PRODUCTION, MARKETING AND PROCESSING OF REDGRAM IN GULBARGA DISTRICT - AN ECONOMIC ANALYSIS

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By

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CERTIFICATE

This is to certify that the thesis entitled **"PRODUCTION, MARKETING AND PROCESSING OF REDGRAM IN GULBARGA DISTRICT- AN ECONOMIC ANALYSIS"** *submitted by* **Mr.BALAPPA SHIVARAYA** *for the degree of* MASTER OF SCIENCE IN AGRICULTURAL ECONOMICS *of the University of Agricultural Sciences, Dharwad, is a record of research work carried out by him during the period of his study in this university, under my guidance and supervision and the thesis has not previously formed the basis for the award of any Degree, Diploma, Associateship, Fellowship or other similar titles.*

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Affectionately
Dedicated
to
my beloved

PARENTS
&
BROTHERS

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(BALAPPA SHIVARAYA)

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INTRODUCTION

I INTRODUCTION

Redgram (*Cajanus cajan* (L.) Mill sp.) is one of the major pulse crop of tropics and sub-tropics, endowed with several unique characteristics. It finds an important place in the farming systems adopted by small holding peasants in a large number of developing countries. In India, redgram ranks second among important pulse crops next to bengalgram. Its main use is as 'dal'. Redgram is of dietary importance with a seed protein content of about 21 per cent that compares well with that of other important grain legumes (Nene and Sheila, 1990). It is also being grown on mountain slopes to reduce soil erosion.

India accounts for 90 per cent of world output with an area of 3.73 million hectares and production of 2.19 million tonnes of grains (Singhal, 1995). In Karnataka, it is grown in an area of 3,60,815 hectares with a production of 1,55,116 tonnes. It is largely grown in the northern parts of the state especially in Gulbarga, which is called as "Redgram bowl of Karnataka". Gulbarga district occupies an area of 1,66,954 hectares with a production of 56,940 tonnes (1993-94). But productivity being 359 kgs/ha, is very low as compared to the Karnataka state's average productivity of 543 kg/ha, (Anon., 1995 a and b).

The lower productivity of redgram is due to many factors, among which the loss due to severe incidence of pests is predominant in recent years. In India, redgram is prone to attack by more than 200 species of insect pests (Anon., 1978) among which the pod borer (*Helicoverpa armigera*) causes enormous losses. The losses have been estimated to vary from 46.6 to 63.6 per cent.

During 1992-93, an unprecedented outbreak of pod borer was noticed in redgram at Gulbarga district and caused a turmoil in the economic condition of farmers. The damage was upto 70 per cent in a total cropped area of 2.31 lakh hectares (sole and mixed cropping) with a monetary loss of about Rs.100 crores (Lingappa and Yelashetty, 1994). For the last few decades, pesticides have been used indescriminately leading to a series of consequences like pest resistance to pesticides, pest resurgence, outbreak of secondary pests, harmful residues, imbalance in the natural eco-system, higher production costs, etc. Thus, cultivation of redgram mainly depends upon the management of pests which took a major share in the total cost of cultivation. This has initiated a complete change in the strategy of pest control, wherein more emphasis is given for the concept known as Integrated Pest Management (IPM).

Various agencies like University of Agricultural Sciences, Dharwad and the Karnataka State Department of Agriculture (KSDA) have started many programmes to popularise these technologies in the name of acronym of Integrated Pest Management, among redgram growers. Simultaneously, Central Integrated Pest Management Centre (CIPMC) has also started demonstrations and trainings to the farmers on the use of IPM practices from 1994-95.

Redgram constitutes an important crop in the agricultural economy of Gulbarga district, occupying about 63.06 per cent of the total cropped area. In view of the dominance of redgram crop in the agricultural economy of the district, it was considered important to study the marketing and processing problems apart from production for this product in Gulbarga district. Although the production of redgram in the country in general and Gulbarga district in particular has increased over the years, it is alleged that redgram producers are not getting remunerative price for their produce, whereas, consumers have to pay very high prices for the same. This is indicative of marketing inefficiencies which may be the result of lacuna in marketing for red gram.

Thus, there is need for detailed study on redgram marketing, covering various aspects such as marketing cost incurred by the producer-sellers and market intermediaries, marketing channels, price spread and net price of produce realised by the producers. Most of the studies have concentrated on the analysis of costs and prices for final products. It was mainly utilised as a raw material for the production of dal by dalmiller. Dalmiller was the terminal point in the redgram market, intercepted by wholesalers, commission agents and village merchants. This necessiated to look at the role of these intermediaries and price margins which they earned.

Pulses are rich in protein and constitute 10-15 per cent of India's foodgrain diet. It has been estimated that more than 90 per cent of redgram crop is consumed as dal (split grain). Therefore, processing is an important function of redgram marketing, connected between the producer and consumer. Processing is the value addition to the product and cost to the raw material. Because of this, it is necessary to study the various aspects of dal processing like investment pattern, cost and returns, efficiency and profitability and problems associated with respect to dal processing. Hence, immediate attention is needed to increase the efficiency of marketing by reducing the marketing cost on one hand and lowering down the cost of processing on the other.

Keeping in view of the above issues having importance in redgram production in the study area, an attempt was made to study the economics of production, marketing and processing of redgram in Gulbarga district of Karnataka state. More specifically, the objectives of the study were:

1. to analyse the growth trend in area, production and productivity of redgram,

2. to evaluate the economics of Integrated Pest Management (IPM) in redgram and to findout its relative profitability,

3. to study the resource use efficiency in redgram production by IPM and Non-IPM farmers,

4. to study the existing system of marketing, processing and their associated constraints and

5. to assess the economics of processing of redgram.

SCOPE OF THE STUDY

Redgram is the major pulse crop of the study region, however, its area is fluctuating from year to year due to high incidence of pests and diseases and market price. Thus farmers blame that they are not getting the remunerative prices for their produce on the one hand and incurring high cost of cultivation on the other. The farmers are taking their produce to neighbouring states due to the lower price and lack of other marketing facilities. Hence, it is necessary to study the trend in area and production along with the resource use efficiency of various inputs including IPM technology for their adoption on large scale by utilising inputs optimaly, which in turn would help in increasing the production. The evaluation of performance of processing units is also necessary to understand the various factors governing the efficiency of processing units. Thus, the findings of the study would throw light on various issues related to production, marketing and processing of redgram which would be helpful to policy makers, administrators, farmers, etc. in formulating the appropriate strategies/measures to combat the above problems.

LIMITATIONS OF THE STUDY

The study also pertains to commission agents, wholesalers and owners of the private processing units who are generally suspicious of motives of any investigation because of fear of taxation. Therefore, this factor need to be considered eventhough greater care was taken to collect the data as accurately as possible.

Finished products, viz., Dal, Chunni (broken dal pieces) and Bhusa (Shelled husk of red gram), were sent to Metropoliton cities and other states through brokers and wholesalers. Hence, it becomes very difficult to meet the ultimate buyers of these products at various levels. Further, the expressed opinion of the respondents with regard to the various issues of the study may not be totally free from personal bias and prejudice. Hence, the results of the study can not be generalised (beyond the limits of the study area) in the Karnataka state as a whole.

PRESENTATION OF THESIS

The entire study has been presented in six chapters. The first chapter is on introduction which included importance of redgram in Indian economy, the specific objectives of the study and also scope and limitations of the present study.

Chapter II deals with the review of literature closely related with the objectives of the present study.

Chapter III describes the main features of the study area, the nature and sources from which relevant data have been collected and the statistical tools and techniques employed for evaluating the objectives and interpreting the results.

The results of the study are presented in Chapter IV.

In the Chapter V, the results of the study are discussed in detail.

In the final chapter(chapter VI), a brief summary of the study including the main findings have been presented along with policy implications that emerged from the findings of the study.

REVIEW OF LITERATURE

II REVIEW OF LITERATURE

In this chapter, an attempt has been made to critically review the literature of the past research work related to the economics of Integrated Pest Management, resource use efficiency, marketing and processing of redgram. The review of different studies are given under the following headings:

2.1 Growth Rates in Area, Production and Productivity

2.2 Economics of Integrated Pest Management

2.3 Resource Use Efficiency

2.4 Marketing Channels, Costs and Margins

2.5 Economics of Processing

2.1 Growth Rates in Area, Production and productivity

Pareira (1976) studied the compound growth rate of crop output at the district and state level in Karnataka for the period from 1956 to 1973. The growth rates in the production of ragi and cotton were found to be negative during the pre-green revolution period, while the remaining crops had recorded positive growth in production. But during green revolution period all crops except bengalgram had positive growth in production. The productivity component of production was the most dominant source of growth during green revolution period.

Singh and Moorti (1977) computed the growth rate of area, production and productivity and found that the contribution of productivity to the growth of production was much higher than that of area both in cereals and other food crops.

Ray (1978) studied the growth rates of various crops in rural Bengal and found that the growth rate of food grain production had increased by more than 100 per cent. This was attributed to increase in area, yield per unit area, use of high yielding varieties, and exposure of farmers to applied and adoptive research.

Mishra and Joshi (1979) studied the growth rates of different crops in semi-arid region of Uttar Pradesh and found that yield rather than area was the major source of increased output of the green revolution. The factors responsible for higher growth of yield were size of holdings, fertilizers use, pumpsets, mechanical power and density of rural population.

Chaudhari (1981) analysed the growth rate of food grains and other agricultural commodities for the period of 1949 to 1976. He found that the growth rate of food grains output during the period was lower than the growth rate of total agricultural output.

Gangwar and Pandey (1982) have analysed the area, production and yield trends of pulses during the last decade in India. They argued that to improve pulses production in India, effort must be made to develop drought and disease resistant varieties with high yield potential. They shown that per capita consumption of pulses has been decreasing over the years in India, largely because of ever increasing population.

Rajpurohit (1983) computed the growth rates of agricultural production in Karnataka for the period 1956-82 and observed that there had been a major setback in the productivity of rice and jowar during the period from 1976-77 to 1981-82. He expressed fear of the new varieties not being stable and pest vulnerability being high. In contrast to this, ragi and pulses were observed to have made major break through which, pulses showed a moderate growth in productivity as compared to stagnation prior to 1975. Increase in prices considered to have provoked greater care to pulses.

Rangarao and Ray (1985) examined the exponential trends in production of pulses in India during the period 1967-68 to 1983-84. In Karnataka, pulse production had grown by 3.00 per cent per annum, while productivity had grown by 1.20 per cent. The compound growth rate of area was 1.95 per cent per annum. During the same period, the growth rates for area, production and productivity for the whole of India were 0.37, 0.17 and -0.24 per cent per annum, respectively. To raise production, the authors advocated making the pulses competitive in relation to substitute crops by introducing high yielding varieties and providing price incentives.

Chatha and Singh (1986) found that growth of area in pulses was significantly negative and that of oilseeds though positive but non-significant in Punjab. They opined that risk in productivity and price did not significantly affect the area under pulses, while in case of oilseeds the variance in productivity had a significant effect on area.

Yeladhalli (1987) computed the growth rates of area, production and productivity of dry chillies in Dharwad district. The growth rate in area (6.73%) was found to be higher, compared to the growth rates of production (3.42%) and productivity (0.14%). The growth in production was the combined effect of the growth in both area and productivity.

Sidhu and Sidhu (1988) studied the growth and response of commercial crops in Punjab. The analysis showed that the relative importance of cash crops had influenced by the introduction of new technology, relative producers prices and the degree of producer price stability. The importance of these traditional cash crops diminished over time. The impact of farm size was not significant.

Subramaniyam and Vasanthi (1988) studied the growth rates with regard to area, yield and output for 6 major crops in Tamil Nadu for the period of 1961 to 1978 and the sub-periods 1961-69 and 1970-78. An exponential functional form was used to estimate the growth rates of paddy, sorghum, pearlmillet, cotton, sugarcane and groundnut. The positive growth rates between the two periods were found to be statistically significant for area, yield and output in the case of sugarcane. There is no significant difference in the case of paddy and groundnut. There is a significant difference in the output growth rate of sorghum and pearlmillet but area and yield were not significant.

Tomar (1989) analysed the pattern of growth in area, production and productivity of important crops in Haryana from 1970-71 to 1980-81 using production indices and annual compound growth rates. A significant decrease in production occured for sugarcane, sorghum and gram, while rice, wheat, cotton and rape- seed have recorded an increase in both area and yield resulting non-significant increase in production since 1970-71. There was non-significant decrease in production for barley, pearlmillet and maize with the expansion of irrigation, a new trend of specialisation emerged in which high input intensive crops have replaced course grain and pulse crops.

Arya and Rawat (1990) studied the agricultural growth in Haryana over the period 1966-67 to 1980-81 for state as a whole and for seven districts in existance at the inception of state in 1966. The findings of the study indicated that despite inter district variations, the growth rates in area, production and productivity were found to be negative for oilseeds, sugarcane and cotton in certain districts, whereas, area, production and yield growth rate of wheat, rice and potatoes in all the district registered a increasing trend. Barley, millet, sorghum, maize and pulses have registered declining trend.

Umesh *et al.* (1992) reported a marginal increase in the growth pattern of groundnut productivity and area which lead to an 1.81 per cent increase in production in Karnataka after green revolution, while a negative growth rate was noticed during pre-green revolution period.

Bhowmick and Ahmed (1993) documented growth rate in area, production and productivity of major oilseed crops in Assam during the pre and post-green revolution period. Linear trends and compound growth rates of area, production and yield of oilseed crops were workedout by fitting linear function of the type $Y = a+b^t$ and exponential function of the type $Y= ab^t$ during the period 1950-51 to 1980-89. The results indicated that increase in oilseeds production were related to increased acreage rather than intensification of production.

Choudhari *et al.* (1993) in their study on growth rates in area, production and productivity of gram in Bihar indicated that the compound growth in area (4.62%) and production (3.32%) were negative, while in productivity it was positive (1.67%) and significant.

Singh and Kaur (1993) observed that India as a major oilseed producer has the largest area and production of three oilseed crops, namely groundnut, castor and sesamum. The paper estimated growth rates of area, production and yield of oilseeds for the two periods 1965-66 to 1975-76 and 1976-77 to 1988-89. He has also examined trends in instability in area, production and yield of oilseeds and investigated the factors affecting the instability in yields of oilseed crops. The compond growth rate equation and trend equations were used for estimating variability in area, production and yield.

Singh *et al.* (1993) studied the growth trends of area, production and productivity of cotton in India. He found that cotton area in India increased by about 49 per cent during the last four decades. Similarly, production increased by 315 per cent in the year 1989-90, indicating that the increase in the cotton production was more on account of increased productivity rather than increase in cotton acreage alone.

Patil (1995) examined the growth in area, production and productivity of groundnut in Dharwad district and at the state level for the period from 1984-85 to 1993-94 and found that the growth rate in area (0.51%) was positive but not significant as compared to the significant growth rates in production (6.89%) and producitivity (6.34%) in Dharwad district. The growth rates in area (5.24%), production (10.00%) and productivity (4.63%) of groundnut during the same period for the state as whole were positive and significant.

2.2 Economics of Integrated Pest Management

Ramamoorthy (1983) evaluated the economic impact of Integrated Pest Management on cotton in Tamil Nadu and reported that the cotton growers of project village have earned a net profit of Rs.4081 per hectare as against Rs. 5083 of farmers of non-project village. The additional profit of Rs.1002 per hectare earned by non-project village may be due to introduction of synthetic pyrethroids which were most effective pesticides on cotton pests.

Raodeo (1983) studied the integrated pest management with and without biological control agents in cotton at Marathawada Agricultural University, Parbhani. The highest yield of 491 kgs was obtained from the plot of integrated pest management without biological control agents as against 610 kgs per hectare in integrated pest management with biological control agents.

Sundarmurthy (1985) conducted and operational at research project on integrated pest management on cotton in Tamil Nadu, wherein the per hectare net profit earned by IMP adopter was Rs. 4845 while that earned by non-IPM adopter was Rs. 3402. Thus additional profit of Rs. 543 per hectare earned by IPM adopter was due to the impact of IMP techniques.

Sundarmurthy (1987) conducted an operational research project on integrated control of cotton insects in 1987 in Tamil Nadu, wherein appropriate insecticides were used at action threshold level under supervision. The mean quantity of insecticides used in non-project area was found to be 2682 gms per hectare as against 2808 gms per hectare in project area. A marginally higher quantity of insecticides used in the project area was due to continued pressure of migrates of *Heliothis armigera* from sorghum crop. The results indicated that the per hectare net profit earned by IPM farmer was Rs.8910, while Non-IPM farmer earned Rs.7656.

Buttur *et al.* (1989) studied the efficiency of integrated pest management (IPM) strategy for the control of cotton bollworms in Ludhiana (Punjab). The IPM strategy consisted of spray of sex pheromones and insecticides as well as release of egg parasite, *Trichogramma chillons.* The recommended measures included spray of only insecticides and sex pheromones. The results revealed that the highest seed cotton yield of 1701 kg. per hectare was recorded in IPM strategy as against 1432 kg. per hectare where recommended spray schedule of insecticides was followed. The strategy has been found to be better in reducing bollworm damage and thereby increasing the seed cotton yield.

Ramamoorthy (1989) evaluated the economic impact of integrated pest management (IPM) on cotton cultivation and reported that the per hectares net profit earned by IPM-adopter's was Rs. 2087 as against Rs.1601 earned by non-adopters. The additional profit of Rs.486 per hectare earned by IPM-adopter was due to cumulative impact of IPM techniques.

Pandurangadu and Raju (1990) conducted a study on economics of pesticides use on cotton farms in Guntur districts of Andhra Pradesh. The study revealed that an alarming rise in the cost of cultivation of cotton was largely attributed to the increased use of expensive insecticides hence, not only as an economy measure but also to avoid side-effects, farmers were advised to adopt integrated pest management technology.

Ramamoorthy (1990) evaluated the economic impact of integrated pest management on cotton cultivation in Tamil Nadu. He observed that the farmers who have adopted IPM have earned a profit of Rs.564 per hectare as against the loss of Rs.5705 per hectare by non-adopters of IPM. The benefit cost analysis also revealed that the IPM farmers have realised a net profit of 4 paise, while control farmers have incurred a loss of 40 paise for every one rupee invested in view of the excessive use of plant protection chemicals and labour.

Anonymous (1992) conducted a study on integrated pest management in Guntur and Prakasam districts of Andhra Pradesh. In both the districts, farmers used the package of plant protection recommended by sandoz. They experienced an increase in yield of 3-4 quintals per acre, which represented a significant increase of more than 80 per cent. Also, the total number of application of pesticides was reduced. Educating the farmers on the right use of technology and by adoption of integrated pest management practices, *Helliothis* on cotton can be managed effectively.

Patil (1992) reported that in the demonstration on integrated pest management on cotton, the net profit from the IPM block was about Rs.1029 per acre whereas that from the farmers block was minus Rs.55 per acre, mainly due to high cost of plant protection chemicals used by the farmers in their traditional practice.

2.3 Resource Use Efficiency

Suryanarayana (1958) fitted a Cobb-Douglas type of production function to findout the relationship between the output and inputs like land, labour and capital for both district wise and land wise (wet, dry and mixed). The coefficients of labour and capital were found to be positive, while it was negative return to land.

Venkatareddy Chennareddy (1967) employed a Cobb-Dauglas type of production function to measure the production efficiency in South Indian agriculture (West Godavari district). He considered the total value of all crops as the dependent variable and land, human labour, capital and production expenses as independent variables. He opined that a rapid and mass development of agriculture can be actived only by a break through in the introduction of modern technology in a package. The package should consist of new inputs, agriculutral education, special skills, common techniques and competent guidance in farm planning.

Saini (1969) studied the resource use efficiency in the states of Uttar Pradesh and Punjab, for the years 1955-56 and 1956-57. He concluded that labour was the imiportant input to which output was highly responsive. Constant returns to scale was observed in both the cases.

Singh and Pandey (1971) studied the cropping patttern and resource use efficiency in dry farming district of Banda (Uttar Pradesh). The results indicated that farmers were rational in the use of bullock-labour only since its per hour marginal value product was closer to per hour acquisition cost.

They have suggested one fourth reduction in the use of human labour.

