profits. In addition, they are incurring losses of Rs. 0.165, Rs. 0.136 and Rs. 0.158 per every rupee spent on production of cotton on small, medium and large farms respectively. This situation and further increasing acreage under the crop may be because of no suitable alternate crop that is economically profitable in this region.

To alleviate this piquant situation of the cotton farmers it is binding duty on the part of the state Government to interfere in this issue and take necessary steps to increase the prices of cotton.

5.4 RESOURCE PRODUCTIVITY, RETURNS TO SCALE AND RESOURCE USE EFFICIENCY

Resource productivity

The production function analysis explains the relationship of each variable with the output. The analysis is done at the farm level since optimum allocation of resources is relevant at the farm level. This helps in planning and adjusting the resource utilisation to optimality. An attempt has been made in this section to discuss the resource returns, returns to scale and resource use efficiency on all farms with the help of production function analysis.

The Cobb-Douglas production function model chosen to estimate the resource-use efficiency and returns to scale. This is a power function which is extensively used in research because of it's ease in computation, simplicity in interpretation and feasibility in depicting the relationship of input to output.

Specification of variables for detailed study

1. Land (X_1) : The actual area under cotton was considered in hectares.
2. Seed (X_2) : The actual price paid in monetary terms was considered.
3. Human labour (X_3) : The total human labour (including family and hired labour) was converted into man per day units. The wage rate was considered for the purpose of standardization as they indicate normal productivity. The cost of human labour in rupees was considered for the production function analysis.
4. Cattle labour (X_4) : The total cattle labour utilisation was taken and was converted into cattle pair days and finally CPD were converted into rupees / farm based on hire charges for employing one cattle pair per day of 8 hours.
5. Manures and Fertilizers (X_5) : This variable was taken in monetary terms per farm, based on the actual amount incurred for the purchase of required materials.
6. Plant protection chemicals (X_6) : The variable was taken in monetary terms per farm based on the actual amount incurred for the purchase of required materials.

Output (Y) : This represents the total output produced on the farm and this was considered in the functional analysis. This was taken in monetary terms per farm i.e. gross value. The functional model adopted is in the following form.

$$Y = aX_1^{b1} X_2^{b2} X_3^{b3} X_4^{b4} X_5^{b5} X_6^{b6} U$$

Where,

Y = output per farm in rupees

a = constant

X_1 = Land in hectares

X_2 = Value of seed in rupees per farm

X_3 = Human labour in rupees per farm

X_4 = Cattle labour in rupees per farm

X_5 = Value of manures and fertilisers in rupees per farm

X_6 = Value of plant protection chemicals in rupees per farm

b_1 to b_6 = Respective elasticity co-efficient of the variables.

U = Error term

The power function transformed into loglinear form and co-efficients estimated by using least square method. The log form of function is indicated below.

$$\text{Log } y = \text{Log } a + b_1 \log X_1 + b_2 \log X_2 \ldots. b_6 \log X_6$$

The exponent bi represents the quantitative relationship between the variable and the output. If bi equals to one, it means a percentage change in input causes same percentage change in output when all other factors are held constant. If bi is greater than one it indicates increasing returns to the factor while if b_i is less than one, it indicates decreasing returns to the factor.

Marginal value productivity

The marginal product indicates the expected increase in output coming forth from the use of an additional unit of relevant input, when all other inputs

are held constant. This was obtained by differentiating the production function. In general marginal productivity of any resource depends on the quantity of it already being used and on the levels of other resources with which it is combined in the production process. The formula used for computing the MVP is

$$\text{MVP of Xi} = bi \frac{y}{x_i}$$

Where,

y = Geometric mean of output

X_i = Geometric mean of respective input

b_i = Elasticity of output of a given variable

Since `y' is taken in monetary terms, we need not multiply the above MVP with price of Y. Hence we consider

$$\text{MVP of Xi} = bi \frac{y}{x_i}$$

Resource use efficiency

The ratio of marginal value product to opportunity cost or acquisition cost was considered as a measure of efficiency in allocation of resources. This ratio provides the direction of changes that can be made in resource allocation to maximize profits. If the ratio is less than one, it indicates that too much of the respective resource is being used under the existing price conditions and vice versa.

If the marginal value product equals the opportunity cost, it indicates efficient resource use and deviation from unity indicates the degree of inefficiency in resource use. The estimates of productivity of various resources have been determined, provide solution to the following questions.

a. How to achieve profitability in production
b. The effect of proportionate increase in inputs on output
c. Whether the marginal value products are greater or smaller than their costs
d. When other inputs are at geometric mean level, what is the effect of an increase in a particular input on the output.

5.4.1 Production elasticities and returns to scale

Production elasticities and their respective standard errors are given according to farm size in Table 5.14. The adjusted co-efficients of multiple determination (R^2) varied from 80 to 95 per cent.

1) Land (X_1) : The production elasticities of land was significant in small, medium, large and pooled farms. It was significant at 5 per cent level of significance in case of medium and pooled farms and at 10 per cent level of significance in case of small and large farms.

This indicated an increase in output with increased use of this input in all the farm size groups.

2) Seed (X_2) : The production elasticities were not significant in case of all farm size groups. While it was positive in case of small and large farms, it

showed a negative trend in case of medium farms which implied that the input has not reached a stage to effect the output significantly.

3) Human labour (X_3) : The production elasticities were positively significant at 10 per cent, 5 per cent and 1 per cent level of significance in case of small, large and pooled farms respectively. It was not significant and showed a small negative value in case of medium farms. While, it is obvious that large farms employ less of family labour, the high cost of hired human labour resulted in negative production elasticity of medium farmers. The production elasticity was positive and significant at 1 per cent level of significance on pooled farms indicating that the use of resource can be extended profitably.

4) Cattle labour (X_4): The production elasticities did not show any significant values in case of all the farm size groups. However, the values were observed to be very small in case of medium and pooled farms and a small negative value in case of small farms. The small negative value in case of small farms can be attributed to high costs of hired cattle labour in absence of own cattle.

5) Manures and Fertilizers (X_5): Manures and fertilizers have an important role both in increasing costs as well as yields. However, it was found to be positively significant at 1 per cent level of significance on medium farms and negative and non significant in case of small, large and pooled farms. It indicates that a 1 per cent increase in manures and fertilizers would increase the gross returns by 1.045 per cent.

6) Plant protection chemicals : Production elasticities were found to be negative and significant in case of small, medium and pooled farms at 10 %, 1 % and 1 % level of significance respectively. In case of large farms it was negative but not statistically significant. This shows that plant protection chemicals are being used extensively and indiscriminately. A one percentage increase of this input would decrease the gross returns by 0.448 %, 0.578 %, 0.179 % and 0.865 % on small, medium, large and pooled farms respectively.

5.4.2 Returns to scale

The sum of elasticities of production (Σbi) indicates the coefficient of returns to scale. If Σbi equals to one, it represents constant returns to scale. If Σbi is less than one it indicates decreasing returns to scale and if it is more than one it indicates increasing returns to scale. The sum of elasticities of production was less than one in case of small farms indicating a decreasing returns to scale while it was greater than one in case of medium, large and pooled farms indicating an increasing returns to scale.

5.4.3 Resource use-efficiency in cotton cultivation

The marginal value products, opportunity cost of independent variables and the ratio of MVP to opportunity costs are presented in Table 5.15.

The marginal value products of factors taken in conjunction with their opportunity costs indicate the efficiency of resource use. Marginal value products that are higher than the opportunity costs of factors indicate the scope of raising the output profitably through increased use of those resources

whereas the MVPs less than the opportunity/acquisition costs depict the unprofitable nature of resource use. Any factor input is considered to be used most efficiently if it's MVP is equal to the opportunity/acquisition cost. Equality of MVP to opportunity cost is therefore the basic condition that should be satisfied to arrive at the efficient use of an input.

1) **Land (X_1)** : The marginal value product to opportunity cost ratio was positive in all the farm size groups. This indicates that the resource was not utilized efficiently on all farms.

2) **Seed (X_2)** : The marginal value products compared to their respective opportunity costs, the ratios are greater than one in case of small, large and pooled farms. It would be profitable to increase the use of this resource on these farms. However in case of medium farms the ratio was negative indicating that this input has not reached a level significant enough to effect the output.

3) **Human labour (X_3)** : The ratio of marginal value product to the opportunity cost showed a value greater than one in all the farm size groups indicating under utilisation of the resources in all the farm size groups. This is especially in case of large farms. Thus it would be profitable to increase this input.

4) **Cattle labour (X_4)** : The ratio of marginal value product to the opportunity cost showed a value lesser than one in all size groups. It was

negative incase of small large and pooled farms highlighting the need to reduce this input to achieve profitability.

5) **Manures and fertilisers (X_5)** : The marginal value products compared to the opportunity costs showed a value greater than one in small, medium and pooled farms depicting the under utilisation of this resource on this farm. Whereas the ratio was negative in case of large farms with a negligible value. Thus profits can be maximized by increasing this input on small, medium and pooled farms.

6) **Plant protection chemicals (X_6)** : The marginal value products as compared to the opportunity costs showed a value that was negative depicting over-utilisation of this resource on all the farm size groups. Hence there is a need to drastically reduce this input in order to maximize profits.

Similar results were obtained by Krishna (1998).

The production function analysis has clearly indicated that some of the resources are being under utilized and some over utilized. Particularly the plant protection chemicals are being over utilized by the farmers with an intention of saving their crop from pests and diseases attack without proper advice and technical guidance. This clearly indicates that resources are to be used optimally for profitability.

5.5 CREDIT BEHAVIOUR OF SELECTED FARMERS

Credit is said to be the life blood of agriculture. To say in the words of MS Swaminathan "Credit recycling will hold the key to rapid agricultural production". Majority of the borrowing was for meeting medium and long term capital needs. However, a new trend of increased borrowings to meet short term needs like input purchases has emerged prominently in recent times. This is especially so in case of commercial crops like cotton.

Credit behaviour of selected farmers is an important indicator of the agricultural situation in that part of the region. It indicates the financial health of the farmer and hence the profitability of the crop production enterprise he is involved in. An effort has been made to study the credit behaviour of the selected farmers regarding Agricultural Production Credit under the following heads.

1. Loan amount raised per hectare
2. Amount used for production
3. Amount diverted and purpose for which diverted
4. Loan overdues
5. Sources of credit

Table 5.16 reveals the results of tabular analysis of the pattern of productive utilisation of crop production credit raised for cotton cultivation.

Of the total sample of 96 farmers, it was observed that eleven farmers (Four small, five medium and two large farmers) had not availed credit from any of the sources and had negligible loan overdues.

5.5.1 Loan amount raised per hectare

The loan amount raised per hectare for production purposes increased with farm size indicating greater availability of credit to the farmers with larger areas of land under cultivation. The loan amount raised was Rs. 9863.5, Rs. 9984.7, Rs. 10766.5 and Rs. 10108.3 on small, medium, large and pooled farms respectively. This shows that the large farmers have a greater access to sources of credit as compared to medium and small farmers.

5.5.2 Amount used for production

It is common in agricultural production credit that the amount taken is partially diverted to meet other needs of the farmer. The table revealed that the amount used for production was considerably high in all the farm size categories. The amount of production credit used for production purposes per hectare was Rs. 8926, Rs. 8976, Rs. 10378.90 on small, medium and large farms, respectively. The average for the pooled farms was Rs. 9274.87. It is observed that the percentage of production credit actually used for production purposes was highest for large farmers (96.40 %) and nearly the same for medium (89.90 %) and small farmers (90.50 %) while for the pooled farms it was 91.75 per cent. Similar results were obtained in a study on farm credit in Orissa (Mohapatra and Mishra, 1995).

5.5.3 Amount diverted and its purpose

The percentage of diverters of production credit among the different farm size categories were 70, 48 and 30 per cent among small, medium and large farms. The average number of diverters for the sample as a whole turned out to be 54.1 per cent. However, the amount diverted was considerably low in all the size groups. It was the lowest on large farms (3.20 %) followed by small farms (9.50 %) and medium farms (10 %). The percentage of amount diverted for pooled farms was 8.27 per cent.

The analysis revealed that the purposes for which the credit was diverted were mainly consumption and other agricultural purposes. The diverted credit was more for consumption. It was 4.92 and 4.58 per cent on small farms, 5.15 and 4.95 per cent on medium farms and 2.94 and 0.66 per cent on large farms. For pooled farms the percentage of total loan diverted for consumption was 4.53 per cent and for other agricultural purposes was 3.74 per cent.

This shows that the small and medium farmers are resorting to a greater extent of misutilisation of credit which can be attributed to the inaccessibility to credit for purposes like consumption. The need for consumption loan was also revealed in an earlier study on farm credit (Palanisamy, 1989).

5.5.4 Loan overdues

The main reasons for overdues were investment for purchasing land, political interference and slackness in timely recovery of loans. Anticipation

of waiver of loan overdues and the RBI guidelines directing institutional financing agencies to collect interest on agricultural loans only to a maximum amount equal to the principal amount lent for any period of default were also found to considerably affect the extent of overdues. However, it may be noted that the farmer is under stress to clear loans taken from non-institutional sources like private money lenders. The high amount of overdues can also be attributed to non-performance of cotton in recent years in terms of yield and price.

The overdues were found to be highest incase of large farmers (71.50 %) followed by medium farmers (64.85 %) and small farmers (64.50 %). For pooled farms it was 64.85 per cent. It can be reasoned that small farmers actually have low repaying capacity and hence high overdues. However, in case of large farmers the high overdues can be attributed to investment of the income on other activities instead of clearing the debts and in some cases willful default.

5.5.5 Sources of credit

The source of credit played an important role in the recent suicides of farmers. The non-availability of timely institutional credit has forced the farmers to borrow from private money lenders who charge exorbitant rates of interest. The farmer is under stress to clear these loans as the interest accumulated. In such a situation, crop failure or unfavourable market

conditions put extreme stress on the farmers driving them towards suicides (Shameem and Parthasarathy, 1988).

Institutional credit accounted to a very less amount mainly due to complicated procedures, it was only 22 per cent on small farms, 30 per cent on medium farms and 41 per cent on large farms. On an average it was 28.85 per cent of total credit. While non-institutional credit accounted for 78 per cent of total credit on small farms, 70 per cent on medium farms and 59 per cent on large farms for pooled farms it was 71.45 per cent.

This confirms that the large farmers have better access to institutional credit. The low institutional credit was mainly due to the complicated procedures involved similar observation was made in a study on suicides of farmers in the district (Deshpande, 2002).

5.5.6 Repaying capacity

A regression function of linear model was fitted to know the impact of independent variables on the repaying capacity of the selected farmers in different farm size groups.

Zero-order correlation between dependent and the independent variables were computed in order to know whether any relationship existed between them. A linear relationship was observed and hence the linear function was selected. The results are presented in Table 5.17, 5.18 and 5.19.

1. Large farmers

It is observed from Table 5.17 that correlation coefficient between size of the holding and dependent variable repayment capacity was non-significant while expenditure on production, family expenditure and other loans to be repaid showed a negatively significant relationship.

2. Medium farmers

It is observed from Table 5.18 that except size of holding all other variables showed a significant correlation with the dependent variable. While income from all sources showed a positively significant correlation, family expenditure, expenditure on production, and other loans to be repaid showed a negative correlation with the dependent variable. Of all the variables income from all sources and family expenditure showed a strong relationship with the dependent variable.

3. Small farmers

The size of the holding and income from all sources in Table 5.19 showed a very strong and positive relationship with the dependent variable. Family expenditure, expenditure on production and other loans to be repaid showed a significantly negative correlation with the independent variable. The high R^2 value can be attributed to the fact that the variables expressed above are the only major factors affecting the repaying capacity of small farmers.

5.6 OPINION ANALYSIS ON REASONS FOR CRISIS

5.6.1 Opinion regarding the profitability of cotton cultivation

It can be inferred from the Table 5.20 that nearly 50 per cent of farmers are convinced that the cotton cultivation was a profitable enterprise. However nearly 90 per cent of farmers in all the size groups were not willing to increase the area under cotton cultivation under the present situations. This may be attributed to the fact that low yields were obtained during past 5 to 6 years owing to heavy pest attack and vagaries of weather conditions etc.

It was also observed that during the year 1997, 1998 and 2002 due to crop failure the farmers could not get proper yields and they incurred heavy losses by using resources indiscriminately particularly plant protection chemicals. High cost of cultivation, low yields made the farmers unable to repay back their loans taken from institutional and private money lenders. The pressure mounted on them driving many farmers to commit suicides. The suicides were very much significant in the above mentioned three years. Apart from that during the year 2004 also the suicides have increased as a general failure of agriculture and also the farmers expected the aid the government gives after their death may perhaps helps survival of their families.

5.6.2 Opinion regarding technical advice

The opinion regarding the technical advice is presented in Table 5.21.

The survey pointed out that the small farmers got the least technical advice while the large farmers got the most. In all 59.38 per cent farmers got

technical advice from among all size groups and the chief source turned out to be the Department of Agriculture for majority of the farmers.

The opinion of the selected farmers regarding the utility of the technical advice revealed that majority of the small and medium farmers (77 % and 63 % respectively) felt that the technical advice did not really help them. Whereas 45 per cent of large farmers felt that the advice helped them.

5.6.3 Opinion regarding the production problems

The Table 5.22 depicts the opinion regarding procurement/utilisation of inputs. It can be inferred from the table that nearly 60 per cent of farmers in all the size groups faced problems in seed procurement. This was due to spurious seeds in the market, hoarding by dealers and also lack of information on the part of the farmer about the huge number of varieties of seed released in the market. The analysis showed that more than 2/3rds of the farmers in all size groups faced problems in engaging labour for various operations due to shortage of labour during peak periods in the season.

Majority of farmers upto 90 per cent in small and medium size groups did not get their soils tested. Whereas 30 per cent of the farmers in the large size group got their soils tested. Nearly 50 per cent of the farmers in all the size groups knew the recommended fertilizer dose given by the Department of Agriculture. However, only 27 per cent and 23 per cent of small and medium farmers are applying the recommended dosage whereas 40 per cent of the large farmers are applying the recommended dosage. This is due to the

farmers own perception of requirement of fertilizers and mistrust in the recommended dosage given by the Department of Agriculture.

With regard to prophylactic measures, nearly 50 per cent of the farmers in all size groups adopted prophylactic measures.

With regard to plant protection chemicals, majority of the farmers in small (68 %) and medium (55 %) size groups were not following the recommended dosage of application while 63 per cent of large farmers were adopting the recommended dosage.

It is noticed from the survey that majority of small (77 %) and medium (63 %) size groups of farmers did not use power sprayers while 72 per cent of the large farmers were using power sprayers.

The survey indicated that majority of farmers are not using tractors for ploughing while a small percentage utilizing this resource in case of small (11 %) and medium (30 %) farms. The large farms 59 per cent farms were using tractors in various operations.

Regarding spurious inputs majority of the farmers (70 %) opined that the inputs they used were spurious. The supply of spurious inputs is a major havoc and bringing crisis in agriculture. The supply of seed, fertilisers, plant protection chemicals are important inputs in agriculture and on these inputs the agriculture depends wholly. When the farmer unable to get genuine inputs it results in complete failure of crop and there by heavy losses to farmers.

Government has to tackle this problem with utmost importance by bringing stringent legislations to punish the culprits.

5.6.4 Reasons for the crisis situation

There have been many studies conducted to ascertain the reasons responsible for the crisis situation. An attempt has been made to ascertain the factors that have led the cotton farmers to take the extreme step. The results are presented in Table 5.23. The opinion analysis revealed that all the farmers in all the size groups attributed the crisis situation to loss of crop due to pests and diseases and high interest rates by money lenders. The crop losses due to high incidence of pests and diseases have increased during the 90's. This coupled with exorbitant interest rates by money lenders have created a situation of despair and doom and despair. The situation repeated over a number of years has driven the farmers to take the extreme step of suicide.

Lack of timely and sufficient institutional credit was also attributed to be the cause for the pathetic situation of cotton farmers in the district which forced the farmers to private money lenders who charged exorbitant interest rates. This is in corroboration with the findings of Shameem and Parthasarathy (1998).

Majority of the farmers, 56 per cent among small and medium, 68 per cent among large and 60 per cent among pooled farmers felt that spurious seeds and chemicals in the market had a role in the spate of suicides and consequent crisis situation. Spurious seeds had done an enormous damage

with heavy investment on inputs in anticipation of high yields while at the end of season they harvested meagre yields. This on one account increased input costs and on the other account did not achieve even normal yields and returns.

Ninety per cent of the farmers felt that the high cost of cultivation due to costly and excessive inputs coupled with low yields and hence meagre net returns have made the cultivation of cotton unprofitable.

Lack of knowledge and skills in cotton cultivation was attributed to be the cause for crisis by 70 per cent farmers in small and medium farmers and 60 per cent of farmers in large size group. Lack of adequate irrigation water and timely rainfall during the season was felt to be one of the reasons that led to the crisis situation by nearly 90 per cent of all farm size groups.

Nearly 60 per cent of farmers in all farm size groups attributed family problems to be one of the main reasons for the spate of suicides of cotton farmers.

It can be inferred that though none of the above reasons could singly push the farmer to commit suicide, a combination of a number of the reasons specified above played a significant role in the generation of a crisis situation. Also it can be observed that all the reasons that the farmers attributed to the crisis can be alleviated through implementation of proper cultivation practices, credit lending procedures, dissemination of technical know how and strict vigilance of seeds and chemicals in the market.

The above results corroborated the earlier studies of Krupakar (2001), Shameen and Parthasarathy (1998) and Sathish (2000).