Azad and Garg (1974) fitted a Cobb-Douglas type of production function to determine the productivity of various resources used in the production of sugarcane in Uttar Pradesh. The marginal value product of manures and fertilisers was Rs. 5.28 and bullock labour was Rs. 1.00, while that of human labour was Rs. 0.60. The results indicated that there is scope for increasing use of manures and fertilizers, whereas the excessive use of human labour need to be reduced.

Raju (1975) analysed the resource use efficiency in paddy cultivation in Raipur district (Uttar Pradesh). The study revealed that seeds and fertilisers had significant production elasticities and were non-significant for plant protection, hired labour and land rent.

Singh (1975) used Cobb-Douglas production function to study the productivity of resource use. The results revealed that the productivity per unit of land, seed, fertiliser and manure on the progressive farms was significantly higher than one. On the less progressive farms, only the productivity of bullock labour was significantly higher than unity, reflecting the scope for increasing the farm resources to realise the greater returns.

Bal *et al.* (1983) employed Cobb-Douglas type of production function to study the factor share and productivity of various factors in crops cultivation in central district of Punjab. It was noted that the elasticities of production of human labour, drought power and rental value of land was less than unity, while that of irrigation, fertilisers and weedicides were more than unity, indicating scope for increasing output by these inputs.

Patil *et al.* (1986) employed Cobb-Douglas type of production function to determine the efficiency of various inputs used in the production of summer groundnut in Khed district of Gujarat. The study indicated that the ratio of marginal value product (MVP) to marginal factor cost (MFC) for land and human labour was positive and greater than unity. This implied that more and more of land and human labour could be employed for the production of groundnut. The ratio of other inputs namely, bullock labour, seeds, manures and fertilisers indicated excessive usage of these inputs.

Chandrareddy *et al.* (1990) studied the resource use efficiency in beetle-vine cultivation in Cuddapah district of Andhra Pradesh. The study revealed that there is a potential for further use of labour, manures and fertilisers upto its optimum level. But use of seeds is not desirable as revealed from their non-significant coefficient.

Mahitha and Hemachandrudu (1992) studied the resource use efficiency in paddy cultivation in Andhra Pradesh. It was found that there is high degree of resource use inefficiency on paddy farms in Andhra Pradesh. This warrents the need for reorganisation of farm resources. There is good scope to reorganise the farm resources since ratio of MVP to MFC for most of the resources deviated from unity.

Vishweshwar (1994) employed Cobb-Douglas type of production function to measure the efficiency of various inputs used in the production of cotton by IPM and Non-IPM adopted farmers in Malaprabha command area in Karnataka state. The study indicated that the ratio of MVP to MFC for land was greater than one, while it was less than one for labour. It was negative for seeds, fertilisers and pesticides in conventional farmers. In case of IPM adopted farmers, the MVP to MFC ratio for land, labour, seeds and fertilisers were greater than one and it was negative for fertiliser.

2.4 Marketing Channels, Costs and Margins

Here the various aspects of marketing costs, margins and channels were covered.

Patel (1971) examined the farmers and intermediaries shares in the price spread of groundnut in Gujarat state for the period 1962-68 revealed that the millers had increased their share in the consumers rupee and the farmers had not improved their position over time.

Singh and Verma (1978) reported that the producer's share in consumer's price in groundnut marketing was 71 per cent. The cost of storage per quintal per month at farmer's level was Rs.1.00 as against Rs.0.70 in warehouse.

Sarma and Rao (1979) analysed the price spread of pulses namely redgram and bengalgram in Andhra Pradesh. The price spread of bengalgram was 20 to 40 per cent. In case of redgram, the marketing margin ranged from 50 to 70 per cent. Thus, exhorbitant prices were paid by the consumers, while relatively low levels of prices were received by farmers on account of exploitation in the market.

Singh and Randawa (1979) studied the marketing costs and margins of wheat in Gurdasapur district and found that the net share of the producer's in consumers rupee was 83.84 and 82.53 per cents for channel-I and channel-II, respectively, and the corresponding net price received were Rs.73.05 and 75.09 per quintal in these channels. For III and IV channels where grain was processed into flour, the producer's shares in consumer's rupee were 80.08 and 81.97 per cent, respectively.

Prasad (1980) analysed the producer share in consumer rupee in case of paddy and wheat. The study revealed that producer share in consumer rupee was 26.00 and 21.52 per cent in paddy and wheat, respectively, in Alahabad market. The margin of wholesalers, retailers and commission agents were 4.09, 4.04 and 2.80 per cents of consumer price, respectively.

Singh *et al.* (1981) studied the economics of marketing and processing of Arhar in Unnao district of Uttar Pradesh. They reported that marketing cost per quintal of Arhar was Rs. 4.00, while the producer share in consumer rupee was 80.90 per cent.

Mamle Desai (1983) studied the marketing of redgram in Gulbarga district of Karnataka state. He has identified three channels namely, Producer -> commission agent -> wholesaler -> Dalmiller (Channel-I), Producer -> dalmiller (Channel-II) and producer -> village merchant -> dalmiller (Channel-III). The share of the producer in consumer rupee was found to be 75.96, 96.74 and 80.41 per cents in channel-I, Channel-II and Channel-III, respectively.

Raju and Kakadia (1984) in their study on marketing of groundnut in Gujarat state. They found that the marketing cost for farmers was Rs. 5.07 and Rs. 4.99 per quintal at Gondal and Rajkot market, respectively. The study revealed that the marketing cost for traders was Rs.9.49 and Rs.9.24 per quintal at Gondal and Rajkot markets.

Bhalerao *et al.* (1985) in their study in Vayalpod block of chittoor district (Andhar Pradesh) found that the producers share in consumers rupee was quite low and the marketing margin accounted for quite a big chunk of the consumers rupee. They also observed that there was no co-operative marketing or processing society in the region. The groundnut trading was mainly in the hands of well organised private functionaries such as the oil miller, groundnut wholesaler, village trader and oil wholesalers

Nandal (1985) examined the shares of producer's in the consumer's rupee for mustard and rape seed in Hissar district of Haryana state. He identified the major channel as : producer-> wholesaler--> oil expeller--> retailers--> consumers and observed that the producer's share in the consumer's rupee had not changed inspite of emphasis in the policy to ensure higher share of the farmer's in the consumer's rupee.

Dalvi *et al.* (1986) studied the price spread in the marketing of coconut in Konkan region of Maharashtra state. They reported that the marketing margin (40.30%) was high in the channel where wholesalers and retailers operated in marketing of coconut in Konkan district.

Agarwal and Sharma (1994) studied the soyabean marketing problems in Rajasthan and identified the three marketing channels as followed :

Channel-I : Producer-seller-->oilseed growers co-operative society-->tilham sangh.

Channel-II : Producer-seller-->commission agent-->Tilham sangh.

Channel-III :Producer-seller-->commission agent-->local processor

Producer-sellers (farmer) got the highest net price of Rs.668.56 per quintal in sale of soyabean (96.22% of processor's price) when marketed their produce in channel-I. In all other channels, farmers got lesser price by Rs.10 to 15 per quintal than what they got in channel-I. Producer's share ranged from 3.78 per cent in channel-I to around 8 to 10 per cent in other two channels.

Singh *et al.* (1994) studied the marketing costs and margins of Arhar in Banda district (UP) and found that the net share of the producer's (Rs.601.55/Q) in consumer's rupee (Rs.738.55/Q) was 81.44 per cent in the case of Arhar marketing.

Ravikesh *et al.* (1995) studied the price spread of wheat in Chitrakoot (Madhya Pradesh). The study revealed that 85 per cent of the consumer's price was obtained by producer.

Singh and Mahiley (1995) studied the costs and margins of different channels in marketing of Arhar (1975-1995) in Allahabad. They found that producer's share in consumer's rupee is more or less same in both the above periods.

Suryawanshi *et al.* (1995) studied marketable surplus and marketing cost of oilseeds and pulses in western Maharashtra and found that per quintal marketing costs were Rs.41.21, Rs.41.86 and Rs.57.98 for tur, gram and groundnut, respectively.

Lal and Prakash (1996) studied the producer's share in consumer's rupee at Kanpur. They reported that producer's share in consumer's rupee was 60.69 and 50.78 per cents in pigeonpea and chickpea, respectively. The lower share of producers was due to inefficiency of marketing system.

2.5 Economics of processing

Sankarnarayana (1966) conducted a study on modernised versus traditional rice milling and reported that the profits earned in modern mill was better on economic grounds. The capital output ratio was more or less same for both the traditional and the modern mill. However, the rate of surplus was higher for traditional units.

Shukla and Pandey (1966) analysed the costs and returns in processing of mustard and rapeseed in Hissar. The profit margin was observed to be Rs.3.43 per quintal in case of small sized units with traditional techniques. The profit per quintal was Rs.4.86 in case of medium sized units with modern technique and Rs.7.02 per quintal in case of large sized units with improved technique. It was concluded that there is considerable scope to reduce the unit cost of processing by adopting improved technology which would eventually increase the operational efficiency and benefit to the consumers.

Gupta *et al.* (1974) studied the stages of modernization in the milling industry. Millers mentioned three major problems in paddy procurement, viz., (1) paddy was not available in the market at the prices fixed by the Government which resulted in a loss in surrendering levy rice, (2) there has been competition among millers to procure paddy, and (3) not enough paddy was available in the market due to the drought situation.

Singh (1981) in his study on economics of marketing and processing of Arhar in Annao district (Uttar Pradesh) observed that per quintal cost of processing of arhar dal was Rs. 5.50. He also reported that transport, storage and credit facilities, supply of electricity at cheaper rates to the processing units, etc., were the problems/constraints for increasing the efficiency of Arhar dal processing in the district of Unnao.

Nandal (1985) studied the price structure of rapeseed and mustard in Haryana. He found that the processing cost of rapeseed and mustard was Rs. 11.05 and Rs.16.55 per quintal, respectively in Haryana when processed in oil mill.

Rameshwar *et al.* (1986) estimated processing cost of linseed in Banda district of Uttar Pradesh. They found that the cost per quintal was Rs. 42.41 and Rs.18.52 in rural and urban area of Uttar Pradesh, respectively. The higher cost per unit of processing of linseed in oil crushers situated in rural area was attributed to the low supply of raw material.

Verma and Singh (1986) studied the economics of processing and marketing of mustard in Unnao district of Uttar Pradesh wherein the cost of processing of mustard oil was Rs. 16.50 per quintal.

Acharya and Agarwal (1989) reported the profit margin per quintal of rape seed oil as Rs.19, Rs.21 and Rs.22 in six bolt expellers, nine bolt expellers and oil mills, respectively. He has also found that the profit margin of dal mill owners as Rs.22, Rs.13 and Rs.27 per quintal of gram, mothbean and mung respectively.

Bawa and Kainth (1989) studied the cost and return of rice milling industry in Amritsar district of Punjab and reported that dehusking of one tonne of paddy yielded a net profit of Rs.45.67. Expenses on raw material (86%) constituted the major item. Running expenditure on machinery and repairs and maintenance costs constituted 1.96 per cent and 1.10 per cent, respectively. Net return of enterprises was 2.31 per cent of gross output.

Hemchand Jain (1989) in his study on economics of processing units of arhar pulse in Narasinghpur district (MP) indicated that the fixed and variable costs accounted for 45 and 55 per cents, respectively. The cost of processing of arhar dal was Rs. 61.62 per quintal. The main problems of arhar processing were inadequate availability of raw materials, problems of transportation for disposal of processed material, short supply of power leading to under utilization of the plant which declines output and efficiency of machinery and labour.

Srinivas *et al.* (1989) conducted a study on growth and economics of mustard processing units in Hissar district (Haryana) wherein the cost of processing per quintal of oil seed was Rs.9.24 and Rs.11.22 for the oilmills, expellers and kohlu, respectively, indicating the increase in processing cost per unit with the decrease in plant size.

Verma (1989) studied the economics of processing and marketing of gur in Indore (MP) and the findings revealed that the average cost of processing of sugarcane under power kohlu units of gur as Rs.6.80 per quintal. He concluded that cost of processing varied from mill to mill according to the level of capital investment, power and sugarcane crushed during the year by the mill. Further, he also indicated the necessity of modernising the processing industry for augmenting gram production. A relatively low level of research, development and extension efforts, low capability of obtaining credit; and inefficient dal processing and marketing systems were found to be the major bottlenecks in the system.

Yadhav *et al.* (1989) studied the economics of processing and marketing of sugarcane products and found that the manufacturing of gur was not profitabie to the sugarcane growers as the total net profit earned by converting 100 quintals of sugarcane in to gur was significantly lower (Rs.394) as compared to that earned from sale of 100 quintals of sugarcane itself (Rs.716).

Pawar *et al.* (1990) conducted study on economics of agro-processing units in Maharashtra and the average processing cost workedout to Rs.12241.05 and Rs.7716.71 per unit of huller and rice mill, respectively. The proportion of fixed cost to total cost of processing was more in rice mills (33.94%), compared to huller (26.16%). The variable cost accounted for 59.97 and 64.75 per cents in the case of rice mills and hullers, respectively.

Singh *et al.* (1990) found that inspite of the higher sale price and lower marketing cost in co-operative marketing, producers share was not higher in this system mainly due to higher processing cost (Rs.29.47/q) as compared to private units (Rs.21.95/q). The higher operational cost of the processing unit in proportion to quantity of arhar processed during the year was the major reason for the higher processing cost in co-operatives.

Venkataseshaiah (1992) studied the economics of groundnut processing units in Andhra Pradesh and found the direct relationship between the total capital investment and the oil mill size. It was also observed that the capital invested per quintal of oil production was Rs.161.01 in baby expeller mills, Rs.112.24 in 2-chamber expeller mills and Rs.83.86 in 3-chamber expeller mills. He had also observed that the major problems faced by the groundnut processors were the high competition within the processing units for getting raw material, frequent price fluctuations of raw materials, irregular power supply, high taxing for the commodities, low percentage of recovery due to lack of modernisation of machinery and non-availability of sufficient raw material for crushing. All these resulted in low returns and high cost of processing leading to lower net profit.

Amrutha (1994) studied the economics of processing of paddy into rice, murmura, poha and popped rice in Chitradurga and Dharwad districts of Karnataka wherein, the per quintal fixed cost in large and small rice mills were Rs.16.67 and Rs.25.54, respectively. The variable cost per quintal in rice mill was Rs.477.87, while it was Rs.55.95 both in small and large mills.

Singh *et al.* (1994) in their study on economics of marketing and processing of pulses in district Bonda (Uttar Pradesh) observed that per quintal cost of processing of Arhar, Gram and lentil was Rs. 831.67, Rs.823.47 and Rs.752.05, respectively.

METHODOLOGY

III METHODOLOGY

This chapter deals with the description of the study area, the sampling techniques adopted, the method of survey, the nature and sources of data and the various tools and techniques employed in analysing the data and in evaluating the problems. At the end of the chapter, important concepts adopted for the study are also defined and explained to facilitate a clear understanding of the issues with which the present study is concerned.

The methodology that followed has been presented under the following major heads:

3.1 Description of the study area.

3.2 Sampling procedure adopted

3.3 Nature and sources of data.

3.4 Analytical techniques employed.

3.5 Definition of terms and concepts used.

3.6 Brief methods of processing redgram into dal.

3.1 Description of the Study Area

The present study was conducted in Gulbarga district of Karnataka state during 1995-96 where the redgram cultivation is taken up extensively by the farmers.

Gulbarga district is situated in North Eastern part of Karnataka state (Fig. 1). The soils of this district are deep to very deep black, medium black, sandy loam and light textured soils. The normal annual rainfall ranges from 920.6 mm in Sedam taluka to 794.2 mm in Chitapur taluka with an average district rainfall of 776.5 mm. The total population is 25,82,169 (1991 census) with literacy percentage of 38.54. The total geographical area of the district is 16,10,208 hectares, out of which 11,91,645 hectares is under cultivation.

The important crops grown in this district are redgram, greengram, blackgram, bengalgram, jowar, bajra, wheat, groundnut, sunflower, sesamum and cotton. The agro-climatic conditions are best suited for pulse cultivation. The area under redgram crop during the year 1994-95 was 1,20,784 hectares which accounted for 40 per cent of the total area under redgram in the state. Similarly, production of redgram being 59,035 tonnes, accounted for 49.19 per cent of the total production of the State (Anon, 1995b).

3.2 Sampling Procedure Adopted

3.2.1 Selection of District.

Gulbarga district of Karnataka state was selected for the study since it ranked first in the area under redgram in the state. Further, the fact that Integrated Pest Management Demonstration-cum-Farmers Field School (IPMD and FSS) on redgram crop was in operation in this district since 1994-95 was another consideration for the selection of this district.

3.2.2 Selection of Taluks

Gulbarga district consists of 10 taluks, out of which 8 taluks were covered under Integrated Pest Management Demonstration and Farmers Field School on redgram by the Karnataka State Department of Agriculture (KSDA) in the preceding year of the study were only considered for the selection of taluks. The taluks were arranged in descending order on the basis of area under redgram crop in the previous year (1994-95). The Chitapur taluk stands first followed by Sedam and Gulbarga and hence these 3 taluks were selected for the study by taking into consideration of both the factors.

3.2.3 Selection of Villages

Every year, the Karnataka State Department of Agriculture selects one village in Integrated Pest Management Demonstration Scheme and two villages in National Pulse Development Programme (NPDP) for large size demonstration in each of the selected taluka based on the highest area under redgram crop and conducts Integrated Pest Management Demonstration-cum-Farmers Field School. Therefore, these 3 villages from each selected taluka were selected for the study, the details of which are given in table 3.1.

3.2.4 Selection of Farmers and Sample Size

The list of farmers who have undergone demonstration on IPM in redgram in the selected villages were obtained from the respective taluka Assistant Director of Agriculture. All these farmers (i.e. 25 from each taluk) were selected for the detailed study of Integrated Pest management. An equal number of farmers who have not adopted Integrated Pest management technology from these villages were selected for the study. Thus the total number of Integrated Pest Management (75) and non Integrated Pest Management (75) farmers cnostituted sample size of 150 farmers (Table 3.1).

Table 3.1 : Sample size of the farmers in selected villages/taluks of Gulbarga district.

Taluka	Village	No. of Farmers	
		Adopter of IPM	Non-Adopter of IPM
Chitapur	Kalagi, Tengali, Shahabad.	25	25
Sedam	Neelalli, Mugnur, Benakanalli.	25	25
Gulbarga	Tada Tegnur, Pattan, Srinivas Saradagi	25	25

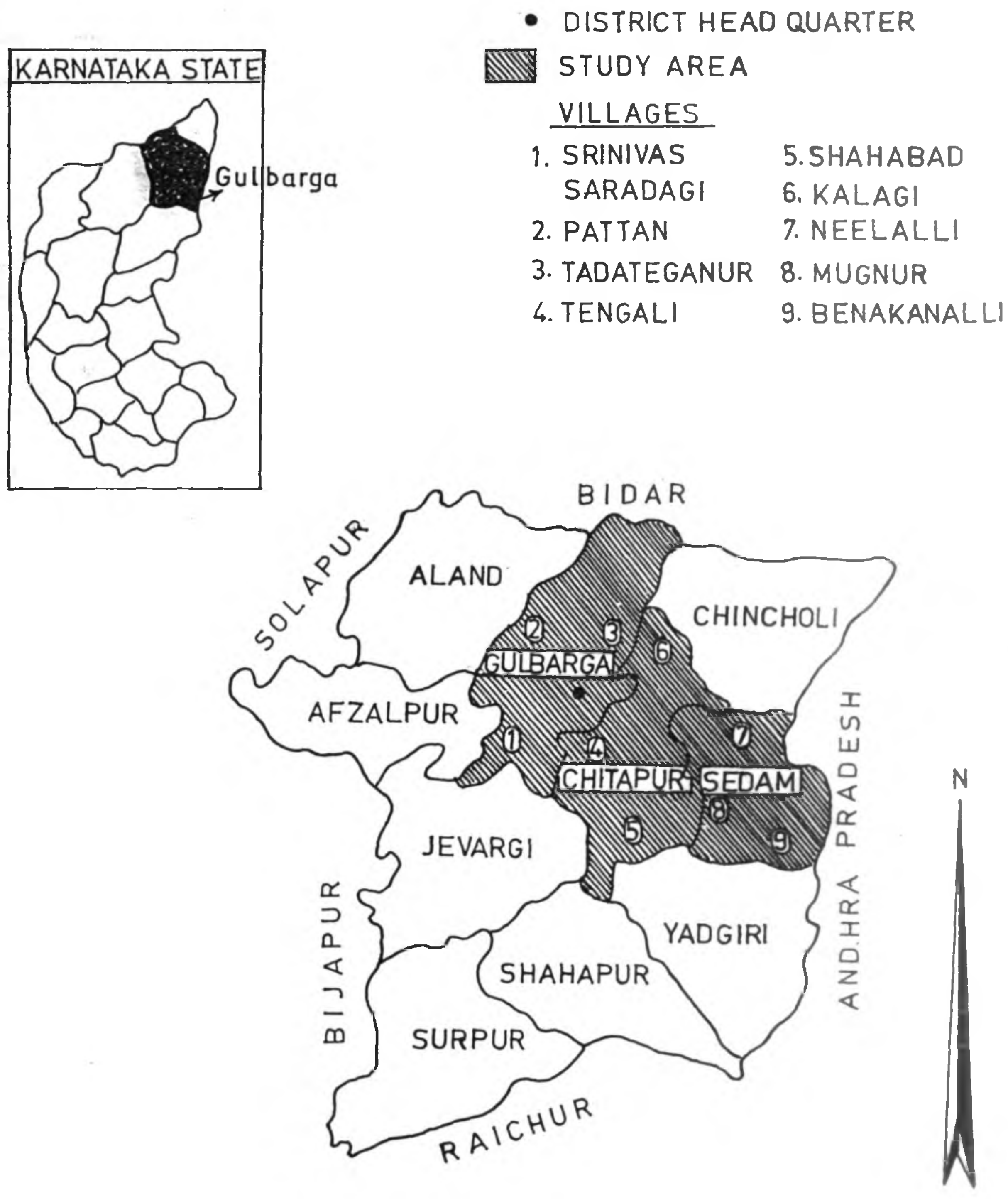

FIG:1-MAP SHOWING STUDY AREA INCLUDING TALUKS AND VILLAGES.

3.2.5 Selection of Processing Units

There are 120 processing units in Gulbarga district, of which Gulbarga city alone has 98 units. Therefore, selection of processing units was confined to Gulbarga city only. Further, 30 units were selected randomly for the study and post classification of processing units was done based on capacity utilization. The processing unit with capacity of 50-75 qunitals per day were considered as small units, while units who's capacity was more than 75 quintals per day were considered as large units. In all, there were 23 large units and seven small units.

3.2.6 Selection of Market Intermediaries

Since the redgram market structure of Gulbarga market predominently consisted of commission agents and dal millers, 30 commission agents were randomly selected out of 120 agents in addition to dal millers as indicated in section 3.2.5.

3.3 Nature and Sources of Data

For evaluating the objectives of the study, the required data were collected through personal interview method with the help of a structured and pre-tested schedule (Appendix I). The data pertained to the agricultural year 1995-96. The data relating to the size of holding, general information of the farmers, cropping pattern, land under redgram cultivation, resource use pattern, pest management and marketing aspects were collected from farmers. Similarly, data pertaining to socio-economic features of processors, investment pattern, cost of processing, returns from processing and constraints in working of processing units were collected from the sample market intermediaries (Appendix II and III). The farmers and market intermediaries were personally interviewed to ensure that the data made available by them were appropriate, comprehensive and reasonably correct.

Secondary data pertaining to area, production and productivity of redgram in Gulbarga district and for the state were collected from the Directorate of Economics and Statistics, Bangalore.

3.4 Analytical Techniques Employed

For the purpose of fulfilling the objectives of the study, data were analysed by using following techniques.

a) Tabular Presentation.

b) Business Ratio Analysis.

c) Break-even Volume Analysis.

d) Functional Analysis.

a) Tabular Presentation

The data collected were presented in tabular form to facilitate easy comparision. This technique of tabular presentation was employed for estimating the cost and return structure and comparision of performance of IPM and Non-IPM farmers. Similarly, cost of processing, returns and profits in the case of market intermediaries were also computed by tabular method.

b) Business Ratio Analysis

Business ratio analysis was carried out to evaluate the economic performance of the redgram processing units and to ascertain the efficient and profitable categories among these units. The following ratios were employed.

I. Profitability Ratios

i) Net profits to total assets $= \dfrac{\text{Net returns}}{\text{Total assets}}$

ii) Net profits to total sales (%) $= \dfrac{\text{Net returns}}{\text{Total sales}} \times 100$

iii) Returns on total capital employed $= \dfrac{\text{Net returns}}{\text{Total capital employed}}$

iv) Benefit cost ratio $= \dfrac{\text{Gross returns}}{\text{Total costs}}$

II. Turnover Ratios

i) Working capital turnover $= \dfrac{\text{Gross returns}}{\text{Total working capital}}$

ii) Total Asset turnover $= \dfrac{\text{Gross returns}}{\text{Total assets}}$

III. Efficiency Ratios

i) Gross ratio (%) $= \dfrac{\text{Total expenses}}{\text{Gross income}} \times 100$

ii) Operating ratio (%) $= \dfrac{\text{Operating expenses}}{\text{Gross income}} \times 100$

c) Break Even Volume Analysis

Break-even volume analysis was used to know the minimum level of production required to recover the total fixed capital employed in redgram processing units. This concept is important in any business as it indicated minimum amount of business necessary for operating the enterprise in the shortrun without loss. The formula which was used in this study was as follows:

$$Q = \frac{FC}{P - VC}$$

Where,

Q = Quantity at break-even point (volume) production.

FC = Total annual fixed cost.

P = Price per unit.

VC = Variable cost per unit.

d) Functional Analysis

i) Production Function Analysis

There are several types of agricultural production functions to study the resource use efficiency. Heady *et al.* (1955) attempted an application of several types of production functions such as Cobb-Douglas, quadratic and square-root to agricultural data to estimate the resource-use efficiency.

The resource use efficiency in redgram cultivation for IPM farmer and Non-IPM farmer was studied by fitting the Cobb-Douglas type production function to the farm level data. The preference for Cobb-Douglas production function over other types is due to the following merits of the function.

a) The co-efficients of the factor inputs in the function are themselves the elasticities of production.

b) The function allows increasing or constant or diminishing marginal productivity to each input factor at a time and the sum of elasticities indicates the types of returns to scale.

c) It assumes a constant elasticity of production over the entire range of input use.

A modified Cobb-Douglas type of production function in log-linear form was fitted to the data in order to estimate the functional relationship between dependent and independent variables. Two seperate functions were fitted, one each for IPM farmer and Non-IPM farmer of redgram cultivation. The first function was fitted for IPM adopter with seven variables namely, land in hectares, human labour in mandays, bullock labour in pair days, farm yard manure in tractor loads, seeds in kgs, value of fertilizers in rupees, and value of plant protection chemicals in rupees. The second function was fitted for Non-IPM adopter with same variables.

The form of the production function fitted for redgram production was as follows:

$$Y = a \; X_1^{b1} \; X_2^{b2} \; X_3^{b3} \; X_4^{b4} \; X_5^{b5} \; X_6^{b6} \; X_7^{b7} \; e^u$$

Where,

Y = Yield (quintals)

X_1 = Land area (hectares)

X_2 = Human labour (mandays)

X_3 = Bullock labour (pairdays)

X_4 = Farmyard manure(tractor loads)

X_5 = Seeds (kgs)

X_6 = Fertilizers (rupees)

X_7 = Plant protection chemicals(rupees)

a = Constant term/intercept term

u = Error/Disturbance term.

b_1 to b_7 = Elasticity coefficients of respective inputs or the regression coefficients of factor inputs.

The Cobb-Douglas type production function was converted into log-linear form and the parameters (coefficients) were estimated by using Ordinary Least Square method.

In logarithmic form, it assumed a log-linear equation as under:

$$\log Y = \log a + b_1 \log X_1 + b_2 \log X_2 + b_3 \log X_3 + b_4 \log X_4 + b_5 \log X_5 + b_6 \log X_6 + b_7 \log X_7 + u \log_e$$

The regression coefficients (b_i) were tested for their significance using `t' test.

$$t = \frac{b_i}{\text{Standard Error of } b_i}$$

Specification of Variables

1. Dependent Variable

a. Output (Y):

This was defined as output of the main product redgram in quintals.

2. Independent Variables

a. Land Area (X_1):

This input was measured in terms of net area under redgram crop in hectares.

b. Human Labour (X_2):

This input was expressed in terms of mandays of eight hours. It included all human labour (family + hired) utilised for performing different farm operations in the production of redgram. The female labour days were converted into mandays on the criterion that one women day equals to 0.75 man labour days on the basis of the wage rate equivalence (Shripad Visheshwar, 1994 and Maheshwarappa, 1996).

c. Bullock Labour(X_3):

Bullock labour both owned and hired used for different farm operations was considered as a seperate unit and it was measured in pair days. An 8 hours of work by a pair of bullocks was considered as one pair day.

d. Farm Yard Manure (X_4):

This input was expressed in terms of tractor load. It included both farm produced and purchased manures.

e. Seeds (X_5):

This was measured in terms of total quantity of seeds used in kilograms.

f. Value of Fertilisers (X_6):

The purchased fertilisers were valued at their actual cost of purchases.

g. Value of Plant Protection Chemicals(X_7):

The purchased plant protection chemicals were valued at their actual costs of purchases.

Estimation of Marginal Products and Marginal Value Products:

In order to determine whether a particular resource is used optimally, the marginal value product and opportunity cost of one unit of that resource were compared. The marginal value product was obtained by multiplying the marginal product by the price of the product. Wherever the ratio of marginal value product to opportunity cost was more than unity, the resource was considered to be advantageously employed.

The marginal products were calculated at the geometric mean levels of the variables by using the following formula.

$$\text{Marginal product of input} = b_i = \frac{\bar{Y}}{\bar{X}_i}$$

Where

$\bar{Y}$ = Geometric mean of output.

$\bar{X}_i$ = Geometric mean of i^{th} independent variable.

b_i = The regression coefficient of i^{th} independent variables.

The marginal value product of each resource was calculated by multiplying the marginal product of that resource by the price of the product.

The formula used for the purpose was as under:

$$\text{MVP of } X_i = b_i \times \frac{\text{Geometric mean of } Y}{\text{Geometric mean of } X_i} \times PY$$

Where,

b_i = Elasticity of production of i^{th} input.

Py = Price of the product.

ii) Growth Rate Analysis

Growth rate analysis was undertaken with a view to find out the growth trends in area, production and productivity of redgram in Gulbarga district as well as Karnataka. For this purpose, 15 years data (1980-81 to 1994-95) on area, production and productivity of redgram was considered for Gulbarga district and Karnataka state.

To analyse the growth trends, first compound growth technique was tried but results showed that `b' co-efficients pertaining to all degrees were non-significant. Therefore, quadratic and cubic functions were used. Quadratic function was used to know the growth rate in area of Gulbarga district as well as Karnataka state, whereas, cubic function was used in the cases of production and yield.

The procedure for computing the growth rate is briefly discussed below:

Quadratic Function

$Y_t = a+bT+cT^2$...........(1)

Where,

Y_t = Area in the year `t'

a = Intercept indicating`Y'in the base period(t=o)

T_i = Time period (i=1 to 15)

b, c = Co-efficients of T_i.

Further analysis was carried out as follows:

$Y_t = a+bT = cT^2$

The above equation was differentiated with respect to T

$$\frac{dY}{dT} = \frac{d(a+bT+cT^2)}{dT}$$

$$= b+2cT$$

Then to workout growth rate following formula was used

$$g = \frac{dY/dT}{Y_a} \times 100$$

Where,

g = Average quadratic growth rate.

$\bar{Y}_a$ = Mean of the area for 15 years.

Cubic Function

$$Y_t = a+bT+cT^2+dT^3 \quad \text{..........(2)}$$

Where,

Y_t = Production/yield in the year `t'

a = Intercept indicating Y in the base period (t = 0)

T_i = Time period (i= 1 to 15) and

b,c and d = co-efficients of T_i

Further analysis was carried out as follows:

$$Y_t = a+bT+cT^2+dT^3$$

The above equation was differentiated with respect to T

$$\frac{dY}{dT} = \frac{d(a+bT+cT^2+dT^3)}{dT}$$

$$= b+2cT+3dT^2$$

To workout growth rate, following formula was used

$$g = \frac{dY/dT}{\bar{Y}p \text{ or } \bar{Y}y} \times 100$$

Where

g = Average cubic growth rate.

$\bar{Y}p$ = Mean of the production for 15 years.

$\bar{Y}y$ = Mean of the yield for 15 years.

3.5 Definition of Terms and Concepts Used

The definitions/explanations of the various terms and concepts used in the study are given under following heads.

Cost Concepts

For estimating the cost of cultivation, it will be more appropriate to consider the concepts employed in All India Farm Management Studies in addition to discussing the composition of the cost in terms of fixed and variable costs.

The cost concepts namely Cost - A_1, Cost - A_2, Cost - B and Cost - C were employed in the present study. The details of the items included under each of the concept were as follows:

1. Cost-A_1: It included wages of hired human labour, cost of bullock labour, cost of seed material, value of farm yard manure and fertilizers, value of plant protection chemicals, land revenue, interest on working capital, repairs and maintenance.

Wages of hired human labour were calculated at the prevailing wage rates of Rs. 40.00 for men and Rs.25.00 for women and the charges of bullock labour both owned and hired were imputed/calculated at the rate of Rs.80.00 per pair as paid in the study area.

Cost of seed was taken at the purchase price paid. When home produced seed was used, the value was imputed at the average rate of Rs.25.00 per kilogram.

In the case of farm yard manure, the actual value paid, if it was purchased and the imputed value at the rate of Rs.225.00 per tractor load where it was produced on the farm was used.

The value of fertilizer and plant protection chemicals were calculated at the actual price paid by the farmers.

Land revenue was calculated at the actual rate paid by the farmers.

Interest on working capital was calculated at the rate of 14.00 per cent per annum for the total variable cost by excluding imputed value of family labour.

Repairs and maintenance cost of implements and machinary were apportioned to redgram crop based on the percentage use of equipments.

2. Cost - A_2: It included Cost-A_1 plus rent paid for leased in land.

3. Cost - B : It consisted of Cost -A_2 plus imputed rental value of owned land.

The imputed rental value was calculated at the rate of Rs.6250 per hectare per year which was the prevailing rent of land in the study area during 1995-96.

Cost - C : It included Cost-B plus imputed value of family labour.

INCOME CONCEPTS

1. Gross Income:

The value of the main product and by-product were valued at the prices at which they were sold.

2.Net Income:

This was defined as the difference between gross income and total cost (Cost-C) incurred by the farmers.

3. Farm Businesss Income:

It was the returns over Cost A_1/A_2.

4. Family Labour Income

The difference between the gross income and cost-B, represented the income of the cultivators on account of his own and family labour. It is the profit at cost-B.

Depreciation

Depreciation was calculated by straight line method on buildings, machinaries and implements.

Conventional Pest Management

It is the management of pest as per the farmers practice.

Integrated Pest Management (IPM)

It is defined as the optimisation of pest control in an economically and ecologically sound manner. It is a judicious combination of feasible pest management components to keep insects below economic injury level. Components of IPM are given in Appendix -IV.

Cost of IPM Materials

This cost included the costs incurred in purchasing the IPM materials such as Nuclear Polyhedrosis Virus, Neem seed kernal extract, Traps, chrysoperla larvae, lures and chemical pesticides.

Biological Control

Biological control of pests is a natural process by which the pest population is maintained at a lower level. This is possible with the help of the naturally available parasitoids, predators, and pathogens of the pest.

Nuclear Polyhedrosis Viruses (NPV)

It is the virus extracted from the nucleus of the cell of the host insect. It is mixed with jaggery and sprayed over the plants. The larvae of pest consume these virii along with food materials while feeding plants and thereby die.

Pheromones (Sex pheromones)

Pheromone is a chemical that is secreted into the external environment by an insect and they elicit a specific response in receiving malemoth of the species. These mostly facilitate mating.

Pheromone Trap

Trap containing the pheromone chemical. These traps are used to attract the malemoth insect.

Sticky Traps

Trap containing a sticky substance, which is fitted around plant stem. This will check both ascending and descending movement of insect.

Economic Threshold Level

There is a particular level of harm due to insect pests. This level is called as the economic threshold or economic injury level or critical level of damage. When the harm is below that level it is tolerated. When it rises above that level, the pests can cause severe damage to the plant. This level varies from pest to pest and place to place.

IPM Farmers

The farmers who have practiced integrated pest management in redgram.

Non-IPM Farmers

The farmers who have not practiced integrated pest management in redgram.

Concepts used in the case of Market Intermediaries

Fixed capital

The items included under the fixed capital were the value of land, building, machinery and equipment.

Fixed Costs

The items included under fixed costs were the depreciation on buildings, machinery and equipments; rental value of long-lease buildings; salaries for permanent staff and interest on fixed capital.

Working Capital (Variable Cost)

The working capital included the raw material cost, cost of gunny bags, charges on power, fuel and lubricant, transportation costs, wages for casual labour, repairs and maintainance, miscellaneous charges, interest on working capital, taxes and telephone charges.

Processing Cost per unit of Output

This was calculated by dividing total processing costs by total quantity of output produced.

Gross Returns

Gross returns were estimated by considering the sale value of main product and by-product at the processing units.

Net Returns

Net returns were calculated by substracting total processing costs from gross returns.

Break-Even Point

This is the point of output at which the total revenue obtained is equal to the total cost incurred. At this point of production, there are neither losses nor profits.

Marketing Cost of the Producer-Seller

These cost included charges on packing, loading, unloading, transportation, gunny bags, cleaning, weighment and commission.

Producer's Sale Price

The price at which farmers sold their produce.

Producer's Net Price

This referred to the sale price less sum of costs incurred by the producer-seller in the marketing of his produce.

Costs of Commission Agents

These costs comprised of shop rent, licence fees, labour cost and maintenance cost.

Margin of Commission Agent

This represented difference between commission earned by the commission agent and the cost of services rendered by him in the process of transactions.

Purchase Price of Mill Owner

It included producer sale price plus charges paid by mill owner towards procurement of redgram.

Margin of Dal Miller

This represented the difference between the price paid by the dalmiller for the raw product and the price received by him for his end products.

Marketing Margin (Price Spread)

This represented the difference between the net price received by the producer-seller and the price paid by the dalmiller.

Producer's share in Dalmiller's rupee

This represents the percentage of the net price received by the producer-seller to the selling price of dalmiller.

Business Ratios

To evaluate the efficiency and profitability of the processing units, following business ratios have been used in this study.

1. Profitability Ratios

These shows performance of the business. Profitability ratios provide a fairly sound method of diagnosis of the financial status of the processing units and their overall efficiency. These ratios also compare the returns over the amount sunk into the business by processing units. Thus, these ratios indicate the profitability of sales and investments made in the business. The profitability ratios used for the purpose in the study are described below:

a) Net Profit to Total Assets

It was calculated by dividing the net profit (total sales minus total cost) by total assets. This indicates the net profit generated from each rupee of assets. An increase in the ratio over years shows improvement in the overall efficiency of the processing units. Net profits included the amount of income received by the processing units after meeting all its expenses at the end of the year.

b. Net Profit to Total Sales

It is also called profit margin and is calculated by dividing net profit by total sales (gross returns) and expressed in percentage. This indicates percentage of net profit realised by the processing units out of their gross returns and determined for a period. Higher the ratio, higher the overall efficiency of the business of the processing units and thereby fuller utilization of its total resources and vice-versa.

c. Return on Total Capital Employed

It was calculated by dividing the net returns by total capital employed (fixed and working capital). This indicates net returns generated from each rupee of total capital employed.

d. Benefit Cost Ratio

It was calculated by dividing the gross retuns by total costs (Fixed and variable cost). It indicates the actual benefit realised from one rupee investment towards processing.

2. Turnover Ratios

The ratios which were not in the above categories but impregnate to this study are discussed as under :

a) Working Capital Turnover Ratio

It was calculated by dividing the gross returns (total sales) by total working capital (fixed and variable capital). This ratio is useful in assessing the efficiency of the total working capital employed in the business by the processing units. Higher the turnover, greater would be the efficiency and larger the rate of profitability.

b. Total Asset Turnover

It was calculated by dividing the total sales (gross returns) by total assets. This indicates the extent of gross returns realised by one rupee of total asset investment.