5.7 SUGGESTIONS/MEASURES TO OVERCOME/MITIGATE THE CRISIS

It is interesting to note that the farmers have come out with the following suggestions/measures to overcome the crisis. The results are presented in Table 5.24.

Among the medium farmers 46.7 per cent, felt that a change in cropping pattern/shifting to other crops would reduce the risks and hence better returns. Among small, large and pooled farmers 40.9 per cent, 36.3 per cent and 41.7 per cent respectively felt a change in cropping pattern would help to overcome the crisis situations.

Majority of the farmers, nearly 80 per cent in all farm size groups felt that the strengthening of PACs and other cooperatives, Rythu clubs etc to extend credit and supply inputs at reasonable prices would help tide over the tough conditions faced by the cotton farmer.

Strengthening of the Extension organisation and effective dissemination of Good Agricultural Practices was felt as a need to enhance the farmers understanding and help adopt better practices to tide over the difficult conditions faced by the cotton farmer in the district by nearly 65 per cent of the farmers in all size groups.

Almost all farmers (95 % on pooled farms) suggested Government intervention in stabilizing the prices and assuming remunerative prices to the farmers.

Institutional financing to a greater extent and simple procedures was suggested to be a major factor that can influence the current situation and help overcome the debt burden of the farmers to the money lenders, by 81 per cent, 80 per cent, 86 per cent and 82 per cent on small, medium, large and pooled farms respectively.

The results are in confirmation with the studies conducted by Shameem and Partha Sarathy (1998), Sathish (2000) and Krupakar (2001).

All the above suggestions/measures as put forward by the farmers can not singly bring about the needed changes to tide over the crisis. However when the above measures go hand in hand, a real change in the situation can be looked forward to. Thus it is bound on the part of both the farming community as well as the Government, Extension Organizations and the Institutional Financing agencies to have a clear agenda to meet the challenges ahead in mitigating the crisis situation facing the cotton farmers in the district.

Table 5.4 : Holding pattern of selected farmers (ha)

Holding pattern	Small farms	Medium farms	Large farms	Pooled farms
Irrigated	0.05	0.92	2.90	1.05
Unirrigated	1.60	2.88	7.05	3.13
Total holding	1.65	3.80	9.75	4.18
Net area sown	1.92	3.18	7.54	3.37
Gross cropped area	1.50	3.52	8.60	3.76
Cropping intensity (%)	105.60	110.69	114.05	111.51
Area under cotton	1.20	3.03	5.65	2.79
% of cotton to gross cropped area	80.00	86.04	65.69	70.40

Table 5.5 : Asset structure of selected farmers

	Particulars	Small farms	Medium farms	Large farms	Pooled farms
1.	Land value	68379.54 (83.92)	70051.67 (82.30)	73293.18 (66.50)	70027.91 (78.5)
2.	Value of farm buildings	1292.45 (1.60)	1508.34 (1.80)	1779.55 (1.61)	1471.54 (1.65)
3.	Value of wells	457.95 (0.60)	498.70 (0.60)	559.09 (0.51)	493.86 (0.57)
4.	Value of implements and machinery	2131.81 (2.62)	2810.00 (3.30)	23954.55 (21.75)	7344.78 (8.24)
5.	Value of livestock	9172.72 (11.52)	10246.67 (12.00)	10613.63 (9.63)	9838.53 (11.04)
	Total assets without land	13054.93 (16.08)	15063.67 (17.70)	36906.82 (33.5)	19148.73 (21.5)
	Value of total assets with land	81434.47	85115.38	110200.00	897176.85

Figures in parentheses are percentage values

Table 5. 6 : Labour utilisation by sample farmers (operation wise)

	Operations	Small		Medium		Large		Pooled	
		CPD	MPD	CPD	MPD	CPD	MPD	CPD	MPD
1.	Preparatory cultivation	6.03	6.42	5.74	6.05	4.13	4.39	5.50	5.83
2.	Sowing	-	3.44	-	3.21	-	2.98	-	3.26
3.	Manures and fertilizer application	2.81	3.50	2.76	3.77	2.50	2.97	2.72	3.44
4.	Intercultivation	3.85	8.61	3.45	8.32	3.32	7.82	3.60	8.33
5.	Plant protection	-	17.05	-	17.74	-	17.09	-	17.27
6.	Picking	-	7.75	-	7.67	-	7.45	-	7.65
	Total	12.69	46.77	11.95	47.25	9.95	42.65	11.82	45.78

Table 5.7 : Cost of cultivation according to farm size (Rs/ha)

Particulars	Small farms	% to total	Medium farms	% to total	Large farms	% to total	Pooled farms	% to total
VARIABLE COSTS								
1. Human labour								
Hired	629.09	3.40	869.95	4.74	1248.67	6.45	846.35	4.58
Family	1006.95	5.66	784.03	4.27	243.63	1.26	762.36	4.14
Total	**1636.04**	**9.05**	**1653.98**	**9.01**	**1492.30**	**7.71**	**1608.71**	**8.73**
2. Cattle labour								
Hired	405.90	2.25	276.85	1.51	226.79	1.17	278.69	1.51
Family	165.29	0.91	274.94	1.49	220.61	1.14	258.06	1.40
Total	**571.19**	**3.16**	**551.79**	**3.00**	**447.40**	**2.31**	**536.75**	**2.91**
3. Machine labour								
Hired	342.05	1.89	406.67	2.22	565.52	2.92	413.45	2.24
Family	-	-	-	-	89.29	0.46	30.46	0.11
Total	**342.05**	**1.89**	**406.67**	**2.22**	**654.81**	**3.38**	**443.91**	**2.35**
4. Seed	520.00	2.88	621.67	3.38	729.50	3.76	599.78	3.25
5. Manures and fertilizers	3625.00	20.07	3564.17	19.42	3536.36	18.27	3585.67	19.45
6. Plant protection chemicals	7617.95	42.18	7690.67	41.91	7763.60	40.12	7674.05	41.59
7. Interest on working capital	451.95	2.50	450.20	2.45	456.99	2.36	452.55	2.45
Total variable costs	**14764.17**	**81.75**	**14939.14**	**81.39**	**15080.96**	**77.93**	**14901.42**	**80.73**
FIXED COSTS								
1. Rental value of own land	2905.90	16.09	2958.33	16.11	3146.5	16.27	2977.42	16.13
2. Land revenue	-	-	-	-	-	-	-	-
3. Depreciation	316.81	1.75	374.50	2.06	866.36	4.47	460.77	2.50
4. Interest on fixed capital	74.26	0.41	81.52	0.44	256.86	1.33	118.37	0.64
Total fixed costs	**3296.97**	**18.25**	**3414.35**	**18.61**	**4269.72**	**22.07**	**3556.56**	**19.27**
Total costs	**18061.14**	**100.00**	**18353.49**	**100.00**	**19350.68**	**100.00**	**18457.98**	**100.00**

Table 5.8 : Cost of cultivation according to cost concepts per ha (Rs.)

Particulars	TVC	TFC	Cost A	Cost B_1	Cost B_2	Cost C_1	Cost C_2	Cost C_3	Prime cost
Small	14764.17	3296.97	14074.03	14148.29	17054.19	15128.24	18061.14	19867.25	15080.98
Medium	14939.14	3414.35	14529.61	14611.13	17569.49	15395.16	18353.49	20188.83	15313.64
Large	15080.96	4269.75	15703.69	15960.54	19107.05	16204.17	19350.68	21285.75	15947.32
Pooled	14891.45	3556.58	14589.86	14708.23	17685.66	15470.59	18447.86	20292.64	15352.22

Table 5.9 : Cost of cultivation per quintal according to cost concepts (Rs.)

Particulars	TVC	TFC	Cost A	Cost B_1	Cost B_2	Cost C_1	Cost C_2	Cost C_3	Prime cost
Small	2203.60	492.08	2100.60	2111.68	2545.4	2257.9	2695.69	2965.26	2250.89
Medium	2119.02	484.30	2060.94	2072.50	2492.12	2183.70	2603.33	2863.66	2172.15
Large	2080.13	588.93	2166.02	2201.45	2635.45	2235.05	2669.06	2935.96	2199.62
Pooled	2147.17	512.47	2102.29	2119.35	2548.37	2229.20	2658.19	2927.09	2212.14

Table 5.10 : Returns from cotton cultivation

Farm size	Yield/ha (Qt)	Gross returns/ Qt (Rs.)	Gross returns/ha (Rs.)	Net returns/ha (Rs.)		Net returns/qt (Rs.)	
				Over cost C	Over prime cost	Over cost C	Over prime cost
Small	6.70	2250	15075	-2986.14	-5.98	-445.69	-0.89
Medium	7.05	2250	15862.5	-2490.99	548.86	-353.33	77.85
Large	7.25	2250	16312.5	-3038.18	335.18	-419.06	50.38
Pooled	6.94	2250	15604.0	-2843.86	251.78	-408.19	37.86

Table 5.11 : Profitability of cotton cultivation (Rs./ha)

Farm size	Gross returns	Net returns		Farm business income	Family labour income	Farm investment income
		Over cost C	Over prime cost			
Small	14795.55	-2986.14	-5.98	+1000.97	-1979.19	-5.98
Medium	15615.75	-2490.99	548.86	+1332.89	-1706.99	548.86
Large	16211.50	-3038.18	335.18	+608.81	-2794.55	335.18
Pooled	15376.35	-2843.86	251.78	1018.25	-2081.66	251.78

Table 5.12 : Input - Output ratios in cotton cultivation according to farm size

Particulars	Gross returns (Rs/ha)	Total cost (Rs./ha)	Prime cost (Rs/ha)	Input-Output ratio on cost C_2	Input / Output ratio on prime cost	Net loss per investment on cost C_2
Small	15075.00	18061.14	15080.98	1 : 0.835	1 : 0.999	0.165
Medium	15862.50	18353.49	15313.64	1 : 0.864	1 : 1.035	0.136
Large	16312.50	19350.68	15977.32	1 : 0.842	1 : 1.020	0.158
Pooled	15604.00	18447.86	15352.22	1 : 0.845	1 : 1.016	0.155

Table 5.13 : Break-even output according to farm size (qt/ha)

Particulars	Average yield per farm (qts)	Fixed cost per farm (Rs.)	Variable cost per quintal (Rs.)	Price per quintal (Rs.)	BEO per ha (Qts)	Difference between BEO and avg. output
Small	6.70	3296.97	2203.58	2250	71.02	64.32
Medium	7.05	3414.35	2119.03	2250	26.07	19.02
Large	7.25	4269.72	2080.13	2250	25.14	17.89
Pooled	6.94	3556.56	2147.30	2250	34.63	27.69