3. Efficiency Ratios

The efficiency with which the processing units functioned was measured employing the following efficiency ratios.

a. Gross Ratio

This ratio was computed by dividing the total expenses of the processing units by its gross income and expressed in percentage. The total expenses included fixed cost and variable cost incurred by the processing units. Similarly, the gross income included value of the main product (dal) plus value of the by-products.

b. Operating Ratio

This ratio was computed by dividing the operating expenses of the processing units by its gross income (sales) and expressed in percentage. The operating expenses included only variable costs incurred by the processing units. This ratio measured the extent of cost incurred for effecting sales and hence reflected the operating efficiency of the processing units. A rise in the operating ratio shows decline in efficiency and vice-versa.

3.6 Brief Methods of Processing Redgram into Dal

The post harvest operation consist of cleaning, grading, drying, milling and storage. The pulse milling is almost an exclusive industry in Indian Sub-Continent, but it has not received the necessary scientific and technological support like other primary food processing industries such as rice and wheat milling. There are about 10,000 dal mills in the country, out of which, 120 redgram processing units are in Gulbarga district of Karnataka state.

Redgram consist of 7 per cent husk, 13 per cent broken grains, 2 per cent powder and 78-80 per cent dal.

There are 7 major steps in the processing of redgram depending upon the method used which are as follows :

1. Soaking

Soaking or sprinkling the redgram seeds with water helps to loosen binding action of the gum, soften the seed coat and increases the outturn by reducing breakage in milling. The seeds are soaked for 6 to 10 hours.

2. Oil Treatment

Redgram seeds are treated with oil which helps to loosen the husk and release cotyledon layer binding from seeds.

3. Drying

After oil treatment the seeds are heaped up and left over night, then spreadout for drying either under sun for 1 to 2 days or by means of mechanical drier.

4. Winnowing

Winnowing is to remove the foreign matter before brining to milling. Normally, it is done by mechanical winnower.

5. Dehulling

Removing the hull/seed coat from redgram seeds and spliting the seeds into its dicotyledonous components.

6. Polishing

Polishing is the removal of membrane from the dal. It provides shining to split grains.

7. Separating

Separation of the parts of broken grains, husk and powder from dal.

Dehulling of redgram is an age-old practice in India. In earlier days, hand-pounding was a common phenomenon. This was later replaced by stone chakkis and in due course of time it was also replaced by mechnical processing.

Dal is prepared by removing the seed coat and spliting the seed into two catyledons. It is accomplished by either wet or dry method. Wet method is commonly used in Karnataka state. The seeds are first soaked in water for 6 to 10 hours, then mixed with sieved red earth, heaped up and left overnight. The seeds are then spread out, dried in the sun and winnowed to remove the earth before being milled. The split dal is cleaned by repeated winnowing and heated with a small quantity of castor or gingelly oil to improve its appearance and preserve its quality. The yield of dal by this method is about 75-80 per cent.

RESULTS

IV. RESULTS

In this chapter, the findings of the study as per the set objectives are presented under the following heads:

4.1 Growth in Area, Production and Productivity of Redgram.

4.2 Cropping Pattern of Sample Farmers.

4.3 Economics of Production of Redgram.

4.3.1 Pattern of Input Use in IPM and Non-IPM Farmers.

4.3.2 Operational Costs and Returns Structure in IPM and Non-IPM Farmers.

4.3.3 Distribution of Cost on Integrated Pest Management.

4.3.4 Farm Management Cost Concepts and Returns in Redgram Production.

4.4 Resource Use Efficiency in the Production of Redgram by IPM and Non-IPM Farmers.

4.4.1 Production Elasticities of Inputs in Redgram Crop.

4.4.2 Ratios of Marginal Value Product to Marginal Factor Cost in Redgram.

4.5 Marketing Costs and Price Spread in Redgram.

4.5.1 Marketing Cost Incurred by Producer-Seller

4.5.2 Producer Share in Dalmiller Rupee

4.6 Economics of Processing of Redgram.

4.6.1 Capital Investment, Costs and Returns in Processing Units.

4.6.2 Business Ratios of Processing Units.

4.1 Growth in Area, Production and Productivity of Redgram

Redgram is cultivated over a large area in the State. However, the growth in area and production has been rather unsteady. Generally, the year to year fluctuations have often resulted in a phenomenon of aggregate demand of redgram exceeding the aggregate supply in one year and falling short of demand in the following year. These wide swings not only adversely affects the adoption of new redgram technology by the farmers, but also make the enterpreneur hesitant in modernising redgram processing industry. In the study, an attempt is made to examine the pattern of growth in area, production and productivity of redgram.

Table 4.1 depicts the growth in area, production and productivity in Gulbarga district as well as Karnataka state as a whole (Fig. 2 and 3). To workout the growth rates in area, quadratic equations were used for both Karnataka state as well as Gulbarga district, while cubic functions were used for production and productivity.

Table 4.1 Growth rates in area, production and productivity of redgram in Gulbarga district and Karnataka state during 1980-81 to 1994-95

State/ District	Particulars	Growth Function	Growth Rate
Gulbarga	Area	$b+2cT/\bar{Y}$	-10.0^{**}
	Production	$b+2cT+3dT^2/\bar{Y}$	43.0
	Productivity	$b+2cT+3dT^2/\bar{Y}$	28.0^{*}
Karnataka	Area	$b+2cT/\bar{Y}$	$- 9.0^{**}$
	Production	$b+2cT+3dT^2/\bar{Y}$	- 4.0
	Productivity	$b+2cT+3dT^2/\bar{Y}$	11.0^{*}

Note: ** : Significant at 1 per cent level
* : Significant at 5 per cent level

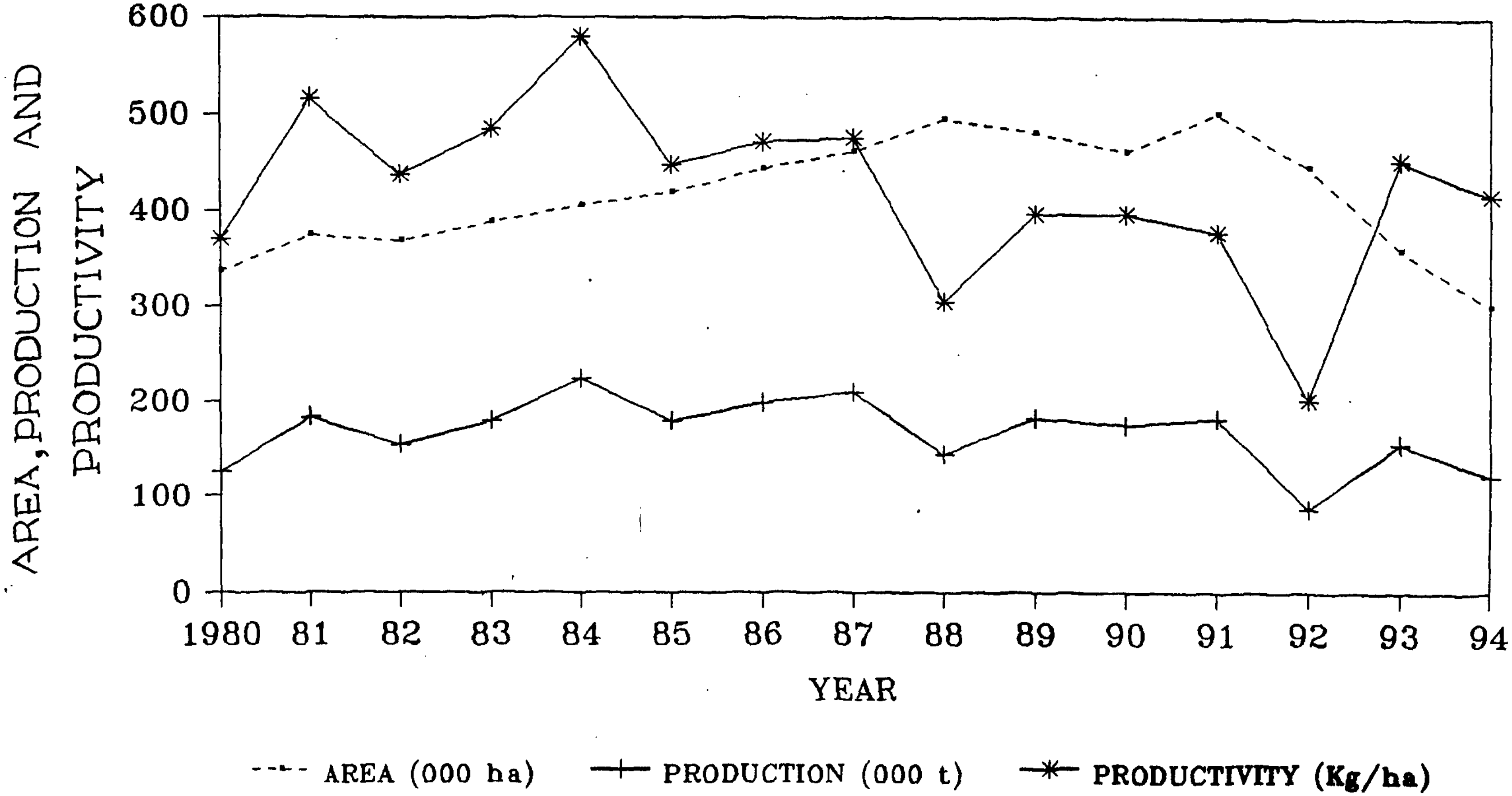

Fig. 2. GROWTH IN AREA, PRODUCTION AND PRODUCTIVITY OF REDGRAM IN KARNATAKA

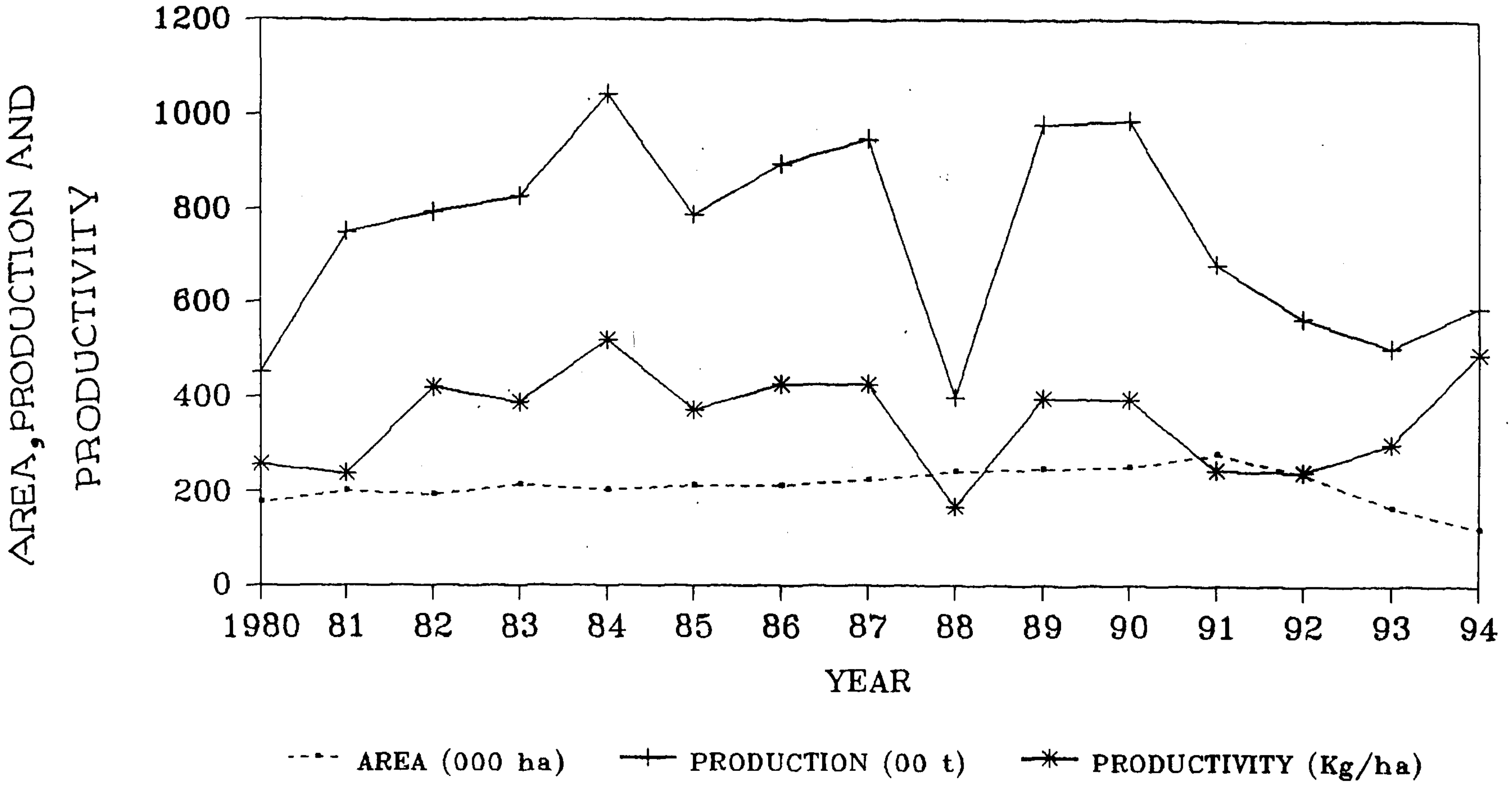

Fig. 3. GROWTH IN AREA, PRODUCTION AND PRODUCTIVITY OF REDGRAM IN GULBARGA

It is clear from the table that area under redgram declined significantly by 10 and 9 per cent per annum during 1980-81 to 1994-95 in Gulbarga district and Karnataka state as a whole, respectively.

Despite of the decline in area, the production increased by 43 per cent for Gulbarga district indicating the impact of productivity on production of redgram in Gulbarga district. The increase in productivity in Gulbarga district was found to be 28 per cent and it was statistically significant at 5 per cent level annually.

For the Karnataka state as a whole, the production of redgram had declined by 4 per cent, however, it was not significant. It is worth noting that the productivity of redgram has increased significantly by 11 per cent in Karnataka state. Thus, eventhough the area had declined significantly, the production did not decline due to the significant increase in its productivity for the state as a whole.

4.2 Cropping Pattern of the Sample Farmers

The cropping pattern followed by the sample farmers was identified and is presented in Table 4.2.

As indicated in Table 4.2, the cultivation of redgram as an entire (sole) crop among the farmers of Gulbarga district indicated that it was a major crop, which occupied about 338.72

Table 4.2 Cropping pattern on sample farms

Season/crop	Area (ha)	Per cent to Gross Cropped Area (%)
Kharif		
Redgram	338.72	63.06
Rabi		
Jowar	119.02	22.16
Bengalgram	43.64	8.13
Safflower	35.70	6.65
Gross cropped area	537.09	100.00

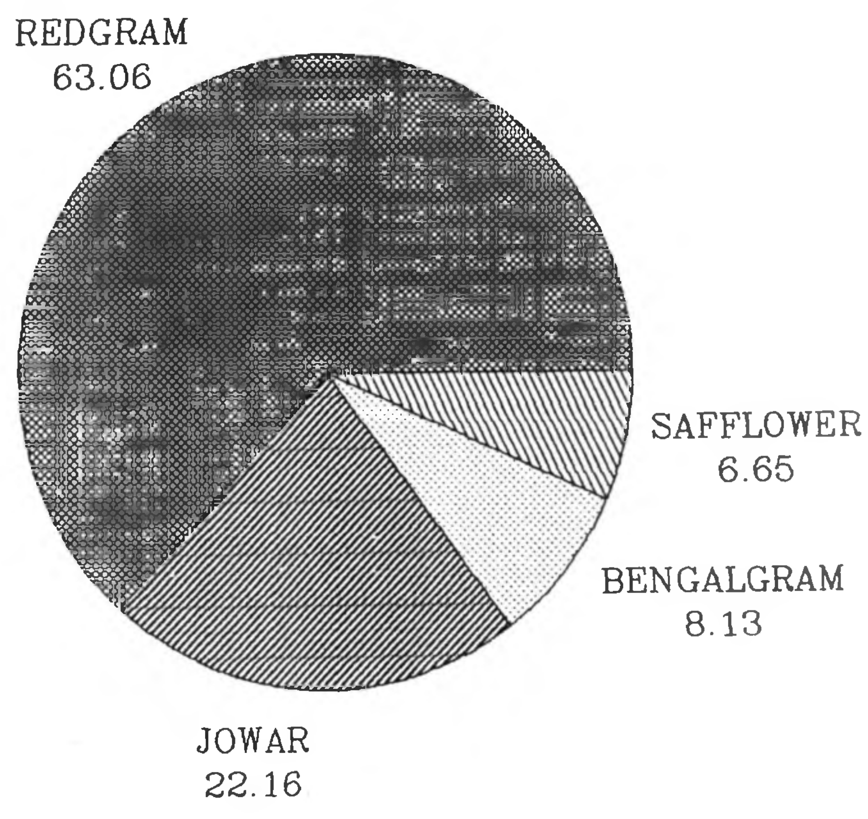

Fig. 4. CROPPING PATTERN ON SAMPLE FARMS

hectares (63.06%) in a total gross cropped area of 537.09 hectares (Fig. 4). The next important crop was jowar in rabi season which occupied 22.16 per cent (119.02 ha) of gross cropped area followed by bengalgram (8.13%) and safflower (6.65%). This clearly indicated the predominance of redgram cultivation in the study area.

4.3 Economics of Redgram Production

The economic aspects of redgram cultivation were worked out for farmers who had adopted integrated pest management technology as well as for farmers who have used conventional (Non-adopter of Integrated pest management) method of plant protection measues in redgram. Detailed analysis of input use, cost incurred and returns obtained in the production of redgram have been presented below :

4.3.1 Pattern of Input Use and Output of Redgram in IPM and Non-IPM Farmers.

The input use pattern in the production of redgram by IPM and Non-IPM farmers is presented in Table 4.3. It is evident from the table that the IPM farmers used more of human labour, bullock labour, manures and phosphatic fertilisers, whereas, Non-IPM farmers used more of nitrogenous fertilisers and plant protection chemicals. IPM farmers engaged on an average 68.18 mandays of human labour as against 52.60 mandays

Table 4.3 Pattern of input use and output of redgram in IPM Vs Non-IPM farmers.

(Per hectare)

Sl. No.	Items	Units	IPM Farmers	Non-IPM Farmers
1.	Human labour	Mandays	68.18	52.60
2.	Bullock labour	Pairdays	11.48	9.42
3.	Seeds	Kg.	11.06	11.28
4.	Manure	Tractor load	2.26	1.21
5.	Fertilizers			
	a) Nitrogen	Kg.	31.97	79.18
	b) Phosphorus	Kg.	18.65	8.12
	c) Potash	Kg.	13.64	13.56
6.	Plant Protection chemicals			
	a) Liquids	Litres	2.00	5.50
	b) Dust	Kg.	50.00	200.00
	c) Light traps	Number	4.00	-
	d) Pheromone traps	"	6.00	-
	e) Errect Bird perches	"	2.00	-
	f) Chrysoperla larvae	"	5.00	-
	g) NPV	Le.	200.00	-
	h) Neem seed extract and formulation	Litres	1.50	-
7.	Yield			
	a) Main product	Quintals	9.60	8.36
	b) By-product			
	- Stalk	Cart load	3.42	6.89
	- Pod husk	Jalagi	5.95	8.87

Note: NPV = Nuclear Polyhedroses Virus
Le = Larval equivalent

of the Non-IPM farmers. Similarly, IPM farmers engaged 11.46 pairdays of bullock labour as compared to 9.48 pairdays of bullock labour in the case of Non-IPM farmers. In the case of manure, IPM farmers had applied 2.26 tractor loads, while Non-IPM farmers applied 1.21 tractor loads. The extent of application of phosphorus was considerably higher in the case of IPM farmers (18.65 Kg/ha) than that of Non-IPM farmers (8.12 kg/ha). However, the extent of nitrogenous fertilisers used by the Non-IPM farmers (79.18 Kg/ha) was substantial, compared to IPM farmers (31.97 Kg/ha). Similarly, Non-IPM farmers applied 5.5 litre and 200 kgs. of liquid and dust form of plant protection chemicals, respectively as against 2.0 litre and 50 kg. in the case of IPM farmers, However, the IPM farmers used non-chemical pesticides and other biological agents like light traps, pheromone traps, nuclear polyhedroses virus, neem seed kernal extract etc. which were not applied by Non-IPM farmers.

The yield obtained by the IPM farmers was 9.60 quintals per hectare which was higher than that of Non-IPM farmers (8.36 Q/ha). However, the by-products in redgram cultivation like stalk and pod husk were higher in Non-IPM farmers, compared to IPM farmers.

4.3.2 Operational Cost and Return Structure in Redgram Production

The details of the cost incurred on material inputs and labour as well as the returns obtained in the cultivation

Table 4.4 Operational cost of redgram in IPM and Non-IPM farmers

(Rs/ha)

Sl. No.	Cost items	IPM Farmers		Non-IPM Farmers	
		Rupees	% age	Rupees	% age
1.	**Material cost**				
	Seeds	271.53	7.40	279.52	6.99
	Manures	523.19	14.27	370.98	9.28
	Fertilizers	566.27	15.46	424.71	10.64
	P.P. Chemicals	2304.61	62.87	2921.79	73.09
		3665.60 (50.23)	100.00	3997.00 (55.46)	100.00
2.	**Labour cost**				
	Land preparation	771.19	21.24	710.42	22.14
	FYM application	118.49	3.26	71.89	2.24
	Sowing	267.87	7.39	274.11	8.54
	Fertilizer application	96.68	2.66	85.10	2.65
	P.P.Chemicals application	281.83	7.76	347.83	10.84
	Weeding & Hoeing	860.95	23.71	801.45	24.97
	Harvesting	460.06	12.67	358.82	11.18
	Threshing	396.19	10.92	317.56	9.89
	Winnowing, bagging, etc.	377.31	10.39	242.44	7.55
		3630.57 (49.77)	100.00	3209.62 (44.54)	100.00
	Total cost	7296.21 (100.00)		7206.62 (100.00)	
3.	**Returns**				
	Yield (Q)	9.60		8.36	
	Rate (Rs/Q)	1800.00		1800.00	
	By-product	124.30		201.91	
	Gross Returns	17404.30		15249.91	
	Net Returns	10108.09		7840.10	

Note: Figures in the parantheses indicate percentages to total cost

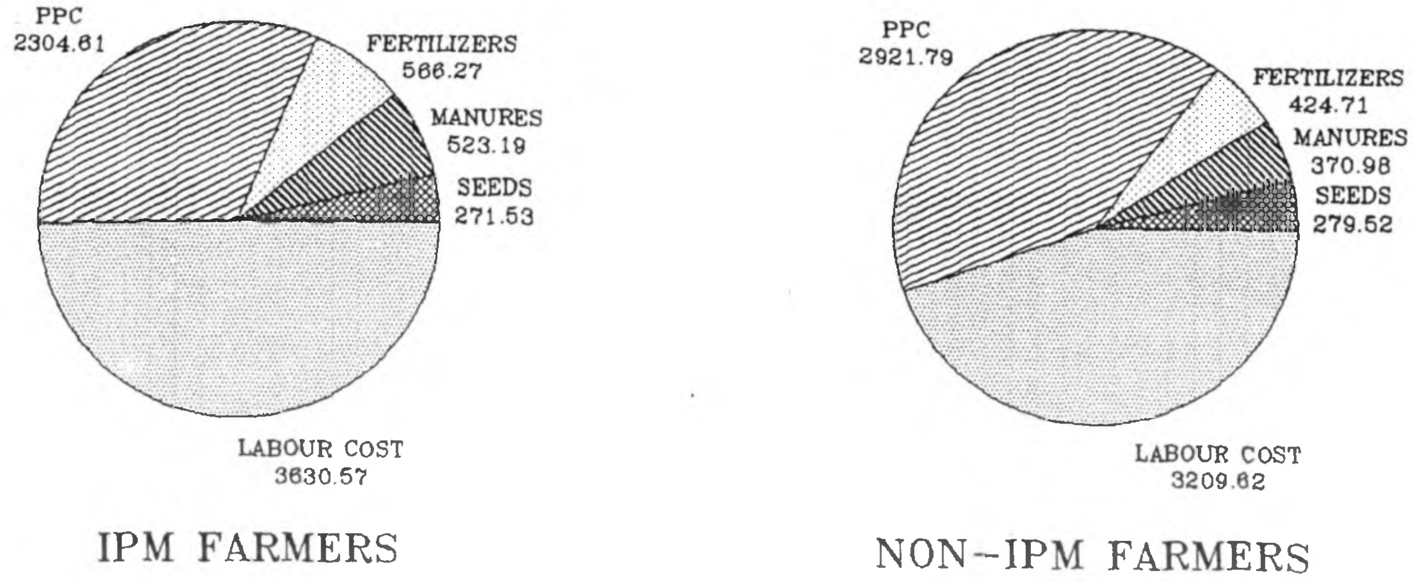

Fig. 5. OPERATIONAL COST OF REDGRAM IN IPM AND NON-IPM FARMERS (Rs./ha)

of redgram by IPM and Non-IPM farmers are presented in Table 4.4 and Fig. 5.

4.3.2.1 Material Cost

It is clear from the Table 4.4 that the total operational cost incurred in redgram cultivation was marginally higher in IPM farmers (Rs.7,296.21/ha), compared to Non-IPM farmers (Rs.7,206.62/ha). The total operational cost was constituted by 50 per cent each of material cost and labour cost in IPM farmers, whereas, the material cost (Rs.3,997/ha) was marginally higher (55.46%) than labour cost (44.54%) in the case of Non-IPM farmers.

The material cost incurred by Non-IPM farmers (Rs.3,997/ha) was relatively higher than that of IPM farmers (Rs.3,665.60/ha). Out of the total material cost, the cost incurred on plant protection chemicals constituted a major component (62.87%) followed by the cost on chemical fertilizers, manures and seeds, in the case of IPM farmers. A similar pattern of cost on material inputs was observed in the case of Non-IPM farmers. However, the proportion of cost on plant protection chemicals in IPM farmers (73.09%) was higher than that of IPM farmers (62.87%). The cost incurred on chemical fertilisers was higher in IPM farmers (Rs.566.27/ha) than the Non-IPM farmers (Rs.424.71/ha). Similarly, the cost on manures was higher in IPM farmers (Rs.523.19/ha) as compared to Non-IPM farmers (Rs.370.98/ha). However, there was no significant difference on cost incurred on seeds in both the categories of farmers.

4.3.2.2 Labour Cost

As indicated in Table 4.4, the cost incurred on labour for carrying out various operations in redgram cultivation was found to be higher in the case of IPM farmers (Rs.3,630.56/ha), compared to Non-IPM farmers (Rs.3,400.76/ha). Out of the total labour cost, the cost on weeding and hoeing (Rs.860.95/ha) formed a major component (23.67%) followed by cost on land preparation (21.20%), harvesting (12.65%), threshing (10.89%), winnowing and bagging (10.37%), application of plant protection chemicals (7.74%) and sowing (7.36%) in the case of IPM farmers. A similar pattern of cost on labour was observed in the case of Non-IPM farmers. The proportion of expenditure on various operations out of the total labour cost revealed that there was no much difference in these costs between the IPM farmers and the Non-IPM farmers except in the case of application of plant protection chemicals, the cost of which in the case of Non-IPM farmers (Rs.347.83/ha) was higher than that of IPM farmers (Rs.281.83/ha).

4.3.2.3 Returns

The returns structure (Table 4.4) in redgram production clearly revealed that the return from main product formed major component of the gross returns. The gross returns obtained by IPM farmers (Rs.17,404.30/ha) was found to be relatively higher than that of Non-IPM farmers (Rs.15,449.91/ha). Similarly, the net returns obtained by IPM farmers (Rs.10,108.09/ha) was also higher than that of Non-IPM farmers (Rs.7,840.10/ha). This clearly indicated that the adoption of IPM technology in redgram cultivation was profitable.

4.3.3 Distribution of Cost on Integrated Pest Management

The distribution of cost incurred on Integrated Pest Management in redgram cultivation (Table 4.5 and Fig. 6) clearly indicated that about two-third of the total cost was still incurred on chemical pesticides. Out of the total cost (Rs.2,304.61), the expenditure on non-chemical pesticide materials (Rs.850.00/ha) formed only 36.83 per cent. This indicated that the expenditure on chemical pesticides dominated in the control of pests even in Integrated Pest Management. Out of the total non-chemical pesticide materials, the cost on Nuclear Polyhedrosis Virus (Rs.260.00/ha) formed the major component (30.59%) followed by the cost on pheromone traps/neem extracts and formulations (17.65%), chrysoperla larvae, erecting bird perchs (10%) and light traps (9.4%).

Table 4.5 Distribution of cost on Integrated Pest Management (per hectare)

Sl. No.	Items	Units	Quantity	Cost Rs.	Cost % age
1.	Light traps	Number	4	80.00	9.41
2.	Pheromone traps	"	6	150.00	17.65
3.	Errect Bird perches	"	2	85.00	10.00
4.	Chrysoperla larvae	"	5	125.00	14.70
5.	NPV	Le.	200	260.00	30.59
6.	Neem seed extract and formulation	Litres	1.5	150.00	17.65
	Total Non-chemical pesticide			850.00 (36.88)	100.00
7.	Chemical pesticides	-	-	1454.61 (63.12)	
	Total cost			2304.61 (100.00)	

Note: 1. NPV = Nuclear Polyhedrosis Virus
2. Le = Larvel equivalent
3. Figures in parantheses are percentages

A. Light traps

B. Pheromone traps

C. Errect bird perches

D. Chrysoperla larvae

E. NPV

F. Neem seed extracts
and formulation

G. Chemical pesticides

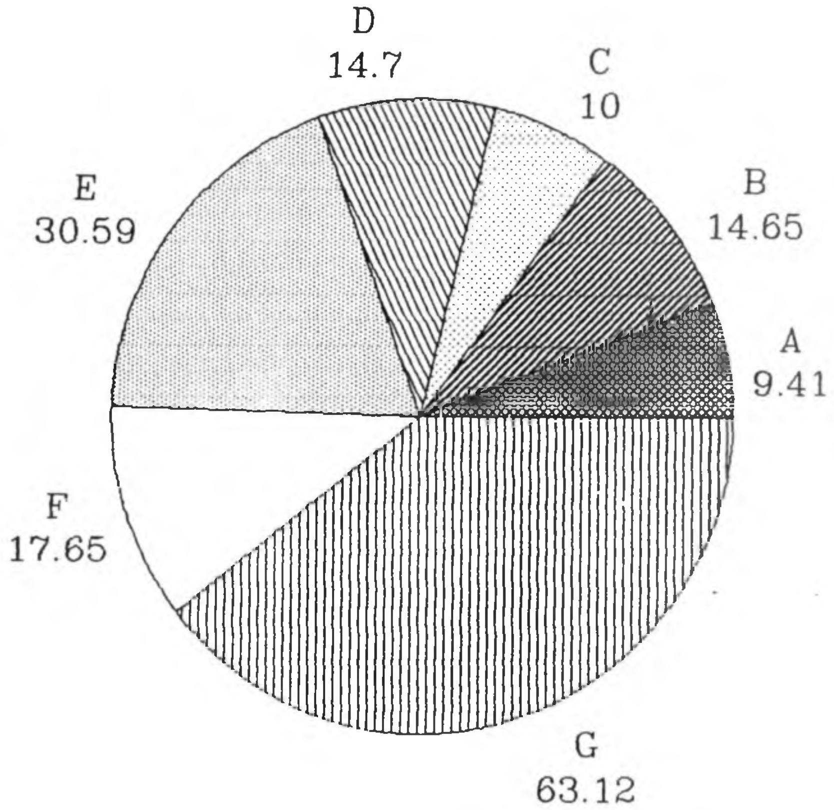

Fig. 6. PERCENTAGE DISTRIBUTION OF COST ON INTEGRATED PEST MANAGEMENT

4.3.4 Farm Management Cost and Return Concepts in Redgram Cultivation

The estimated costs and returns in redgram production as per farm management concepts are presented in Table 4.6 and Fig. 7. The Table revealed that the cost of cultivation as per the farm management cost concepts, in general, were higher for IPM farmers as compared to Non-IPM farmers. Cost-A_1 in IPM farmers (Rs.5,100.85/ha) was relatively higher than that of Non-IPM farmers (Rs.4,629.79/ha). In the case of IPM farmers, Cost-A_2 (Rs.5,100.85/ha) was same as Cost-A_1 because there were no cases where land was leased-in for redgram cultivation. However, in the case of Non-IPM farmers the Cost-A_2 was Rs.4,950.06 per hectare. Cost-B being Rs.11,350.89 per hectare in IPM farmers was higher than that of Non-IPM farmers (Rs.11,200.06/ha). Similarly, Cost-C in IPM farmers (Rs.12,041.88/ha) was relatively higher than that of Non-IPM farmers (Rs.11,848.35/ha). However, the magnitude of incomes were higher in the case of IPM farmers as compared to the Non-IPM farmers. The farm business income which is the profit over Cost-A_1/A_2 in the IPM farmers (Rs.12,303.45/ha) was relatively (19.45%) higher than Non-IPM farmers (Rs.10,299.85/ha). The income to the family labour in redgram cultivation in the case of IPM farmers being Rs.6,053.41 per hectare was higher by 49.47 per cent over Non-IPM farmers (4,049.85/ha). Similarly, the net income obtained by the IPM farmers (Rs.5,362.42/ha) was

Table 4.6 Farm management cost and return concepts in redgram production.

(Rs/ha)

Sl. No.	Items	IPM Farmers	Non-IPM Farmers
A.	**Cost of cultivation**		
1.	Cost - A_1	5100.85	4629.79
2.	Cost - A_2	5100.85	4950.06
3.	Cost - B	11350.89	11200.06
4.	Cost - C	12041.88	11848.35
B.	**Returns over**		
1.	Cost - A_1/A_2 (Farm Business Income)	12303.45 (19.45)	10299.85
2.	Cost - B (Family Labour Income)	6053.41 (49.47)	4049.85
3.	Cost - C (Net Income)	5362.42 (57.64)	3401.56
C.	**Benefit Cost Ratio** (over cost - C)	1.44	1.28

Note: Figures in parantheses indicates percentage increase over Non-IPM farmer.

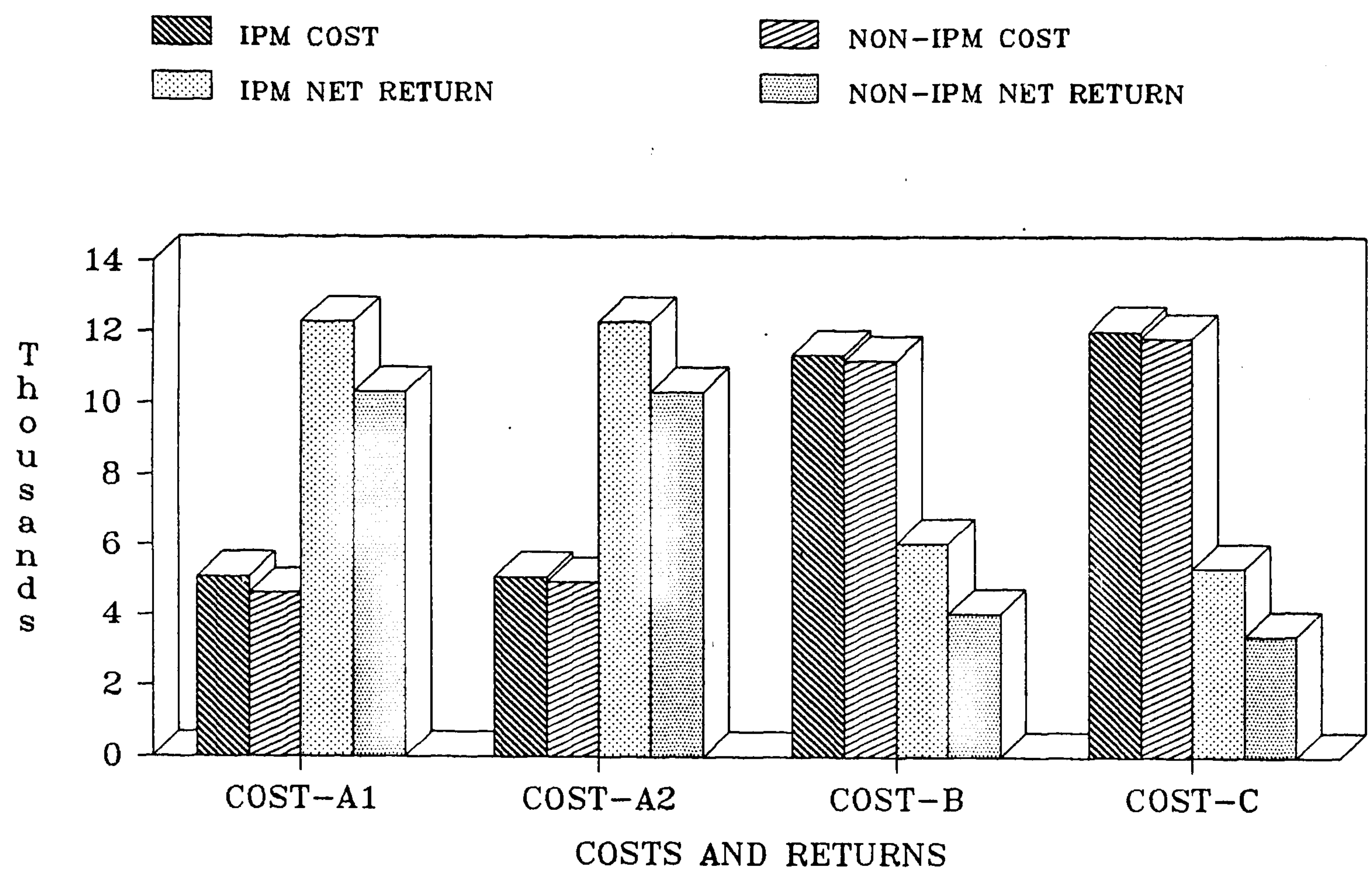

Fig.7. FARM MANAGEMENT COSTS AND NET RETURNS IN REDGRAM PRODUCTION

considerably higher than (57.64%) that of Non-IPM farmers (Rs.3,401.56/ha). The benefit cost ratio in IPM farmers (1.44) was marginally higher than that of Non-IPM farmers (1.28).

Thus, the returns as well as the benefit cost ratio have clearly indicated that the cultivation of redgram, in general, was profitable in Gulbarga district.

4.4 Resource — Use Efficiency in the Production of Redgram by IPM and Non-IPM Farmers.

Production functions were fitted to the farmers data to asses the degree of influence of the inputs on the redgram output.

While studying the economics of redgram cultivation, it was noticed that land, human labour, bullock labour, farm yard manure, seeds, fertilisers and plant protection chemicals were the important inputs involved in the production of redgram. There was quite an amount of variation in the use of these inputs from farm to farm. These variables were included as independent variables in the production function analysis. The Cobb-Douglas type of production functions were fitted to the data of redgram crop in order to estimate the functional relationship between dependent and independent variables.

4.4.1 Production Elasticities of Inputs in Redgram under IPM and Non-IPM Farmers.

The details of production function estimates are presented in Table 4.7. As indicated in the Table, the Coefficient of Determination (R2) were 0.8658 and 0.9632 in the case of IPM and Non-IPM farmers, respectively, indicating that the variables included in the function had explained 86.58 per cent and 96.32 per cent of variations in the yield of redgram.

It is worth noting that land and fertiliser inputs had significantly influenced the redgram yield in both IPM and Non-IPM farmers, whereas, farm yard manure and plant protection chemicals were two additional factors in the case of non IPM farmers found to influence yield significantly. Though the influence of land was positive and significant, the magnitude of output elasticity in the case of IPM farmers (0.9762) was considerably higher than that of Non-IPM farmers (0.4296). Similarly, the output elasticity of chemical fertilizers (0.0581) was significant in IPM farmers and higher than that of Non-IPM farmers (0.0430). The regression coefficient of farm yard manure in Non-IPM farmers (0.0286) was significant while, it was non-significant in Non-IPM farmers (0.0121). It is interesting to note that the influence of plant protection chemicals (-0.3000) among Non-IPM farmers was significant and negative, indicating decreasing returns per increment applied.