Table 5.16 : Credit utilisation pattern of selected farmers

Borrowers	Non-divertors	Divertors	Loan amount raised per ha	Used for production	Diverted towards			Amount overdue	Over due Per cent	Source %	
					Consumption	Other agricultural purpose	Total			Institu-tional	Non-Institu-tional
Small - 40	12	28	9863.5	8926.48 (90.50)	491.21 (4.92)	451.8 (4.58)	943.18 (9.50)	6366.15 (64.50)	64.50	22.00	78.00
Medium – 25	13	12	9984.7	8976.24 (89.90)	514.21 (5.15)	494.25 (4.95)	1008.46 (10.00)	5995.8 (60.00)	60.05	30.00	70.00
Large – 20	14	6	10766.5	10378.90 (96.40)	316.53 (2.94)	71.07 (0.66)	387.60 (3.20)	7698.04 (71.50)	71.50	41.00	59.00
Pooled	39	46	10108.3	9274.87 (91.75)	458.37 (4.53)	377.82 (3.74)	836.23 (8.27)	6555.64 (64.85)	64.85	28.85	71.45

Table 5.20 : Opinion regarding the profitability of cotton cultivation

	Particulars of the opinion	Small farmers		Medium farmers		Large farmers		Pooled	
		Yes	No	Yes	No	Yes	No	Yes	No
1.	Are you willing to increase the area under cotton	6 (13.63)	38 (86.37)	2 (6.67)	28 (93.33)	1 (4.54)	21 (95.46)	9 (9.38)	87 (90.62)
2.	Is cotton cultivation profitable	20 (45.45)	24 (54.55)	16 (53.33)	14 (46.67)	13 (59.09)	9 (40.91)	49 (51.04)	47 (48.96)

Table 5.21 : Opinion regarding technical advice

	Particulars of the opinion	Small farmers		Medium farmers		Large farmers		Pooled	
		Yes	No	Yes	No	Yes	No	Yes	No
1.	Are you getting technical advice	20 (45.45)	24 (54.55)	20 (66.67)	10 (33.33)	17 (77.27	5 (22.73)	57 (59.38)	39 (40.62)
2.	Do you think the technical advice helped you ?	10 (22.73)	34 (77.27)	11 (36.67)	19 (63.33)	10 (45.45)	12 (54.55)	31 (32.30)	63 (67.7)

Table 5.22 : Opinion regarding the procuring / utilisation of inputs

	Particulars of the opinion	Small farmers		Medium farmers		Large farmers		Pooled	
		Yes	No	Yes	No	Yes	No	Yes	No
1.	Do you have problems in seed procurement ?	26 (59.09)	18 (40.91)	17 (56.66)	13 (43.34)	13 (59.1)	9 (40.9)	56 (58.33)	40 (41.67)
2.	Did you face problems of labour shortage ?	28 (63.63)	16 (36.37)	23 (76.66)	7 (23.34)	19 (86.36)	3 (13.64)	70 (72.91)	26 (27.09)
3.	Do you get your soil tested	5 (11.36)	39 (82.64)	3 (10.00)	27 (90.00)	7 (31.80)	15 (68.20)	15 (15.62)	81 (84.38)
4.	Do you know the required close of fertilizer	19 (43.18)	25 (56.82)	15 (50.00)	15 (50.00)	13 (59.10)	9 (40.90)	47 (48.95)	49 (51.05)
5.	Are you applying the required quantity of fertilizers	12 (27.28)	32 (72.72)	7 (23.34)	23 (76.66)	13 (59.1)	9 (40.9)	28 (29.1)	68 (70.9)
6.	Do you take any prophylactic measures	24 (54.54)	20 (45.46)	17 (56.66)	13 (43.34)	12 (54.54)	10 (45.46)	53 (55.20)	43 (44.80)
7.	Are you applying the recommended plant protection chemicals	14 (31.82)	30 (68.18)	14 (46.67)	16 (53.33)	14 (63.63)	8 (36.37)	60 (62.50)	36 (37.50)
8.	Use of power sprays	10 (22.73)	34 (77.27)	11 (36.66)	19 (63.34)	16 (72.72)	6 (27.28)	37 (38.54)	59 (61.46)
9.	Tractor ploughing	5 (11.36)	39 (88.64)	9 (30.00)	21 (70.00)	13 (59.10)	9 (40.90)	27 (28.20)	69 (71.80)
10.	Do you think the inputs you got are spurious ?	34 (77.28)	10 (22.72)	22 (73.33)	8 (26.67)	12 (54.55)	10 (45.45)	68 (70.84)	28 (29.16)

Table 5.23 : Opinion regarding reasons for the crisis

	Reasons for crisis	Small				Medium				Large				Pooled			
		Yes	%	No	%	Yes	%	No	%	Yes	%	No	%	Yes	%	No	%
1.	Loss of crop due to pests and diseases	44	100	0	0	30	100	0	0	22	100	0	0	96	100	0	0
2.	High interest rates by money lenders	44	100	0	0	30	100	0	0	22	100	0	0	96	100	0	0
3.	Lack of timely and sufficient institutional credit	40	90.9	4	9.1	26	86.7	4	13.3	20	90.9	2	9.1	86	89.70	10	10.3
4.	Spurious seeds and chemicals in market	39	88.63	5	11.37	27	90	3	10.0	20	90.1	2	9.9	86	89.6	10	10.4
5.	High cost of cultivation coupled with low yields	39	88.63	5	11.36	28	93.39	2	6.66	19	86.36	3	13.64	86	89.60	10	10.4
6.	Lack of knowledge and skills	31	70.45	13	29.55	21	70	9	30.0	13	59.1	9	40.9	65	67.70	31	32.3
7.	Lack of adequate irrigation water and rainfall during season	25	56.8	19	43.2	17	56.7	13	43.3	15	68.9	7	31.1	57	59.30	39	40.62
8.	Family problems	20	45.45	24	54.55	18	60.00	12	40.00	14	63.64	8	36.36	52	54.17	44	45.83

Table 24 : Suggestions / Measures to overcome crisis

	Particulars	Small	Medium	Large	Pooled
1.	Change in cropping pattern i.e. shift to crops other than cotton	18 (40.9)	14 (46.7)	8 (36.3)	40 (41.7)
2.	Strengthening of PACS, Rythu Sanghams etc. to supply inputs and also extend credit	36 (81.8)	24 (80.0)	18 (81.8)	78 (81.4)
3.	Strengthening of Extension activities in dissemination of GAP (Good Agricultural Practices)	28 (63.6)	20 (66.67)	15 (68.1)	63 (65.6)
4.	Government should intervene and make sure the farmers get a remunerative price	44 (100.0)	28 (93.4)	20 (91.0)	92 (95.8)
5.	Institutional financing should be enhanced and procedures made simple	36 (81.8)	24 (80.0)	19 (86.3)	79 (82.3)

Figures in parenthesis are percentage values

Table 5.1 : Compound growth rates for Area, Production and Productivity of cotton in Warangal and Andhra Pradesh

	Area	Production	Productivity
Period (1970-2000)			
Warangal	8.48**	15.79**	6.74**
	(10.97)	(14.6)	(8.85)
Andhra Pradesh	4.69**	8.96**	3.87**
	(16.499)	(11.52)	(5.58)
Period (1971-80)			
Warangal	7.20	11.00	3.64
	(1.37)	(1.31)	(0.83)
Andhra Pradesh	2.18	11.78	11.39*
	(1.162)	(1.89)	(2.54)
Period (1981-90)			
Warangal	2.082	16.37**	13.99
	(0.403)	(3.66)	(1.83)
Andhra Pradesh	4.279**	3.106	11.394*
	(6.047)	(1.102)	(2.54)
Period (1991-2000)			
Warangal	12.43**	25.87**	3.60
	(9.99)	(3.244)	(2.20)
Andhra Pradesh	5.418**	5.36**	-1.72
	(4.82)	(3.176)	(1.40)

* Significant at 10 per cent level
** Significant at 5 per cent level

Table 5.2 : Trend in Area, Production and Productivity of cotton in Warangal district during the period 1990-91 to 2000-01

Year	Area ('000 ha)	Production ('000 kgs lint)	Productivity (kg lint/ha)
1990-91	52.5	1261.2	240
1991-92	60.92	1584.0	260
1992-93	61.9	14860.8	240
1993-94	56.8	13075.5	230
1994-95	72.4	22154.4	306
1995-96	82.2	23826.4	363
1996-97	107.6	37337.2	347
1997-98	99.3	32183.0	324
1998-99	144.6	49749.2	344
1999-2000	153.0	50662.8	331
2000-01	138.9	59474.8	428

Table 5.3 : Family composition and family labour particulars of selected farmers

Particulars	Size of the farms			
	Small	**Medium**	**Large**	**Pooled**
Family size				
Males	2.70	2.95	3.15	2.88
Females	2.05	2.25	3.95	2.55
Children	2.95	2.35	2.96	2.76
Total	**7.70**	**7.55**	**10.06**	**8.19**
Family Labour				
Males	2.15	2.11	2.01	2.10
Females	1.72	1.70	1.02	1.55
Children	2.32	2.17	0.04	1.75
Total	**5.96**	**5.33**	**3.07**	**5.10**

Table 5.14 : Production elasticities in cotton production per farm

Particulars	Small	Medium	Large	Pooled
Log a	7.3844	7.3963	1.2695	0.5844
Production Elasticities				
Land (ha)	1.36*	1.0613**	0.405*	1.44**
	(0.7564)	(0.3913)	(0.2330)	(0.635)
Seed (Rs)	0.0421	-0.0604	0.1869	0.0357
	(0.0797)	(0.0609)	(0.1561)	(0.0510)
Human labour (Rs)	0.170*	0.0566	0.5688**	0.531***
	(0.089)	(0.2160)	(0.2630)	(0.0869)
Cattle labour (Rs)	-0.2320	0.0694	0.7361	0.0614
	(0.1828)	(0.1225)	(0.4864)	(0.1025)
Manures and Fertilizers (Rs.)	-0.2502	1.045***	-0.6610	-0.0616
	(0.6648)	(0.1270)	(1.0519)	(0.1822)
Plant protection chemicals	-0.4480*	-0.5778**	-0.179	-0.8655***
(Rs.)	(0.1812)	(0.2014)	(1.7060)	(0.2237)
Sum of elasticities (Σbi)	0.6419	1.481	1.056	1.141
R^2	83.563	84.53	92.371	96.98

Figures in parenthesis are standard errors
* Significant at 10 per cent level
** Significant at 5 per cent level
*** Significant at 1 per cent level

Table 5.15 : MVP, opportunity costs and MVP to opportunity cost ratios

Particulars	Small	Medium	Large	Pooled
MVP (Rs.)				
Land (Rs)	5.6150	1.5750	1.5030	1.0510
Seed (Rs)	1.2760	-0.0868	1.1620	1.0360
Human labour (Rs)	1.1100	1.0600	1.2500	1.3372
Cattle labour (Rs)	-0.3454	0.1002	-0.1510	-0.0898
Manures and Fertilizers (Rs.)	1.1600	1.2090	-0.0758	1.1320
Plant protection chemicals (Rs.)	-0.4789	-0.6171	-0.1910	-0.9238
Opportunity costs				
Land (ha)	1.00	1.00	1.00	1.00
Seed (Rs)	1.00	1.00	1.00	1.00
Human labour (Rs)	1.00	1.00	1.00	1.00
Cattle labour (Rs)	1.00	1.00	1.00	1.00
Manures and Fertilizers (Rs.)	1.00	1.00	1.00	1.00
Plant protection chemicals (Rs.)	1.00	1.00	1.00	1.00
MVP to opportunity costs ratio				
Land	5.6150	1.5750	1.5030	1.0510
Seed	1.2760	-0.0868	1.1620	1.0360
Human labour	1.1100	1.0600	1.2500	1.3372
Cattle labour	-0.3454	0.1002	-0.1510	-0.0898
Manures and Fertilizers	1.1600	1.2090	-0.0758	1.1320
Plant protection chemicals	-0.4789	-0.6171	-0.1910	-0.9238