Table 4.7 Production function estimates in redgram production

Sl. No.	Explanatory variables	Regression coefficient	
		IPM farmers	Non-IPM farmers
1.	Intercept	1.3959	-0.3786
2.	Land in hectares (X_1)	0.9762*** (0.3005)	0.4296** (0.2303)
3.	Human labour in mandays(X_2)	0.0901 (0.1195)	0.0244 (0.1286)
4.	Bullock labour in pairdays(X_3)	-0.1442 (0.0973)	-0.0097 (0.1126)
5.	Farmyard manure in Tractor load(X_4)	0.0121 (0.0144)	0.0286** (0.0130)
6.	Seeds in Kgs. (X_5)	0.1437 (0.2226)	0.2907 (0.2191)
7.	Fertilizers in rupees (X_6)	0.0581** (0.0233)	0.0431** (0.0218)
8.	Plant Protection Chemicals in rupees (X_7)	0.1900 (0.1300)	-0.3000* (0.1700)
9.	R^2	0.8658	0.9632

Note: Figures in parantheses indicates standard error of coefficient.

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

On the other hand, the influence of plant protection chemicals was positive (0.1900), though, non-significant in the case of IPM farmers. The output elasticities of human labour and seeds were found to be positive and non-significant in both the categories of farmers. The output elasticities of bullock labour in both IPM (-0.1442) and Non-IPM farmers (-0.0097) were found to be negative and non-significant.

Since all the regression coefficients in the case of IPM farmers were less than one, diminishing returns to land, human labour, farm yard manure, seed, fertilizers and plant protection chemicals were observed. In the case of Non-IPM farmers, it was land, human labour, farm yard manure, seed and fertilizers. This meant that one per cent increase in any one of the factors, holding others constant, resulted in less than one per cent increase in the output. Negative returns to bullock labour in IPM farmers as well as bullock labour and plant protection chemicals in Non-IPM farmers was observed.

In the case of IPM farmers, the sum of the output elasticities (1.336) was more than one, indicating an increasing return to scale. This meant that if all the inputs were increased together by one per cent, the yield of redgram would increase by one per cent in IPM farmers. However, the sum of regression coefficients in the case of Non-IPM farmers was 0.506 which indicated a decreasing return to scale.

4.4.2 Ratios of Marginal Value Product to Marginal Factor Cost in Redgram

The ratios of marginal value products (MVP) of various resources to their respective marginal factor costs (MFC) were computed for IPM and Non-IPM farmers and are presented in Table 4.8.

The ratios of MVP to MFC was greater than one for land (3.1745), bullock labour (3.0532), seeds (10.8152), plant protection chemicals (1.0235) and fertilizers (2.1000) in the case of IPM farmers. In the case of Non-IPM farmers, ratios of MVP to MFC for land (1.0417), farm yard manure (1.6438), seeds (15.5920) and fertilizers (1.6700) were higher than one. This indicated the under use of these resources. Hence, there is scope for using additional units of these factors to increase the returns. The ratio of MVP to MFC was less than one for human labour in both IPM farmers (0.625) and Non-IPM farmers (0.160), indicating the excessive use of this input in the redgram cultivation. Further, the ratios of MVP to MFC for bullock labour (-0.1924) and plant protection chemicals (-2.5800) were negative in Non-IPM farmers which indicated that each additional rupee spent on these inputs reduced the gross income by Rs.0.1924 and Rs.2.5800, respectively.

Table 4.8 Ratio of MVP to MFC in redgram production

Sl. No.	Variables	Ratio of MVP to MFC	
		IPM Farmers	Non-IPM Farmers
1.	Land	3.1745	1.0417
2.	Human labour	0.6255	0.1605
3.	Bullock labour	3.0532	-0.1924
4.	Farmyard manure	3.7666	1.6438
5.	Seeds	10.8152	15.5920
6.	Fertilizers	2.1000	1.6700
7.	Plant Protection Chemicals	1.0235	-2.5800

4.5 Marketing Costs and Margins in Redgram

The following marketing channel was identified as the most predominant for redgram marketing in Gulbarga district.

Producer-Seller ---> Commission Agents ---> Dalmillers

The costs incurred by the farmer as well as other market functionaries namely, commission agents and dalmillers along with their margins in the marketing of redgram are presented under.

4.5.1 Marketing Costs incurred by Producer - Seller

It is evident from the Table 4.9 that the total marketing cost incurred by the farmers was found to be Rs. 85.27 per quintal. Of the total marketing cost, the commission charges (Rs. 51.94/q) paid formed a major component (60.91%) followed by the expenditure on gunny bags (23.61%) and transportation (6.06%). The expenses incurred on miscellaneous items (3.71%), loading (2.02%) and unloading (1.19%), cleaning (1.17%), weighment (0 .78%) and packing (0.50%) were the other components of the marketing cost of producer-seller (farmer).

4.5.2 Producer Share in Dalmiller Rupee

It is clear from the Table 4.10 that the share of the producer (Rs.1,714.73/q) in the sale price of the dalmiller

Table 4.9 Marketing costs incurred by the producer-seller

Sl. No.	Particulars	Rate (Rs/Q)	Percentage (%)
1.	Gunny bags	20.14	23.62
2.	Loading	1.73	2.03
3.	Transportation	5.17	6.06
4.	Unloading	1.02	1.21
5.	Cleaning	1.00	1.12
6.	Packing	0.43	0.50
7.	Weighment	0.67	0.78
8.	Commission charge	51.94	60.91
9.	Miscellaneous expenses	3.17	3.71
	Total	85.27	100.00

Table 4.10 Costs and margins of different market functionaries

Sl. No.	Particulars	Amount (Rs/Q)	Percentage of Dal miller sale price
1.	Marketing cost incurred by the producer	85.27	3.74
2.	Producer sale price	1800.00	79.05
3.	Net price received by the producer at farm level	1714.73	75.30
4.	Net price of the producer after deducting cost of cultivation	384.73	16.90
5.	Cost incurred by the commission agent	22.85	1.00
6.	Margin of the commission agent	55.85	2.45
7.	Costs incurred by the dalmiller	81.27	3.57
8.	Purchase price of dalmiller	1881.27	82.62
9.	Processing cost of dalmiller	287.78	12.64
10.	Margin of dalmiller	107.99	4.74
11.	Sale price of dalmiller	2277.04	100.00

(Rs.2,277.04/q) was 75.30 per cent. The producer-seller (farmers) had obtained a gross return of Rs.1,800.00 per quintal in redgram production. However, the net returns at farm level was found to be Rs.1,714.73 per quintal as the farmers had incurred about Rs.85.27 per quintal in the marketing of the produce. On an average, the dalmiller obtained a net margin of Rs.107.99 per quintal by incurring costs of Rs.81.27 and Rs.287.78 per quintal for procurement and for processing, respectively. Thus, the sale price of dalmiller formed Rs.2,277.04 per quintal even though he had paid only Rs.1,881.27 per quintal.

4.6 Economics of Processing in Redgram

4.6.1 Capital Investment, Costs and Returns in different size of Processing Units.

The investment on the redgram dalmills and investment made per quintal of redgram dal production by different categories of redgram processing mills are presented in Table 4.11.

The investment made for the establishment of redgram processing mills included expenditure on land, building and machinery. It may be seen from the Table 4.11 that a total investment of Rs. 6,63,142 were needed for the establishment of small size dal mills and Rs. 9,96,522 for large size dal mills. On an average, Rs. 8,65,400 was needed for the establishment of

Table 4.11 Pattern of investment in different size of dalmills

(Rupees)

Sl. No.	Investment particulars	Size of the dalmills		Overall
		Small	Large	
Investment on				
1.	Land	3,00,000 (45.23)	5,00,000 (50.17)	4,00,000 (46.22)
2.	Buildings	1,53,857 (23.20)	2,14,348 (21.50)	2,00,233 (23.13)
3.	Machinary	1,89,285 (28.54)	2,62,174 (26.30)	2,45,167 (28.32)
4.	Borewell	20,000 (3.03)	20,000 (2.03)	20,000 (2.33)
	Total Capital (1+2+3+4)	6,63,142 (100.00)	9,96,522 (100.00)	8,65,400 (100.00)

Note: Figures in brackets indicate percentages the redgram processing unit, out of which, the investment made on land formed a major component with Rs. 4,00,000 (46.22%) followed by machinery (25.44%) and buildings (23.13%). A similar pattern of investment composition was observed both in small and large size dalmills. The extent of investment made on land was marginally higher in large size dalmills (50.17%), compared to small size dal mills (45.23 %). However, the proportion of investment on buildings and machinery was higher in small size dalmills with 23.20 and 31.55 per cent of total investment, respectively.

4.6.1.1 Procurement Cost of Redgram

The per unit cost of procurement of redgram by different categories of redgram processing units are presented in Table 4.12.

As indicated in the Table 4.12, the total quantity of redgram procured in normal size dalmills was 11,200 quintals, annually. However, small size dalmills procured only 5039.29 quintals as compared to 13,075.00 quintals procured by large size dalmills. With regard to procurement cost, on an average, the total cost of procurement of redgram worked out to Rs. 81.27 per quintal. The per quintal procurement cost in small size dalmills (Rs. 81.57) was marginally higher than that of large size dalmills (Rs. 79.01).

Table 4.12 Pattern of procurement and its costs in redgram Processing.

(Rupees)

Sl. No.	Particulars	Size of the dalmills		Overall
		Small	Large	
1.	Quantity of redgram procured (Q)	5039.28	13075.00	11200.00
2.	Cost incurred on (Rs/Q)			
	a. Transportation	4.09 (5.01)	2.62 (3.31)	3.93 (4.84)
	b. Handling	3.53 (4.33)	3.13 (3.97)	3.48 (4.28)
	c. Market fee	19.85 (24.33)	19.85 (25.12)	19.85 (24.32)
	d. Commission	39.70 (48.67)	39.70 (50.25)	39.70 (48.85)
	e. Gunny bags	14.40 (17.66)	13.71 (17.35)	14.31 (17.61)
3.	Total procurement cost	81.57 (100.00)	79.01 (100.00)	81.27 (100.00)

Note: Figures in the parantheses indicate percentages to total procurement costs.

Of the total procurement cost (Rs. 81.27/q), the expenditure towards commission paid formed a major component (48.84%) followed by expenses on payment of market fee (24.42%), cost of gunny bags (17.60%), transportation (4.83%) and handling charges (4.28%).

A similar trend of composition of total procurement cost was observed both in small and large size dalmills.

Of the total cost incurred by small and large size dal mills, commission charges and market fee accounted for largest cost in both the categories of dalmills. The remaining items of cost were higher in small units as compared to large units.

4.6.1.2 **Processing Costs of Redgram in different sizes of in Dalmills**

The per unit cost of processing of redgram in to dal by different categories of dalmills are presented in Table 4.13.

On an average, the total cost incurred in the processing of redgram workedout to be Rs. 2169.05 per quintal. However, the total cost per quintal of redgram processed in the case of small size dalmills (Rs. 2190.37) was marginally higher than that in the case of large size dalmills (Rs.2164.29). A similar pattern of total cost of processing was

Table 4.13 Structure of processing cost under different sizes of dalmills.

Sl. No.	Particulars	Size of dalmill				Overall	
		Small		Large		Amt. (Rs/Q)	% age
		Amt. (Rs/Q)	% age	Amt. (Rs/Q)	% age		
A.	**Fixed cost**						
1.	Depreciation	4.88	10.65	2.59	7.46	2.83	7.29
2.	Salaries for permanent staff	3.77	8.23	4.06	11.69	4.03	10.37
3.	Interest on fixed capital	19.55	42.68	11.99	34.53	15.74	40.52
4.	Int.on borrowed capital	14.78	32.26	14.39	41.44	14.43	37.14
5.	Insurance premium	1.75	3.83	1.10	3.17	1.17	3.01
6.	Corporation tax	0.68	1.48	0.44	1.26	0.47	1.21
7.	Licence fees	0.40	0.87	0.15	0.45	0.18	0.46
	Total fixed cost	45.81 (2.09)	100.00	34.72 (1.60)	100.00	38.85 (1.79)	100.00
B.	**Variable cost**						
1.	Cost of raw material	1800.00	83.93	1800.00	84.52	1800.00	84.50
2.	Cost of gunny bags	11.71	0.54	10.39	0.49	12.31	0.58
3.	Power charges	10.00	0.46	6.37	0.30	10.00	0.47
4.	Handling charges	3.13	0.15	2.53	0.12	3.49	0.16
5.	Transportation charges	4.09	0.19	2.62	0.12	3.94	0.18
6.	Wage for labour	8.92	0.41	8.18	0.38	8.26	0.39
7.	Repairs and maintenance	2.46	0.11	3.22	0.15	3.14	0.15
8.	sales tax	44.82	2.09	44.82	2.10	44.82	2.10
9.	Market fee and commission	34.72	1.63	34.72	1.63	34.72	1.63
10.	Office maint.	2.12	0.11	1.67	0.09	1.72	0.09
11.	Telephone charges	4.90	0.23	4.92	0.23	4.92	0.23
12.	Interest on working capital	217.69	10.15	210.13	9.87	202.88	9.52
	Total variable cost	2144.56 (97.91)	100.00	2129.57 (98.40)	100.00	2130.20 (98.21)	100.00
C.	Total cost per quintal of redgram processed (A+B)	2190.37		2164.29		2169.05	
D.	Total cost per quintal of output (dal)	2737.96		2705.36		2711.31	

observed when per qunital of output (dal) was taken into consideration.

It is worth noting that the total variable cost (Rs. 2130.20 per quintal), in general, formed a substantial component (98.21%) of the total cost of processing in redgram. The total fixed cost being Rs. 38.85 per quintal, accounted only 1.79 per cent of the total costs of processing. A similar trend of fixed and variable cost were observed both in small and large size dalmills. However, the extent of both fixed and variable costs in the total cost of processing were marginally higher in the case of small size dalmills as compared to large size dalmills.

Of the total variable cost, the cost of raw material (Rs. 1800/q) accounted for 84.50 per cent followed by interest on working capital (9.52%). The sales tax (2.10%), market fee and commission (1.63%), cost of gunny bags (0.58%), power charges (0.47%), wages of labour (0.39%), etc., were the other minor components of the total variable cost incurred in the processing of redgram. A similar proportion of components of the total variable costs were observed both in small and large size dalmills.

In general, the interest on fixed capital (15.74/q) formed the major component (40.52%) of the total fixed cost (Rs. 38.85 /q) followed by interest on borrowed capital

(37.14%), salaries for permanent staff (10.37%), depreciation (7.29%), insurance premium (3.01%) and so on. A similar trend was observed in small size dalmills. However, the interest on borrowed capital (Rs. 14.39/q) formed major component (41.44%) in the case of large size dalmills.

4.6.1.3 Pattern of Returns under Different Size Procesing Units

The pattern of redgram processed and the returns obtained under different sizes of dalmills is presented in Table 4.14 and Fig. 8.

In general, the total quantity of output obtained was found to be 8,793.20 quintals out of 11,200 quintals of total redgram processed, indicating 78.51 per cent of recovery. However, the percentage of physical recovery in the case of small size dalmills (79.00%) was relatively higher than that of large size dalmills (78.45%), indicating the higher physical efficiency of the small size dalmill.

The gross returns per quintal of output was found to be same (Rs.2,782.00) in both small and large size dalmills. However, the net returns per quintal of output in the case of small size dalmills (Rs. 44.04) was considerably lower than that of large size dalmills (Rs.74.64). A similar pattern of net returns obtained was observed both in small and large size dalmills, when per quintal of redgram processed was considered.

Table 4.14 Pattern of returns under different sizes of dalmills

Sl. No.	Particulars	Size of the dalmills		Overall
		Small	Large	
1.	Total quantity of redgram processed(q)	5039.28	13075.00	11200.00
2.	Total quantity of (Dal) output obtained(q)	3981.00 (79.00)	10257.78 (78.45)	8793.20 (78.51)
3.	Total value of main product(lakh Rs)	110.75	285.37	244.63
4.	Total value of by-product(lakh Rs)	4.17	12.30	10.40
5.	Gross returns(lakh Rs)	114.92	297.67	255.03
	a) Per quintal of redgram processed (Rs)	2280.53	2276.63	2277.04
	b) Per quintal of output(dal) in Rs.	2782.00	2782.00	2782.00
6.	Net returns			
	a) Per quintal of redgram processed (Rs)	90.16	112.34	107.99
	b) Per quintal of output (dal) in Rs.	44.04	76.64	70.69

Note: Figures in the parantheses indicate recovery percentage.

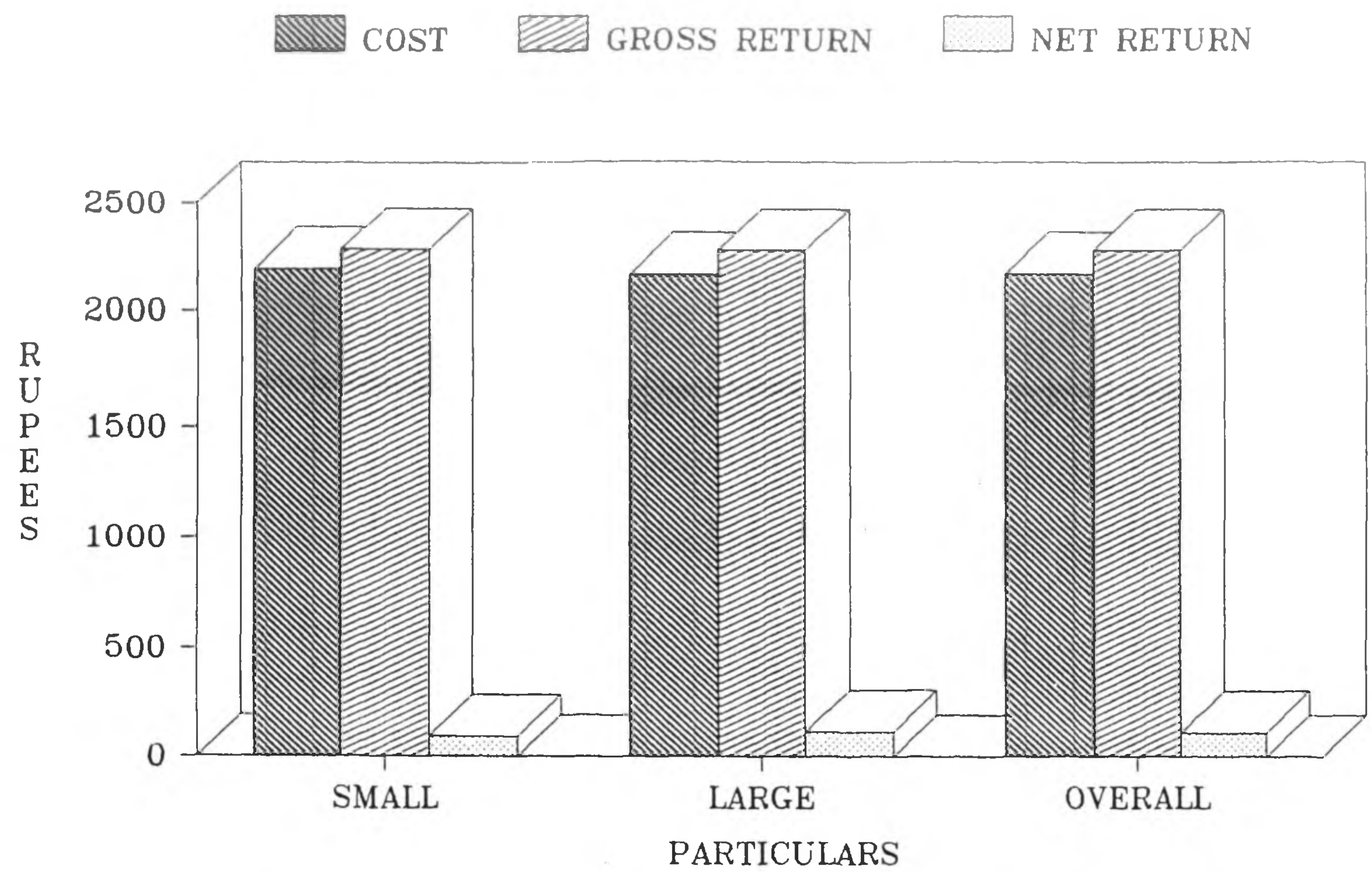

Fig. 8. PER QUINTAL COST AND RETURNS IN PROCESSING OF REDGRAM

Table 4.15 Business ratios in redgram under different size of processing units.