Table 5.17 : Partial regression coefficients and standard errors for equation I (Large Farmers)

Item		Partial regression coefficient	Standard error	`t' value
Constant	(a)	381.56		
Size of the holding	(x_1)	38.372	365.03	0.105
Income from all sources	(x_2)	0.3958	0.168	2.35**
Family expenditure	(x_3)	-0.5652	0.223	2.52**
Expenditure on production	(x_4)	-0.2958	0.146	2.02*
Other loans to be repaid	(x_5)	-0.374	0.189	1.97*

R^2 = 76.30; n = 22

* Significant at 10 per cent level

** Significant at 5 per cent level

Table 5.18 : Partial regression coefficients and standard errors for equation II (Medium Farmers)

Item		Partial regression coefficient	Standard error	`t' value
Constant	(a	-249.64		
Size of the holding	(x_1)	121.08	141.760	0.854
Income from all sources	(x_2)	0.5655	0.1419	3.984***
Family expenditure	(x_3)	-0.6135	0.1620	3.770***
Expenditure on production	(x_4)	-0.4691	0.1580	2.954***
Other loans to be repaid	(x_5)	-0.4861	0.2310	2.096**

R^2 = 88.114 n = 30

** Significant at 5 per cent level

*** Significant at 1 per cent level

Table 5.19 : Partial regression coefficients and standard errors for equation III (Small Farmers)

Item		Partial regression coefficient	Standard error	`t' value
Constant	(a)	3237.293		
Size of the holding	(x_1)	4332.672	1253.62	3.456**
Income from all sources	(x_2)	0.3274	0.0208	15.740***
Family expenditure	(x_3)	-0.4349	0.2460	1.7682*
Expenditure on production	(x_4)	-0.3768	0.0450	8.3733***
Other loans to be repaid	(x_5)	-0.4526	0.1563	2.895***

R^2 = 99.35; n = 44

* Significant at 10 per cent level
** Significant at 5 per cent level
*** Significant at 1 per cent level

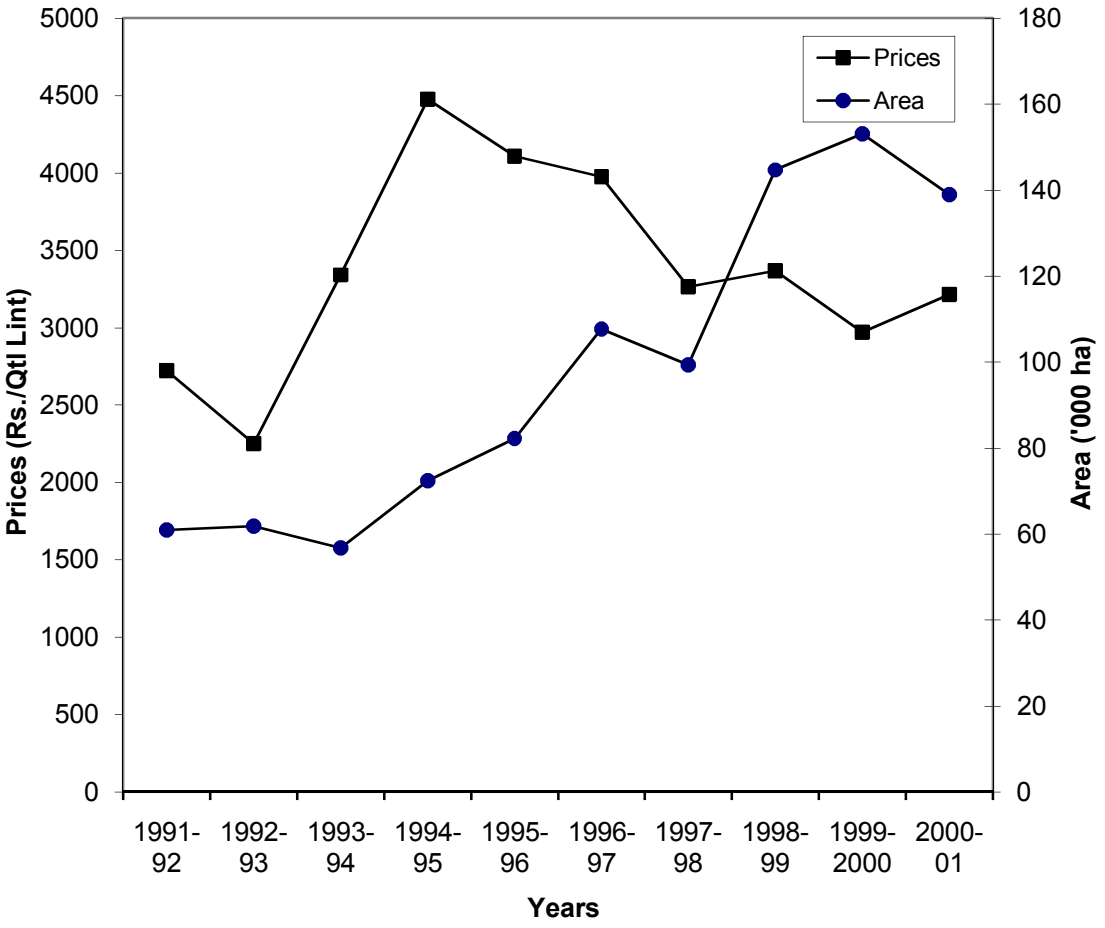


Fig. 4 : Trends in Area and Prices of cotton in Warangal district

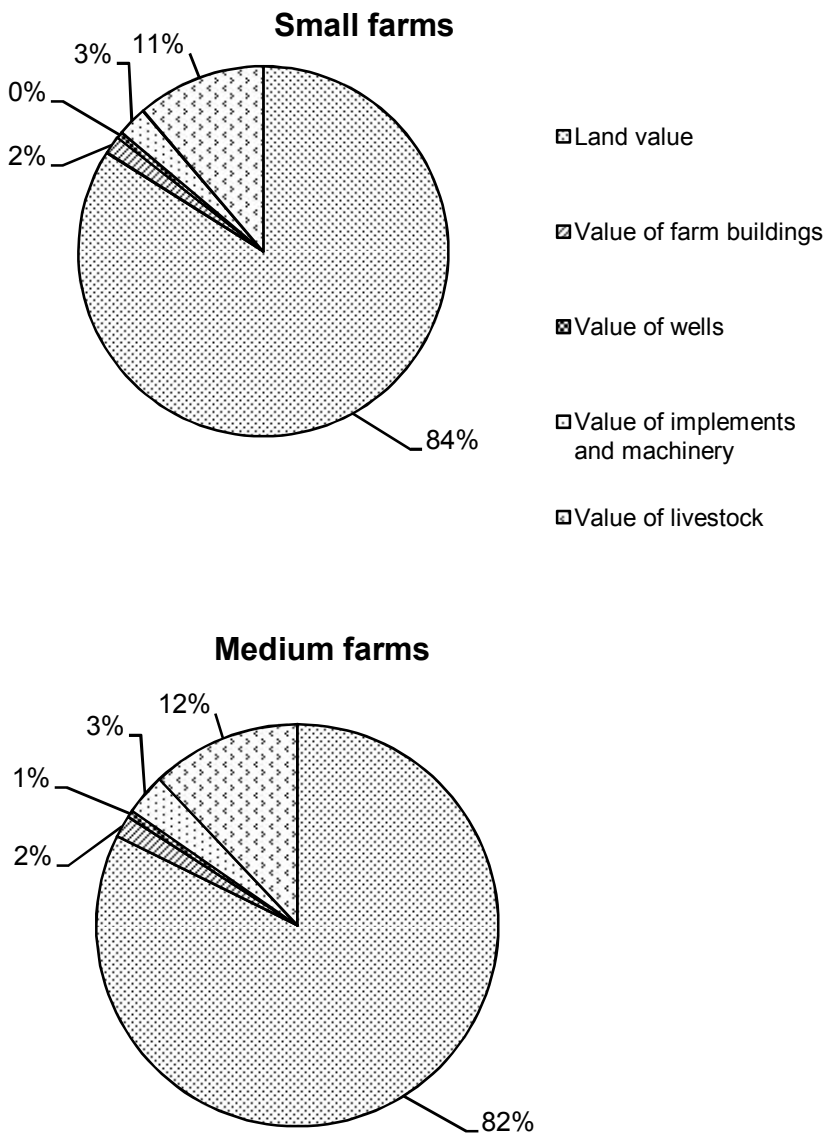
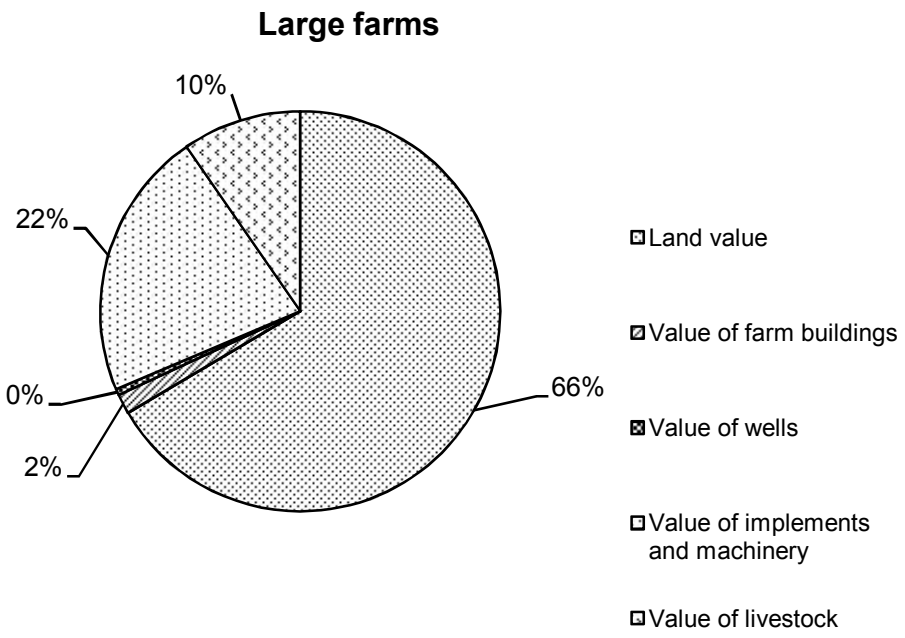


Fig. 5a : Asset structure of small and medium farms



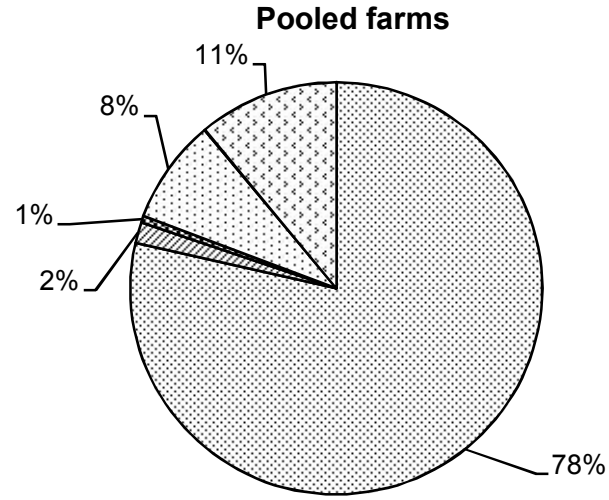


Fig. 5b : Asset structure of large and pooled farms

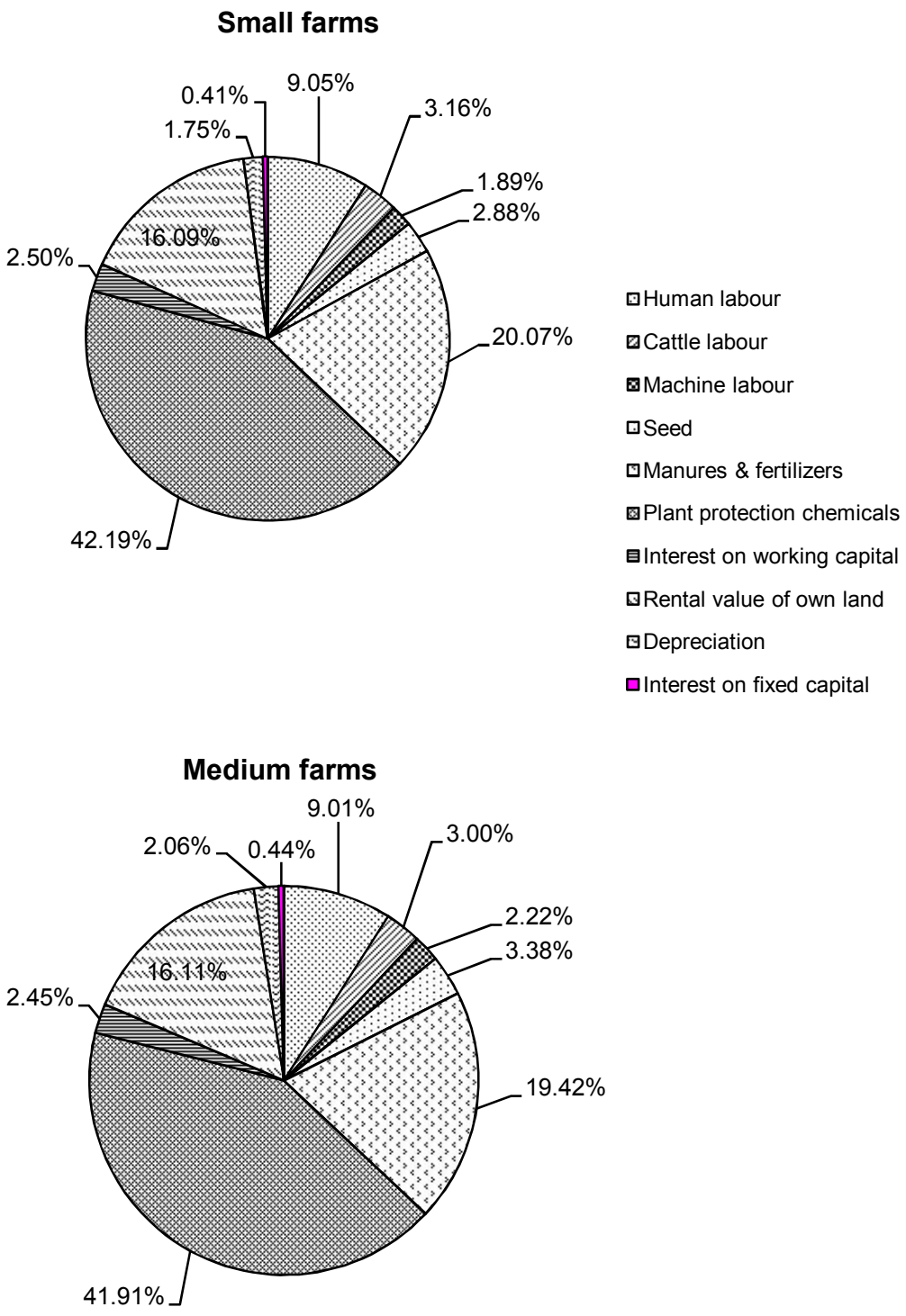


Fig. 6a : Composition of cost of cultivation on Small and Medium farms

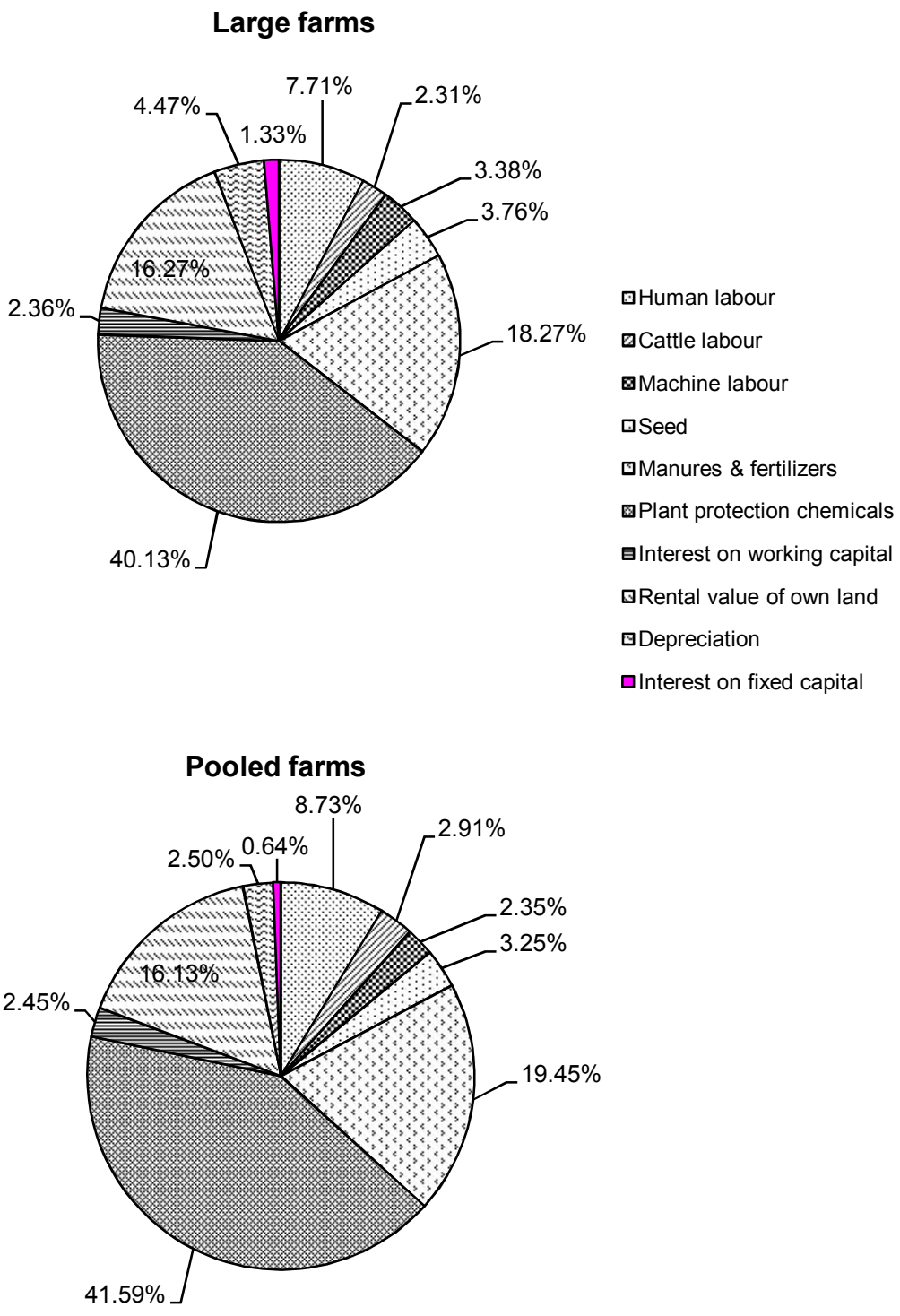


Fig. 6b : Composition of cost of cultivation on Large and Pooled farms

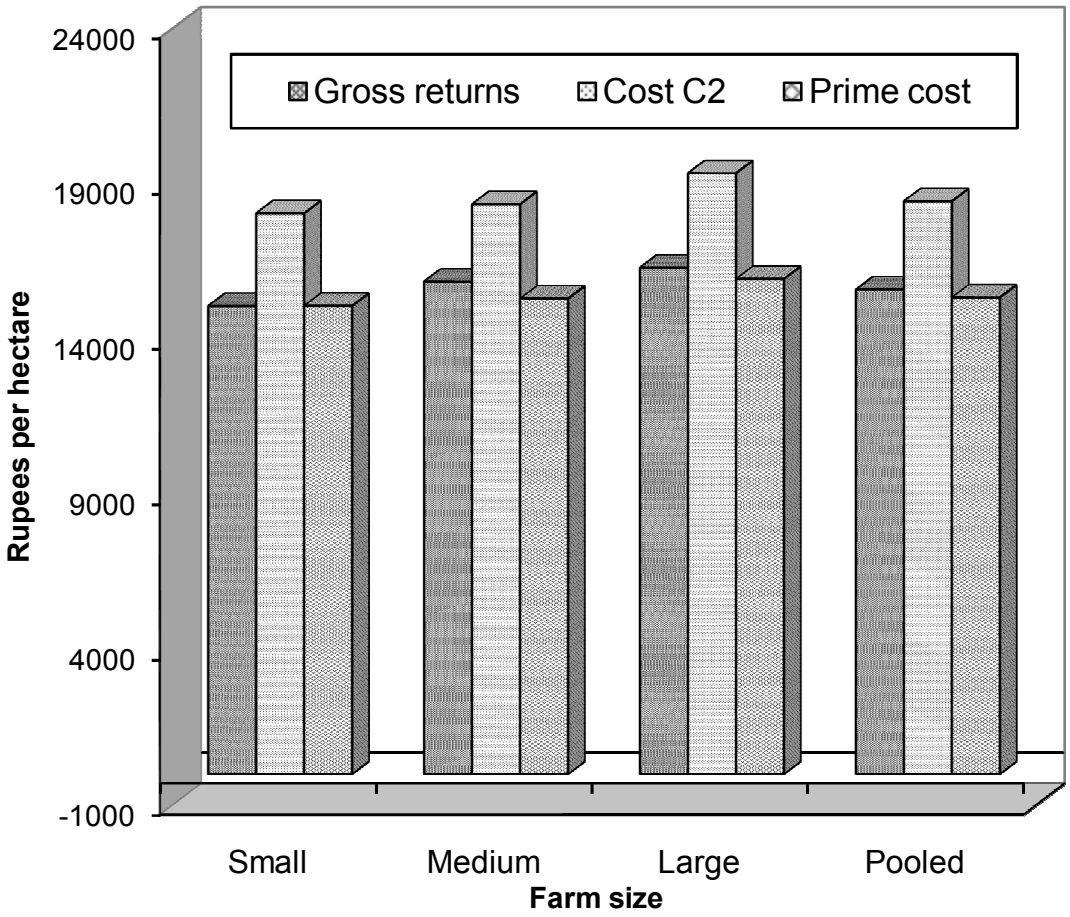


Fig. 7 : Costs and returns in cotton cultivation (rupees per hectare)