Sl. No.	Particulars	Size of the dalmills		Overall
		Small	Large	
1.	**Profitability Ratios**			
	a) Net profits to total assets	0.68	1.47	1.39
	b) Net profits to total sales (%)	3.95	4.93	4.74
	c) Returns on total capital employed	0.04	0.05	0.04
	d) Benefit cost ratio	1.04	1.05	1.04
2.	**Turnover Ratios**			
	a) Working capital turnover	1.06	1.06	1.06
	b) Fixed asset turnover	17.32	29.87	29.46
3.	**Efficiency Ratios**			
	a) Gross ratio (%)	96.05	95.06	95.25
	b) Operating ratio(%)	94.03	93.54	93.55

2. **Turn Over Ratios**

The results of the following turnover ratios are presented in Table 4.15.

a) **Working Capital Turnover Ratio**

The working capital turnover ratio was found to be same (1.06) for both the size of dalmills indicating the equal amount of rupee (Rs. 1.06) generated for every rupee of working capital invested.

b) **Fixed Asset Turnover Ratio**

It is evident from the Table 4.15 that the fixed asset turnover in the case of large size dalmills (29.87) was considerably higher than that of small size dalmills (17.32). On an average, dalmills have generated Rs.29.46 for every rupee of fixed assets.

3. **Efficiency Ratios**

The following efficiency ratios were workedout and presented in Table 4.15.

a) **Gross Ratio**

For an average size of dalmills, the gross ratio was workedout to be 95.25 per cent, indicating significance of total cost in the gross returns. However, the gross ratio in the case of small size dalmills (96.05%) was found to be marginally higher than that of large size dalmills (95.06%).

b) Operating Ratio

In general, the operating ratio was found to be 93.55 per cent. This clearly indicated that the operating costs were found to be 93.55 per cent of the gross returns. However, the operating ratio was marginally higher in the case of small size dalmills (94.03%) as compared to large size dalmills (93.54%).

4.6.3 Break Even Point in Redgram Processing Units

It is evident from the Table 4.16 that, on an average, a minimum quantity of 3,648.8 quintal of redgram dal should be produced so as to continue the production process without sustaining losses. Similarly, a minimum quantity of 3,788.30 quintals in the case of large size dalmills and 2,278.86 quintals in the case of small size dalmills need to be produced to cover the total fixed cost per annum.

4.7 Problems/Constraints in Production, Marketing and Processing of Redgram

The opinions of farmes and dalillers with erspect to problems/constraints associated with the production, marketing and processing activities were collected and summarized below.

Table 4.16 : Break-even point of production in redgram processing units

Size of the dalmill	Fixed cost per year (lakh Rs.)	Average variable cost per unit of output (dal) (Rs)	Average price per unit of output(dal) (Rs)	Break-even point (Annual basis)
Small	2.31	2680.70	2782.00	2278.86
Large	4.55	2661.96	2782.00	3788.30
Overall	4.35	2662.75	2782.00	3648.80

4.7.1 Problems Faced by Farmers

Opinion of sample farmers regarding problems associated with production, marketing and processing of redgram were gathered and presented in Table 4.17.

The high incidence of pests and diseases was the major problem faced by the farmers in redgram cultivation. All the sample farmers (100%) including both who have adopted IPM as well as those not adopted IPM have expressed the severety of the pests. The other major problem pertained to low level of prices (56%) of redgram with wide fluctuations (59.33%) especially during post harvest period as expressed by more than 72 per cent of both IPM and Non-IPM farmers. The scarcity of labour formed another major problem, felt (80%) by most of the farmers. The supply of poor quality pesticides (63.33%) at exhorbitant price (59.33%) were the other problems faced by the farmers.

4.7.2 Problems Faced by Redgram Processors

Opinions of sample processors regarding problems associated with processing of redgram were elicited and presented in Table 4.18.

Inadequate power supply was the major problem faced by the processors in redgram processing. All the processors (100%) including both small and large size dalmillers, have

Table 4.17 Problems/Constraints faced by the farmers production, marketing and processing of redgram.

Sl. No.	Problems/ Constraints	IPM Farmers No.	IPM Farmers %	Non-IPM Farmers No.	Non-IPM Farmers %	Overall No.	Overall %
1.	High incidence of pests & diseases	75	100	75	100	150	100
2.	Inadequate availability of labour	47	62	73	97	120	80
3.	Scarcity of water for Plant protection measures	46	61	43	57	89	59
4.	Supply of improper quality pesticides	44	58	51	68	95	63
5.	High output price fluctuations	54	72	56	74	110	73
6.	Low output price during harvesting	38	50	46	61	84	56
7.	High market charges	32	42	57	76	89	59
8.	Pollution from cement factories affecting crop growth.	29	38	45	60	74	49
9.	High cost of pesticides	34	45	48	64	82	55
10.	Lack of milling facilities	57	76	33	44	90	60
11.	Lack of knowledge of milling	32	42	20	26	52	35
12.	Manual preparation affects dal quality	37	32	33	44	70	47
13.	No demand for manually prepared dal	34	49	52	69	86	57
14.	Lack of support for redgram production	24	45	44	58	68	45

Note: 1. The percentage figures are rounded off.
2. The total percentages are more than 100 since each farmer has given more than one opinion.

Table 4.18 Opinion of sample processors regarding problems associated with redgram processing.

Sl. No.	Problems	Size of processors				Overall	
		Small		Large			
		No.	%	No.	%	No.	%
1.	Lack of availability of sufficient raw material.	-	-	4	17	4	13
2.	Inadequate transportation facilities	2	28	4	17	6	20
3.	High transportation cost	5	71	3	30	8	27
4.	High price of raw material	6	86	4	17	10	33
5.	High market fees and charges	7	100	23	100	30	100
6.	Scarcity of labour	6	86	14	61	20	67
7.	Inadequate power supply	7	100	21	91	28	93
8.	Statutory problem regarding stock limits	1	14	23	100	24	80
9.	Problems in getting finance	5	71	20	87	25	83
10.	Difficulties of handling facilities	4	57	5	22	9	30
11.	Difficult to sale their produce	4	57	3	13	7	23
12.	Problems of repairs and maintenance	6	86	8	35	14	47

Note: The percentage figures are rounded off.

expressed the poor supply of power. This has resulted in under utilization of the capacity of the dalmills. Similarly, all the dalmillers (100%) have expressed that the existing market fees and other charges were very high and needs to be rationalised. The scarcity of labour formed another problem as more than 85 per cent of the dalmillers felt it. The lack of suitable system to get the required capital for the redgram processing ws also felt by more than 80 per cent of dalmillers. The statutory provisions with regard to stock limits, etc., formed a severe constraint (>80%) in the sale of dal. In addition to above problems faced by both the categories of dalmillers, the small dalmillers felt that the prices of raw material (85%) and transportation costs (71%) were very high.

DISCUSSION

V DISCUSSION

The important results of the study are discussed in this chapter under the following heads.

5.1 Growth rate in Area, Production and Productivity.

5.2 Cropping Pattern of Sample Farmers.

5.3 Economics of Redgram Production
- IPM and Non-IPM Farmers.

5.4 Resource Use Efficiency in Redgarm Production
- IPM and Non-IPM Farmers.

5.5 Marketing Costs and Margins.

5.6 Economics of Processing.

5.7 Constraints in Production, Marketing and Processing of Redgram.

5.1 Growth Rate in Area, Production and Productivity of Redgram

The quadratic function was used to calculate growth rate in area while, cubic function was used for production and productivity as indicated in Table 4.1. There was a significant decline in area under redgram both for Gulbarga district and Karnataka State. This was mainly due to high incidence of pests and diseases in recent years which discouraged the farmers to take up redgram cultivation. Further, increase in the cost of cultivation coupled with the low and fluctuating prices of output as expressed by farmers during opinion survey have also contributed to the decline in area under redgram. Similar findings in pulses were reported by Chatha and Singh (1986). Therefore, it is suggested to demonstrate the Integrated Pest Management technology on a large scale since it is economically feasible as discussed in later sections, for efficient management of redgram pests. Along with this technology, the necessary measures like supply of quality pesticides at the required time, adequate quantity of biological components of integrated pest management, etc., need to be ensured for the adoption of this technology.

5.2 Cropping Pattern of Sample Farmers

Table 4.2 indicated that redgram dominated in kharif season (63.06%) among the crops cultivated by sample farmers, while, jowar (22.16%) followed by bengalgram (8.13%) and safflower (6.65%) were the major crops in the rabi season. Such a cropping pattern was mainly due to the uncertainty of kharif rains and relatively assured rainfall in the rabi season in the study area. Further, redgram being a drought tolerant crop, is best suited to Gulbarga district which normally receives less than 700mm rainfall annually. In addition, the poor resource endowment of farmers in the district restricted them to take up the cultivation of above crops as they were less capital intensive. Therefore, to encourage the farmers to increase production of redgram, the necessary infra-structure along with the improved production technology need to be developed.

5.3 Economics of Redgram Production - IPM and Non-IPM Farmers

In the cultivation of redgram (Table 4.3 through 4.6), it was found that there was no considerable difference in the cost of cultivation between the IPM and the Non-IPM farmers. However, there were differences in the structure of the cost components. It was observed that the IPM farmers used both human and bullock labour in relatively higher quantities than that of Non - IPM farmers. Similar findings in cotton were reported by Sripad Vishweshwar (1994). As such, the total cost incurred on labour by the IPM farmers (Rs. 3,630.57/ha) was also higher than that of Non-IPM (Rs. 3,400.76/ha) farmers. This was mainly due to intensive cultivation and adoption of of recommended practices by the IPM farmers.

It is interesting to note that the IPM farmers have used more of manures and fertilisers while, Non-IPM farmers used more of the plant protection chemicals. Since, the IPM farmers had been exposed to demonstrations, the extent of use of inputs were as per recommendations, whereas, the Non-IPM farmers have used more of nitrogen and less of phosphorus and potash and thereby, resulting in an imbalanced use of chemical fertilizers. Similarly, through the indiscriminate use of chemical pesticides, the Non-IPM farmers have incurred relatively higher cost on plant protection measures. In the case of IPM farmers, even though the use of chemical pesticides still dominates (63.12%), the cost on plant protection measures was found to be lower than the Non-IPM farmers mainly due to the use of non-chemical pesticide materials like NPV, traps, etc. Among the non-chemical pesticide materials, the expenditure on NPV (30.59%) formed the major expenditure followed by pheromone traps/neem extracts and formulations (17.62%), chrysoperla larvae (14.70%) and so on. Therefore, in order to reduce the cost on plant protection measures the use of non-chemical pesticides need to be increased. Further, the supply of adequate quantity of biological agents as well as non-chemical pesticide materials need to be ensured by developing the necessary infra-structure and system for their production.

Consequent upon the higher yields of redgram (9.60/q) obtained by IPM farmers, the net returns were also found to be considerably higher in IPM farmers (Rs. 10,108.09/ha) as compared to Non-IPM farmers (Rs. 7,840.10/ha). Similar higher yields as well as returns in IPM farmers were also observed by Battur *et al.* (1989), Ramamoorthy (1990), Patil (1992) and Sripad Vishweshwar (1994). Consequently, both farm business income and income to the family labour were also higher in IPM farmers, compared to Non-IPM farmers. Though the extent of use of chemical pesticide was reduced considerably, there was no reduction on yield in the case of IPM farmers. The yield levels of IPM farmers could be attributed mainly due to the effectiveness of IPM technology in the control of pests and the balanced use of nutrients. Thus, it can be concluded that the adoption of IPM technology was profitable over conventional practices in redgram cultivation. Therefore, necessary measures need to be taken for large scale adoption of IPM technology and thereby, increase the production as well as returns to the farmers. For this purpose, as suggested earlier the infrastructure like laboratory for multiplication of biological agents need to be augmented at Gulbarga so that the adequate quantity of these elements can be readily provided.

5.4 Resource Use Efficiency in Redgram Production -IPM and Non-IPM Farmers

The production function estimates (Table 4.7) have clearly indicated that the choosen factors of production have significantly infuenced the production of redgram both in the IPM and the Non-IPM farmers by 86.58 and 96.32 per cent, respectively. However, there were considerable differences in the extent of influence of different factors on the production of redgram. Land and fertilisers were found to influence the production significantly in both the type of farmers. The effect of farm yard manure was significant in Non-IPM farmers.

It is worth noting that the influence of plant protection chemicals on redgram production in the case of Non-IPM farmers was negative and statistically significant. Similarly, the ratio of MVP to MFC (Table 4.8) was also negative (-2.5800) in Non-IPM farmers. This clearly indicated that the plant protection chemicals which were largely ineffective, were thus used excessively by Non-IPM farmers, resulting in negative returns. The MVP of bullock labour was also negative in Non-IPM farmers, indicating its excessive use beyond the optimum level in redgram production. The bullock power is being used for various operations in excess of their actual requirement since they were self owned and often idle. Similarly, there is a general tendency among farmers to take up plant protection measures like spraying and dusting at regular intervals indiscriminately, irrespective of the incidence of pests which adds to the cost of cultivation. Therefore, plant protection inputs have yielded negative returns in redgram production. The regression coefficients of plant protection chemicals was positive (0.1900) in the case of IPM farmers. Further, the ratio of MVP to MFC being 1.0235 was nearer to one has clearly indicated the plant protection chemicals were used optimally by IPM farmers. This was mainly due to adoption of IPM and recommended package of practices by the IPM farmers who had been exposed to crop demonstrations. Therefore, as suggested in earlier sections, there is a need to educate the farmers on the benefits of IPM technology through various extension activities so that its adoption can be extended to benefit larger sections of farmers. For this purpose, the other suggestions hither to made need to be implemented.

The regression coefficients of human labour were found to be statistically non-significant in both the categories of farmers. However, the ratio of MVP to MFC was less than one in IPM (0.6255) as well as Non-IPM (0.1605) farmers indicating the high attendents cost of human labour in the area. Therefore, there is a need to educate the farmers for judicious use of human labour so as to reduce the cost of cultivation.

The sum of output elasticities in the case of IPM farmers (1.33) was more than one, indicating an increasing return to scale which was mainly due to the significant influence of land and fertiliser inputs. The increasing returns to scale has clearly revealed that there is scope to increase the redgram production by increasing especially its area and fertilizers. In the case of Non-IPM farmers, the sum of output elasticities (0.506) was less than one, indicating a decreasing return to scale. Hence, there is no scope to increase the production due to overwhelming negative influence of plant protection chemicals over other inputs as evidenced earlier. Therefore, the IPM technology need to be extended to those farmers who have not adopted so far, through extension activities and other measures suggested earlier. This would, on one hand, cut down the plant protection costs of the Non-IPM farmers, and on the other, increase their redgram yields through improved protection.

5.5 Marketing Costs and Margins

It was observed from the Table 4.9 that the commission charge paid by the farmers formed a considerable proportion (60.91%) in the total marketing cost. It was shocking to note that the commission agents were involved in extracting the commission from the producer-seller (farmer) eventhough it is prohibited as per Karnataka Agriculture Produce Marketing Regulations (KAPMR) Act, 1966. This fact was also emphasized by all of the sample farmers during the opinion survey. It was also observed that the commission agents were getting commission from purchasers (Dalmillers) too. The commission agent obtained Rs. 52.85 per quintal as the margin which forms about 2.80 per cent of whole sale price. This clearly indicates that the commission agents were not only getting commission from the sellers but also the purchasers and the extent of such commission (2.80%) obtained was also higher than the 2.00 per cent fixed as per the Karnataka Agriculture Produce Marketing Regulations Act, 1966. It is also interesting to note that by incurring 1.00 per cent of the

Dalmiller sale price as cost of transactions, the commission agent obtained more than 2.32 per cent as the net margin. This again revealed that the commission agents, with less service to the farmers, realised higher profits by violating the regulations. Therefore, necessary measures may be taken to enforce the regulation of the Act so as to protect the farmers since their share in the price paid by the dalmiller was found to be relatively lower.

The net price received by the farmers (Rs. 1,714.73/q) formed 75.30 per cent of the price paid by the dalmiller after taking into account of marketing costs incurred by the farmers. However, after considering the cost of production, the net returns (Rs. 384.73/q) was only 16.90 per cent of the price paid by the dalmiller. Therefore, to increase the share of the producer, the vertical integration need to be developed wherein the farmers can take up marketing and processing activities themselves through cooperatives or other such means.

5.6 Economics of Processing of Redgram

For conversion of redgram grain into dal, different activities need to be performed which need large capital investment. There are different sizes of dalmills operating and their performance is assessed based on costs and returns in addition to business performance indicators. The main findings are discussed below.

5.6.1 Pattern of Investments, Costs and Returns under different sizes of Dalmills

The pattern of investment in redgram processing units (Table 4.11) indicated a direct relationship between the extent of capital investment and the size of the dalmill. Similarly, both procurement cost and processing cost per unit of output processed was also marginally higher in small size dalmills as compared to large size dalmills. This was mainly due to internal economies of scale and the distribution of over head costs.

Out of the total procurement cost (Rs.81.27/q), the commission paid (Rs.39.70/q) formed the major (48.84%) component followed by market fee (24.32%) and cost of gunny bags for packing (17.60%). A similar pattern of structure of procurement cost was observed both in small and large size dalmills.

The structure of the processing cost clearly indicated that the variable cost (Rs.2,130.20/q) was the significant component (98.21%) of the total processing cost. The fixed cost was only 1.79 per cent of the total processing cost. A similar trend was observed both in small and large size dalmills. Out of the total variable cost, the cost of raw material (Rs.1,800/q) alone was about 84.50 per cent of the total variable cost. In general, the cost per quintal of output of dal was found to be Rs.2,711.31 per quintal. This indicated that there is need to increase mainly the procuring efficiency of processing units so as to reduce the processing cost per unit of dal processed in order to benefit both the dal millers and the ultimate consumers.

Even though the investment was higher in large size dalmills, the gross returns were also higher in large size dal mills (Rs.297.67 lakhs) as compared to small size dalmills (Rs.114.49 lakhs). In contrast to the capital employed, cost of procurement and cost of processing, the net returns per quintal of both redgram processed and output (dal) were considerably higher in large size dalmills, compared to small size dalmills. The net returns per quintal of redgram processed in large size dalmills were Rs.112.34 as against Rs.90.16 in small size dalmills. Similarly, the net returns per quintal of output produced (dal) was also considerably higher in large size dalmills (Rs.76.64/q), compared to small size dalmills (Rs.44.04/q). A similar findings were also reported by Amrutha (1994) in rice mills. The higher returns among large size dalmills was mainly due to the economies of large scale production as stated earlier. The quantity of redgram procured and processed by the large sized dal mills was nearly two and half times of that of the small sized dalmills. Thus, it can be concluded that the large size dalmills earn more profit by large scale production of dal. Therefore, in order to increase the net returns to the small size dalmills their efficiency needs to be improved by maximising their capacity utilization by increasing their working capital base. It is also necessary to provide facilities such as necessary infrastructure, regular supply of power, transportation, and so on.

5.6.2 Business Ratio Analysis

The business ratios were worked out to know the cost efficiencies and profitabilities of different categories of redgram processing units.

As indicated in Table 4.15, the profitability ratios were relatively higher in large size dalmills as compared to small size dalmills, mainly due to the lower levels of processing cost as stated in the earlier section. This again strengthens our conclusion that the operation of large size dalmills are profitable.

In the case of turnover ratios, the working capital turnover ratio (1.00) was on par in both the types of dalmills. However, the fixed asset turnover ratio was considerably higher in large size dalmills (29.87) as compared to small size dalmills (17.32), indicating the higher the efficiency of fixed assets employed in large size dalmills. This also indicates that the small size dalmills were not using their fixed assets efficiently in redgram processing. Therefore, there is need to improve the performance of small size dalmills as indicated earlier.

The efficiency ratios (Table 4.15) clearly revealed that more than 95 per cent of the returns was consumed by the costs in both small and large size dalmills. There was no much differences in gross as well as operating ratio's in both small and large size dalmills. Thus, there is need to reduce the cost of processing so as to increase the income to the dalmillers.