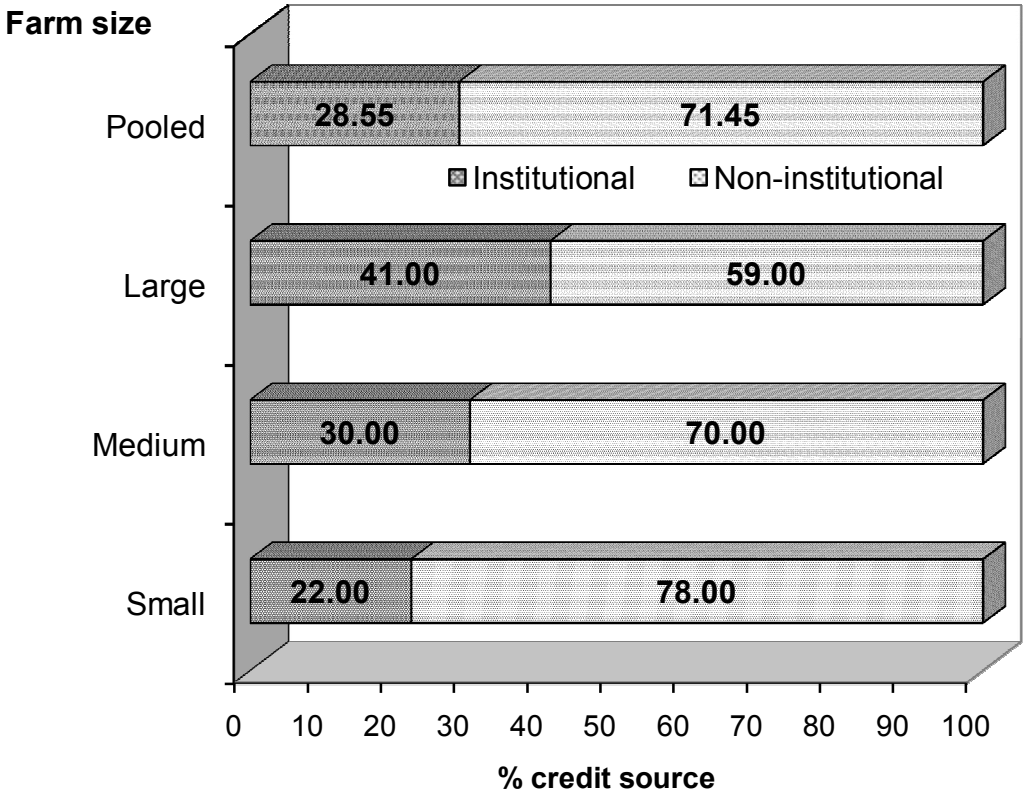


Fig. 8 : Sources of agricultural production credit

CHAPTER VI

SUMMARY AND CONCLUSIONS

Cotton is the most important commercial crop next only to food grains. It has made quite in roads into the Nation's Economy since it's introduction in early Nineteenth Century. Cotton is the primary source of raw material for the traditional textile Industry even while artificial fibres are gaining significance in the traditional textile market. The present study aimed to study the production performance, economics of cultivation, resource use efficiency and returns to scale, credit utilisation pattern and the reasons for the crisis situation of cotton farmers.

The cultivation costs have increased manifold in the past decade due to high input costs. The farmer was unable to meet these costs from internal resources and hence a need to gather credit from external resources. The high costs of credit have even more inflated the production costs. The present study has analysed these aspects empirically.

The area of study was Warangal district of Andhra Pradesh to find out the crisis in cotton cultivation in the district since a large number of cotton farmers had committed suicide in this district. The specific objectives of the study are :

1. To study the production performance of cotton in the district.
2. To study the economics of cotton cultivation and resource use efficiency on cotton farms.

3. To analyse the credit use pattern of selected farmers.

4. To identify factors responsible for the crisis.

5. To suggest measures to overcome the crisis.

Warangal district was purposively selected for the study as it is one of the major cotton growing districts in the state in terms of both area and production. More over the district has experienced a large number of suicides by cotton farmers. Four mandals viz., Geesugonda, Atmakur, Duggondi and Shayampet were selected for the study as they accounted for largest share in area under cotton out of 50 mandals in Warangal district. A total of eight villages were selected @ 2 villages per mandal based on area and production of cotton. All the cotton growers in each selected village were stratified into 3 size groups viz., small (< 2 hectares), medium farms (2 to 4 hectares) and large farms (> 4 hectares), medium farms (2 to 4 hectares) and large farms (> 4 hectares) on the basis of operational area under cotton. Twelve growers from each village were selected at random with probability proportional sampling making a total of Ninety six farmers. Small farmers (44), medium (30) and large (22) made up the final sample. Thus one district, four mandals, eight villages and ninety six farmers formed the material for the study.

The secondary data was collected from various institutions like Centre for Economic and Social Studies, Central Planning Office, Warangal, MRO offices of respected mandals. The primary data were collected by personal

interview with the help of a specially devised set of schedules. The reference period for the study was the agricultural year 2002-03.

Compound growth rates were used for analyzing the production performance of cotton in the district. Conventional analysis has been used to workout capital investment, costs and returns. Functional analysis has been used to estimate resource productivity, returns to scale. Break-even analysis has been used to find out profitability. Regression analysis has been used to find the factors affecting repayment capacity Tabular analysis has been used to identify the reasons for crisis based on opinion of selected farmers.

Basic characteristics of the selected holdings

The family size has increased with the farm size. The average family size ranged from 7.7 on small farms to 10 on large farms with an overall average of 8.19 for the whole sample.

The number of farm labour per family showed an inverse relationship with farm size. It varied from 3 on large farms to 5.96 on small farms. The same for medium and pooled farms was 5.33 and 5.10, respectively. The increase in farm size was associated with a decrease in quantum of female working members progressively.

The average size of holding varied from 1.42 ha on small farms to 7.32 hectares on large farms with an overall average of 4.18 hectares for the sample as a whole. The cropping intensity showed a positive relationship with farm

size. It was 105.6 on small farms, 110.7 on medium farm and 114 on large farms with an overall average of 111.5.

The value of farm assets was highest on large farms (110200) followed by medium (85115.34) and small farms (81434.09). There was a small difference between small and medium farms. However, a wide disparity was observed between medium and large farms.

Among the various farm assets, land constituted the major part with 84.2, 82.3, 66.5 and 78.5 per cent on small, medium, large and pooled farms, respectively. However in real value terms there was not much disparity observed across all farm size groups.

The value of total assets other than land was found to increase across small to large size groups. It was 15.8, 17.7, 33.5 and 21.5 per cent on small, medium, large and pooled farms, respectively. The livestock constituted the major portion of farm assets next to land with 11.5 per cent on small farms, 12 per cent on medium farms and 9.63 per cent on large farms. However on large farms machinery and farm implements constituted the major portion of farm assets after land. It was 21.75 per cent on large farms, while it formed a meagre 2.02 per cent and 3.3 per cent of total farm assets on small and medium farms, respectively. On pooled farms it was 8.24 per cent of total farm assets.

Value of farm buildings was the next important asset on all farms irrespective of size. It was 1.6 per cent on small farms, 1.8 per cent on medium

farms, 1.61 per cent on large farms and 1.65 per cent on pooled farms. The component that added least to the total value of farm assets across all farm size groups was the value of wells. It was 0.60 per cent on small farms and medium farms, 0.52 per cent on large farms and 0.57 per cent on pooled farms.

Labour utilisation

The human labour utilisation did not show any perceptible relationship with farm size. The overall average on all farms was 45 man days. It was 47 man days on small farms, 47.25 man days on medium farms and 42.6 man days on large farms. Human labour utilisation was mainly for plant protection, Intercultivation, preparatory cultivation, manure and fertilizer application with the quantum used in that order of descent.

The cattle labour utilisation was highest on preparatory cultivation followed by intercultivation and manures and fertilizer application.

Cost of cultivation

Cost of cultivation includes all costs right from preparatory cultivation upto harvesting of the crop. The analysis revealed that the total cost of cultivation per hectare has increased with farm size. It ranged between Rs. 18061 on small farms, Rs. 18353 on medium farms, Rs. 19350 on large farms and Rs. 18447 on pooled farms.

The total variable costs formed a major chunk of the total cultivation costs constituting nearly 80 per cent of total costs on all farms. It was

Rs. 14764 on small farms, Rs. 14939 on medium farms and Rs. 15080 on large farms. The overall average on all farms was Rs. 14901.42. The total variable costs has shown an increase with farm size however when taken as percentage of total costs it showed a decreasing trend with farm size from 81.75 per cent on small farms to 77.93 per cent on large farms.

The total fixed costs varied from 18.25 per cent on small farms to 22.07 per cent on large farms showing an increasing trend with farm size. The real values also increased with farm size at Rs. 3296.97 on small farms to Rs. 4269.72 on large farms. On an average of all farms it constituted 19.27 per cent of total costs at Rs. 35.56.

Among all the variable costs plant protection chemicals constituted the major portion with nearly 40 per cent on all farm size groups. Among fixed costs rental value of own land constituted nearly 16 per cent of total costs on all farms.

The cost of production per quintal of cotton varied from Rs. 2691.67 on small farms, Rs. 2603.33 on medium farms and Rs. 2669.06 on large farms. On the whole it was Rs. 2658.19 on all farm size groups. It did not show any perceptible relationship with farm size.

Productivity

The productivity showed a positive relationship with farm size. It was 6.70 quintals per hectare on small farms, 7.05 quintals, 7.25 quintals per

hectare on medium and large farms respectively. The average productivity on all farms together was 6.94 quintals per hectare.

Returns

As a consequence of increasing productivity with farm size, the gross returns also showed a positive relationship with farm size. The gross returns on small farms was Rs. 15075 on medium farms was Rs. 15862.5 and on large farms it was Rs. 16312.5. The average gross returns for the sample as a whole was Rs. 15604.

The net returns per hectare over cost `C2'on small, medium and large farms showed a net loss of Rs. 2986.14, Rs. 2490.99 and Rs. 3038.18 respectively. On pooled farms it was a net loss of Rs. 2843.86.

The net returns per hectare over prime cost was a net loss of Rs. 5.98 on small farms and a net gain of Rs. 548.86 and Rs. 335.18 on medium and large farms, respectively. On pooled farms it was Rs. 251.78.

The net returns per quintal of cotton produced over cost C2 was a loss of Rs. 445.69, Rs. 353.33 and Rs. 419.06 on small, medium and large farms, respectively. However net returns for quintal over prime cost was a loss of Rs. 0.89 on small farms and a gain of Rs. 77.85 and Rs. 50.38 on medium and large farms, respectively. On pooled farms it was a net loss of Rs. 37.86.

Profitability

The input-output ratio analysis showed a net loss on all farms. The loss was Rs. 0.165 on small farms, Rs. 0.136 on medium farms and Rs. 0.158 on

large farms. The net loss was Rs. 0.155 on the sample farms as a whole per every rupee of investment in cultivation of cotton.

The results of Input-Output ratio analysis were further consolidated by the Break-even analysis. The Break-even output per hectare was observed to be very high and not attainable under present farming situation. It was 64.32 quintals, 19.02 quintals, 17.89 quintals on small, medium and large farms, respectively. The break even output per hectare on pooled farms was 27.69 quintals.

Resource returns and Returns to scale

The resource productivity was analysed with cobb-douglas production function. Six variables were considered viz., land, seed, human labour, cattle labour, manures and fertilizers and plant protection chemicals and fitted into production function analysis. The coefficient of multiple determination (R^2) values indicated that the selected variables sufficiently explained the variance in gross returns on small, medium and large farms. The R^2 value was 83.563, 84.53, 92.371 per cent and 96.98 per cent on small, medium, large and pooled farms respectively. Land, human labour and plant protection chemicals showed significant correlation with returns.

The resource use efficiency was very low in case of plant protection chemicals on all farms indicating over use of the resource. Seed, human labour and manures and fertilisers were under utilized.

Credit utilisation pattern

The credit utilisation pattern of selected farmers was analysed using Tabular analysis.

Among the selected farmers a small number of farmers had met their production expenditure from internal sources. A large majority (> 90 %) of farmers in all size groups have met their production expenditure from credit through external sources. The per cent of diverters among loanees showed an inverse relationship with farm size. Among the divertors, the amount used for production purpose showed a direct relationship with farm size. The diverted amount used towards consumption purpose was less and showed no perceptible relationship with farm size but it was very low on large farms as compared to small and medium farms.

The amount of overdues also did not show any perceptible relationship with farm size. Regarding the source of credit, a wide variation was observed among different farm size groups.

Among small farmers, 22 per cent of credit was from institutional sources and the remaining 78 per cent from non – institutional sources. It was 30 per cent on medium farms and 41 per cent on large farms. The institutional credit has increased with the farm size indicating a better access of large farmers to Institutional sources of credit and hence they are put to a lesser risk of high interest rates changed by non-institutional sources. For the sample as a

whole, 28.8 per cent of institutional credit and 71.45 per cent of non-institutional credit composed the total credit received by the farmer.

Repayment capacity

The regression analysis to identify factors affecting repayment capacity per farm had indicated that income from all sources, family expenditure, expenditure on production and other loans to be repaid showed a significant correlation with the dependent variable (Repayment capacity). The R^2 values were 76.30 per cent on large farms, 88.114 per cent on medium farms and 99.35 per cent on small farms indicating that the factors selected for analysis could significantly explain the variations of the dependent variable (repayment capacity) on small farms. It was found that the repayment capacity was directly related to income from all sources and inversely related to family expenditure, expenditure on production and other loans to be repaid.

Opinion regarding profitability of cotton cultivation

The opinion analysis of selected farmers revealed that a small majority of small farmers felt the cotton cultivation is not profitable. While a small majority of medium and large farmers felt it was profitable. However most of the farmers in all size groups were not willing to increase the area under cotton.

Opinion regarding technical advice

The survey revealed that most of the large farmers were receiving technical advice as compared to small and medium farmers. Regarding the

utility of the advice most of the farmers felt that the advice did not really help them.

Opinion analysis on procurement / utilisation of inputs

The survey indicated that majority of the farmers had faced problems in procurement of seed and labour. Most of the small and medium farmers did not get their soil tested while some of the large farmers had their soil tested.

Regarding the knowledge of recommended fertilizer dose majority of small farmers did not know the dosage while majority of medium and large farmers knew the recommended dosage. Most of the farmers were not following the recommended fertilizer dosage.

While majority of farmers did take some prophylactic measures on all farm size groups, they were not following the recommended plant protection chemicals. Majority of large farmers were using power sprayers while on small and medium farms it was hand sprayer.

Regarding tractor ploughing, majority of the farmers were not using it an all farms, however, considerable number of large farmers were using this input since it is feasible only on a large scale.

Most of the farmers felt that the inputs they got were spurious and did not work as effectively as they were intended to.

Opinion regarding the reasons for crisis

The following reasons emerged from the opinion analysis as the main reasons leading to the crisis. Loss of crop due to pests and diseases, high

interest rates by money lenders, lack of timely and sufficient institutional credit, high cost of cultivation coupled with low yields and prices and spurious seeds and chemicals in the market. Family problems were also found to be a significant reason for the suicides of farmers and hence the crisis.

The survey also revealed that the farmers had given very high priority to greater extent of Institutional financing and strengthening of Primary Agricultural Cooperative societies to supply inputs as the possible measures to overcome the crisis. Almost all the farmers are unanimous that the government intervention in assuring remunerative prices will help mitigate the crisis.

Conclusions

Following were the conclusion arrived at from the present study.

1. The total labour utilisation showed an inverse relationship with farm size. Regarding human labour, plant protection, intercultural operations and preparatory cultivation consumed the major share. Preparatory cultivation and intercultural operations accounted for a major part of cattle labour.
2. The total cost of cultivation showed a direct relationship with size of the farm.
3. The productivity also showed a direct relationship with farm size.
4. Cost of production per quintal was lowest on medium farms followed by large and small farms.
5. The gross returns showed a direct relationship with farm size. Although, net loss did not show any perceptible relationship with farm size.

6. The measures of profitability viz., farm business income, family labour income and farm investment income revealed that medium farms were better placed as compared to large and small farms.
7. The break-even analysis revealed the unprofitable nature of cotton cultivation on small farms because of low productivity and high variable costs per quintal.
8. The analysis also revealed a clear advantage for medium farms over small and large farms because of efficient utilisation of resources available.
9. The production function analysis revealed a decreasing returns to scale on small farms and increasing returns to scale on medium and large farms. The marginal value product to opportunity cost ratios indicated a non-optimal use of resources and the need for adjustments in resource use to reach optimality is greatly forthcoming.
10. The credit utilisation pattern showed that most of the credit was used for production purpose. However the main reason for diversion was towards consumption.
11. The source of credit for most of the farmers was non-institutional sources who charge high rates of interest. Among the different size groups large farmers had better access to institutional credit and hence lesser effect of the high interest rates charged by Private Money Lenders.

12. The repayment capacity of the selected farmers was affected mainly by the income from all sources, expenditure on production, family expenditure and other loans to be repaid.
13. The production problems associated with cotton production were availability of pure and quality seed, pest and disease attack, lack of timely and cheap credit, vagaries of weather, high cost of inputs and lack of technical advice and lack of technical know how.
14. The main reasons for crisis that emerged from the study are non-availability of timely and cheap credit, severe pest and disease attack, high cost inputs and low returns, spurious seeds and chemicals and personal problems of the farmers that lead them to suicides.
15. The major suggestions put forward to overcome the crisis are greater institutional financing, ensuring supply of quality inputs and assured remunerative prices fixed on the basis of real costs of cultivation.

Policy implications

The following facts have emerged from the study which have a bearing on the policy measures.

1. The most important reason for the crisis situation is the low yields due to pest attack. Cotton is susceptible to pests especially boll worm and caterpillar. The control measures have not been sufficiently effective to offset the considerable economic losses. Therefore there is a need to develop a warning system to forecast the incidence of pests and diseases

so that timely control measures are uptaken by the farmers. Also a detailed scientific information should be provided to the farmers by the state department of agriculture.

2. The burden of loan overdues, especially from private money lenders at high rates of interest has been another important factor that has put the farmers to economic losses. The `financial institutions' should gear up to the situation and assure that the stipulated 18-20 per cent of the total lending towards agriculture is fulfilled as against the present 10-11 per cent of total lending.

3. The high cost of cultivation is one of the important factors that has resulted in the uneconomic nature of cotton cultivation. Input costs charged at higher rates because they are taken on credit add to the woes of the farmer. The cooperative institutions should be strengthened so that the farmer is made available genuine inputs at a reasonable price and is in a position to make a choice.

4. The spurious seed and chemicals cause enormous losses by not only increasing costs but also not increasing the returns. The Government should take effective steps to arrest the supply and production of spurious seed and chemicals in the market. Granting of dealerships of agricultural inputs to agricultural graduates only may provide an easy solution to ensure supply of quality inputs to the farmers and arrest spurious inputs.

5. Family problems were related to the commitment of suicides which has gravitated the already grim situation. Family problems in most cases are a fallout of Financial problems. The Government and the non-government organisation should take active role in setting up family counseling centres at the mandal or village level to make the farmer realize the value of life as such.

6. Lack of adequate and timely credit, complicated procedures found to be the main force driving the farmers to private money lenders. Hence the Institutional credit system needs to be liberalized and simplified.

7. The minimum support price (MSP) should be fixed based on the real cost of cultivation estimates, which provides remunerative price to the farmers.

8. A switch over from the high input demanding varieties to the low cost Desi varieties is a viable option in this situation. The Desi varieties need to be developed to improve their quality.

9. The extension system must be strengthened and training programmes on scientific cotton production may be mooted right from the village level. A mobile Farm advisory service on the lines of a mobile Health unit offer on the spot diagnosis of malady and remedy should be taken up immediately.

10. Irrigation facilities need to be improved so that the farmers increase their yields significantly. There is an urgent need to complete the pending irrigation projects to offset this situation.

11. The most important reason for high investment on cotton is the lure of big returns. This may be countered by popularizing other crops which are more economical like millets, soyabean etc.

12. Cultivation of cotton has not been a viable option on small farms. Further fragmentation of land would only aggravate the situation. Hence, concepts of co-operative farming, joint farming need to be popularized. The Government and also the non-government organizations need to take suitable steps in the direction.

13. The Scientists, Officials of State Department of Agriculture, Government and University should spearhead an action plan to ensure that such crisis situations do not arise in cotton cultivation.

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