5.6.3 Break-Even Point of Output in Redgram Processing Units

Table 4.16 revealed that quantity of output required to reach break-even point was 3,788.3 quintals of output (dal) in large size dalmills, whereas, it was 2,278.6 quintals of output in the case of small size dalmills. However, both small size dalmills (3,981 Q) and large size dalmills (10,257 Q) have produced more than the break-even volume of output, indicating that both the categories of dalmills were running under profitable lines. Further, the variations in break-even point output of these redgram processing units was due to the variations in the fixed cost and the quantity of output produced.

SUMMARY
AND
IMPLICATIONS

VI SUMMARY AND POLICY IMPLICATIONS

6.1 Introduction

Redgram is most important pulse crop of tropical and sub-tropical regions of the world. It ranks second among important pulse crops next to the bengalgram. Its main use are as dal, crushed dry seeds as animal feed and green leaves as fodder. Redgram being a drought tolerant, is well suited for low rainfall tracts of Karnataka state especially Gulbarga district. Though the area under this crop is increasing, its cultivation is under threat in recent years due to increased incidence of pests. Farmers are using several methods to control these pests, however, the integrated pest management is being advocated as a better alternative to the conventional systems of pest control measures. Therefore, the evaluation of IPM practices for economic feasibility is essential.

Although the production of redgram has increased over the years, producers are not getting remunerative price for their produce, whereas, consumers have to pay very high price. Hence, immediate attention is needed to increase the efficiency of marketing by reducing the marketing cost on one hand and lowering down the cost of processing on the other. Processors are also one of the important market functionaries connected between producer and consumer. Keeping in view of the above issues having importance in redgram production in the study area, an attempt has been made to study the economics of production, marketing and processing of redgram in Gulbarga district of Karnataka state with the following specific objectives.

1. To analyse the growth trend in area, production and productivity of redgram,

2. to evaluate the economics of Integrated Pest Management in redgram and to find out its relative profitability,

3. to study the resource use efficiency in redgram production by IPM and Non-IPM farmers,

4. to study the existing system of marketing, processing and their associated constraints and

5. to assess the economics of processing of redgram.

6.2 Methodology

The present study was carried out in Gulbarga district of Karnataka state which was selected purposively since it ranked first in the area under redgram cultivation in the state as well as the operation of centrally sponsored "Integrated Pest Management Demonstration - cum - Farmers Field School (IPMD and FSS) " on redgram. Out of 10 taluks *in the* district, 3 taluks namely, Chitapur, Sedam and Gulbarga were selected based on the highest area under the crop and the operation of IPMD and FSS scheme. In each taluka, 3 villages were selected based on the procedure adopted for selection of taluks. In all 150 sample farmers comprising 75 each of IPM and Non-IPM adopted farmers from the 9 selected villages. Similarly, 30 market functionaries and 30 processors were also choosen for the study. The required data as per set objectives were collected from sample farmers and other market functionaries including the processors by personal interview method with the help of pre-tested questionnaire specially prepared by the purpose. The data pertained to 1995-96 years.

6.3 Analytical Techniques Employed

The technique of tabular presentation was adopted to study the cropping pattern of sample farmers, labour use pattern, costs and returns from redgram production, problems in production, marketing and processing of redgram, investment pattern, returns from processing, efficiency of different categories of dalmills and constraints associated with redgram processing.

Growth rate analysis was performed by using quadratic and cubic functions to know the growth in area, production and productivity of redgram over a period of time.

The Cobb-Douglas production function was employed for analysing the resource use efficiency in redgram production.

6.4 Findings of the Study

The most important findings of the study are summarised below:

1. Cropping pattern of the sample farmers was dominated by redgram (63.06%) in kharif season and jowar in rabi season (22.16%).

2. The area under redgram has declined significantly during 1981 to 1994 both in Gulbarga district and Karnataka state as a whole. However, there was positive trend in growth of production and productivity of redgram in Gulbarga.

3. IPM farmers used recommended level of manures and fertilisers whereas, Non-IPM farmers used considerable extent of nitrogenous fertilisers and plant protection chemicals.

4. Eventhough the cost of cultivation in IPM farmers (Rs.12,041.88/ha) was marginally higher than the Non-IPM farmers (Rs.11,842.35/ha), the net returns accrued was also higher (Rs.5362.42/ha) mainly due to higher levels of yields in IPM farmers (9.60 q/ha) as compared to Non-IPM farmers (8.36 q/ha).

5. Distribution of cost incurred on Integrated Pest Management indicates that about 63.12 per cent of the total cost was still incurred on chemical pesticides while, 36.88 per cent incurred on Non-chemical pesticide.

6. The production function estimates indicated that output elasticities of land and fertilisers have significant influence on the redgram yield in both IPM and Non-IPM farmers, whereas, bullock labour was excessively used in both the cases. Plant protection chemicals had positive influence (0.1900) in IPM farmers while it was negative (-0.3000) in Non-IPM farmers.

7. The sum of output elasticities (1.33) was more than one in IPM farmers indicating increasing returns to scale whereas, it was less than one (0.50) in non-IPM farmers indicating decreasing returns to scale.

8. The ratios of MVP to MFC were greater than one for land, bullock labour, seed, plant protection chemicals and fertilisers in IPM farmers. Similarly, it was more than one for land, farm yard manure, seeds and fertilisers in Non-IPM farmers, indicating that there is scope for using additional units of these inputs to increase the gross returns.

9. The farmers are paying the commission charge of Rs.51.94 per quintal (60.91% of marketing cost) against the regulation.

10. The farmer obtained about 79.05 per cent of the price paid by the dalmiller at farm level.

11. Investment pattern in dalmill processing units indicated the direct relationship between total capital employed and size of the dalmills.

12. On an average, total cost incurred on per quintal of redgram processing was Rs.2169.05 and per quintal of output (dal) was Rs.2,711.31. Out of the total cost, variable cost formed more than 98.2 per cent while, fixed cost was less than 1.79 per cent.

13. The net returns per quintal of redgram processed was higher in large size (Rs.112.34) dalmills as compared to small size (Rs.90.16) dalmills.

14. Business ratio analysis showed that the large size dalmills were more efficient and thereby earned more profit, compared to small size dalmills.

15. Break-even quantity of output in large size dalmills was 3988.30 quintals as against 2778.86 quintals in small size dalmills. However, both the categories of dal mills produced more than the break-even level of output.

Policy Implications

The implications that have emerged from this study are summarized below :

1. The growth rate in area under redgram has declined both in Gulbarga district and Karnataka state mainly due to higher incidence of pests and high cost of cultivation. Therefore, there is a need to identify a more effective and low cost pest control strategy alongwith the other measures to tackle the problems of the farmers. The IPM based cultivation, which was found profitable, needs to be demonstrated and disseminated effectively so as to encourage the farmers to rejuvenate redgram cultivation in the district and increase its productivity. The services of Non-Government Organisations (NGO's) may be utilised for the effective implementation of the above programmes. For the large scale adoption of IPM technology, the necessary IPM components need to be made available. For this purpose, a large scale comprehensive infrastructure needs to be established at Gulbarga for large scale productiion of biological agents necessary for the implementation of IPM.

2. The farmers were using excess of human labour resulting in increased cost of cultivation. Therefore, to reduce the cost, the use of labour saving devices like harvesting

machines needs to be deviced and made available to the farmers.

3. The resource use efficiency in redgram clearly indicated that the use of plant protection chemicals and bullock labour was excessive while, the remaining were under-utilised. This indicates the necessity of proper education to farmers about the optimum use of inputs through whole farm demonstrations.

4. The proliferation of spurious pesticides in the case of redgram pod borer has increased the cost of plant protection. Therefore, there is need to strictly monitor the quality of plant protection chemicals available in the market. A pesticide quality analysis laboratory may be setup at Gulbarga.

5. The illegal commission charges levied upon the farmers by the commission agents need to be curbed so as to protect the returns to the farmers.

6. The returns to the farmers can be improved and so also the operational costs of the dalmiller reduced by avoiding the existing marketing middlemen through organisation of their cooperatives which would undertake vertically procurement, transport, processing and distribution activities. This would also benefit the consumers.

7. In the face of high cost of cultivation and erratic prices of redgram, the production of redgram faces an uncertain future. The Government, besides the IPM based cultivation practices, should initiate the supplementary measures such as stabilization of redgram prices, crop insurance schemes, further research and development to refine the technology.

8. The higher operational expenditure coupled with poor capacity utilisation of dalmills resulted in their poor performance especially in small size dalmills. Therefore, in order to improve their efficiency, modernisation of processing units with the adoption of improved technology/techniques needs to be taken up. In addition, regular supply of power and other infra-structure facilities are to be provided for fuller capacity utilisation of dalmills.

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APPENDICES

APPENDIX I

Schedule A

I. General Information :

a> Name : e> Village :

b> Main Occupation : f> Taluka :

c> Subsidary occupation :

d> Land holding (Acre) : Dry......... Irrigated.........

II. Cropping pattern (1995-96)

Field Name/ Survey No.	Season	Crop	Variety	Area	Dry/Irrg.
	Kharif				
	Rabi				
	Summer				

III. Costs and returns of Redgram production

a) Area (Acres) ; .... b) Variety...........

c) IPM : Adopter/Non-adopter

d) Cost of cultivation

Operations	No.of times	Material input			labour input					
		Qty.	Rate (Rs/ unit)	Value Rs	Men		Women		Bullock	
					F	H	F	H	F	H
1	2	3	4	5	6	7	8	9	10	11
1. Land preparation - Ploughing - Harrowing										
2. FYM & its application										
3. Seeds & sowing										

Contd...

1	2	3	4	5	6	7	8	9	10	11
4. Fertilizer and its application										
- Nitrogen										
- Phosphorus										
- Potash										
5. PPC & its application										
6. Weeding & Hoeing										
7. Harvesting										
8. Threshing										
9. Winnowing/Bagging /etc										
Total										

Note : F : Family labour H : Hired labour

e. Details of Plant protection measures followed :

Item	Spray/Dust	Name of PPC used	Qty.	No. of labour used	Cost/value (Rs.) (Mandays)
I. Application					
II. Application					
III. Application					
IV. Application					
V. Application					
VI. Application					
VII. Application					

f) Fixed costs :

Particulars	Rate (Rs/Ac)	Total value (Rs)
1. Land Revenue		
2. Rental value of land		
3. Rent paid for leased in land		
4. Rent paid forleased out land		

g) Returns :

product	Quantity (Q)	Rate (Rs./Q)	Value (Rs.)
Main-product			
By-product			
- Pod hust			
- Stalk			

IV (a) Disposal pattern :

1) Quantity sold (Qt.) :......................

2. Price (Rs./Qt) :......................

3. Value (Rs.) :......................

4. Month of sale :......................

5. Place of sale :......................

6. Method of sale :......................

7. To/through whom sold CA/Miller/Villge Merchant/Itinary trader

8. Quantity retained for a> Seeds :..................

b> Consumption :..................

c> Kind payment:..................

IV. (b) Cost incurred in Marketing

Items	Rs/Qt.	Labour /Mandays
1. Gunny bags		
2. Loading		
3. Transportation		
4. Unloading		
5. Cleaning		
6. Packing		
7. Weighment		
8. Commission charges		
9. Personal expenses		
10. Miscellaneous		
Total		

c) Storage pattern and its costs :

1. Quantity stored (Qt) :....................
2. Period of storage (days) :....................
3. Type of storage(Bags/Bins/Other) :....................
4. Rental value of place of storage :....................
5. Cost of chemical used during storage :....................

d) Procesing under taken : YES/NO

If yes

i. Quantity. processed (Qt) :

ii. Mode of processing : Manua/Floor Mill/Dal mill/other

iii. Cost of processing (Rs/Qt) :

iv. Returns from processing

Output of processing	Quantity	Price (Rs.)
Dal (Qt)		
Tur husk (Qt)		

v. Constraints in production/Marketing/Processing :

1.
2.
3.
4.
5.
6.

APPENDIX II
Schedule B

Commission agents/Wholesale agents/Co-op.society/Dal miller

I a. Name of the respondents b. Edcucation
c. Location d. Age
e. Ownership pattern ; Individual/Partner/Another

II. a. Pulses usually handled
1. 3.

2. 4.

b. Do you handle commodities other than pulses Yes/No.

III. From how long you are in the business ?

IV . Do you make outright purchases on the field and transport it on your own ? Yes /No. Give details

V. What facilities do you provide to the producer, who brings his produce for sale ?

Storage/loading/boarding/transport/bags

VI. do you have any processing units ? (C/W/Crop)

a. How much quantity do you handle/season ?
b. Do you make purchase on processing unit or purchasing the produce from producer and then sending to processing units ?

c. Do you hae any contract agreement with Dal Millers ?

VII. Do you give credit faciilties to the farmers who sells his produce through you ? YES/No.

a. If yes,

1. To how many farmers ?
2. The maximum duration for which the amount is advanced ?
3. Conditions for advancing loans
4. Mode of recovery followed
5. Interest rate
6. Amount advanced.

b. Do you provide any iputs to farmer ? Yes/No.

If Yes

Fertilizer/good quality of seeds/insecticides.

VIII. Investment made in the business.

a. Owned amount b. Borrowed amount c. Interest rate

IX . Major purchase made by using

a. Owner amount (%) b. Commission basis (%)

X. a. Knowledge of different qualities/grades/standards of different pulses in -little/average/perfect

b. do you know the arrival/prices of different pulses prevailing in

1. Local markets Yes/No
2. Other markets Yes/No.

c. Through which media you will get information on market situation ?

1. Through personal visit
2. Through neignbour
3. Through newspapers/Radio
4. Through Telephones.

XI. Difficulties you are experiencing in pulse marketing

1. 2.
3. 4.

XII. Do you grade the pulses ? Yes/No.

a. Do you make payments to producer according to the rules of grading ? Yes/No.

b. Methods used in fixing the prices.

1. 2.
3. 4.

III. Policies that are followed towards setting prices.

. Open auction
. Price leadership (declared by dominant buyer)
. Agreement among buyers
. Trait coordination.
. Tender system

V. Policies that are aimed at rivals

. High prices
. Low prices
. Reducing average costs (by old firm)
. By area of operation and quantity handling.

V. Labour employed in marketing of pulses :

mployees	Number	Nature of work	Salary	Any other payments
. Permanent				
. Casual				
. Family				

VI. a. Shop rent (including electricity and other charges)
b. Licence fee
c. Taxes paid (in detail and basis of taxes)

1. 2.
3. 4.

d. Maintenance costs
e. Any other costs (if any, specify)

1. 2.
3. 4.

APPENDIX III
SCHEDULE C

I. 1. Name of the respondent (Processor) :
   2. Main occupation :
   3. Subsidary occupation :

II. 1. Type of processing unit (size) :
   2. Year of Establishment :
   3. Installed capacity :
   4. Sources of power supply :

III. Investment on processing unit :

a. Fixed costs :

Items	Year of purchase/ establishment	Value (Rs.)	Useful life period (Years)	Annual Depreciation (Rs/Yr.)
1. Land				
2. Building				
- Processing				
- Storage				
3. Borewell/openwell				
4. Machinary & equipments				
5. Salary to permanent employees (Rs.)				
6. Capital borrowed (Rs.)				
7. Interest on borrowed capital (Rs.)				
8. Licence fee (Rs.)				
9. Local/Corpn. Taxes (Rs)				
10. Insurance premium (Rs.)				
11. Telephone charge				
12. Sales tax				
Commission charge				
Market fee				

b. Variable costs :

Items	Qty/No.	Rate (Rs/Unit)	Amount (Rs.)
1. Power charges			
2. Repairs and maintenance			
3. Office maintenance			
4. Wages to casual labour			
5. Marketing costs			
a. Gunny bags			
b. Transport			
c. Handling			
d. Market fee			
6. Any other			

IV. Employment of Labour :

	MEN			WOMEN			CHILDREN		
Month	No. of lab.	Mode of employ.	Wage paid	No. of lab.	Mode of employ.	Wage paid	No. of lab.	Mode of employ.	Wage paid
Jan									
Feb									
Mar									
Apr									
May									
June									
July									
Aug									
Sept									
Oct									
Nov									
Dec									
Total									

V. Storage particulars :

a. Quantity stored (Qt)
b. Storage cost (Rs/Qt)
c. Price difference (Rs./Qt)
(Purchase and sale price).

b. Variable costs :

Items	Qty/No.	Rate (Rs/Unit)	Amount (Rs.)
1. Power charges			
2. Repairs and maintenance			
3. Office maintenance			
4. Wages to casual labour			
5. Marketing costs			
a. Gunny bags			
b. Transport			
c. Handling			
d. Market fee			
6. Any other			

IV. Employment of Labour :

	MEN			WOMEN			CHILDREN		
Month	No. of lab.	Mode of employ.	Wage paid	No. of lab.	Mode of employ.	Wage paid	No. of lab.	Mode of employ.	Wage paid
Jan									
Feb									
Mar									
Apr									
May									
June									
July									
Aug									
Sept									
Oct									
Nov									
Dec									
Total									

A. Storage particulars :

a. Quantity stored (Qt)
b. Storage cost (Rs/Qt)
c. Price difference (Rs./Qt)
(Purchase and sale price).

VI. Procurement of Redgram :

Through the agency	Qty proc. (Q)	Price (Rs/Q)	Cost of Procurement (Rs.)				
			Transport.	Loading/ unloading	Gunny bag	Comm- ission	Total cost
Commission agent							
Co-op. society							
Village merchant							
Itinarary trader							

VII. Redgram processed :

Month	Qty. processed (Q)	Wastage (Q) (%)
Jan		
Feb		
Mar		
Apr		
May		
June		
July		
Aug		
Sept		
Oct		
Nov		
Dec		
Total		

IX. Returns

Particulars	Qty. (Qt)	Price (Rs/Qt)	Total value (Rs.)
Main produc			
By-product			
- Chunni			
- Bhusa			

VIII. Disposal of the product (Dal)

Month	To/Through the Agencies				Total	
	Wholesaler		Co-op society			
	Qty.	Value	Qty.	Value	Quantity	Value
Jan						
Feb						
Mar						
Apr						
May						
June						
July						
Aug						
Sept						
Oct						
Nov						
Dec						
Total						

X. Processing problems/Constraints

1. Procurement problems

a. Availability of tur ; Regular/Irregular
   If irregular, what alterntive shave been made
   (Storage, or not running mill)

b. Transportation facilities :Adequate/inadequate/costly/moderate

c. Problems in Market :
i. Distance from the market : Near/Far away
ii. Price condition in the market
    Procurement : Fair/High
iii. Market fees and charges : High/Reasonable
iv. Handling facilities (Labour availability)
    Easy/Difficult.

2. Storage problems ;

a. Availability of Gunny bags : Timely/Not available
b. Availability of space : Adequate/Inadequate
   If inadequate, what alternative arrangement smade
c. Percentage loss during storage : 5,10,15,20,25,30,40,50.

3. Processing problems :

a. Power supply : Continuous/intermittently/breakdown
   period of breakdown (days)

b. Availability of fuel : Sufficnent/insufficnent
   If insufficnet what alternative arrangement for power supply,

c. Labour : i> Available sufficiently/Not available
   If not available, what alternative arrangement made
   ii> Mode of employment : Daily/Weekly/Monthly/yearly.

4. Problems in marketing of Dal :

a. Availability of customers : Good /poor

b. Transport facilities Adequate/inadequate
   If inadequate, what alternative arrangemetn made.

5. Finacial problems :

a. Source of finance
b. Problems in getting finance
   Adequate /Inadequate
c. Maintenance of machnery and equipments
   Timely/Untimely.

6. Any statutory problems with regard to Tur processing business

i.
ii.
iii.

7. Any other problems :

APPENDIX IV
INTEGRATED PEST MANAGEMENT COMPONENTS

The following sequence of pest management methods involving physical, mechanical, biological method can be adopted.

1. Fall ploughing to expose the pupae to hot sun and natural enemies.

2. Crop rotation with least prepared host which will prevents the multiplication of pests.

3. Intercropping of redgram with jowar, bajra, seasmum and seteria.

4. Sowing should be done at a time on co-operative basis.

5. Fix tree branches are biforcated wooden poles to serve as bird percha, such structure provide to place for insectious birds to prea *Helicoverpa* on interruptedly

6. Use of 5 sex pheromone traps per hectare placed at a distance of 10 meter from ech other during cropping period to monitor the pest incidence. Trap colllection of 5 adult male moth per trap per night indicates the initiation of pest activity.

7. The spraying of NPV 250 LE per hectare with 0.1 per cent teepol or soap powder and 0.2 per cent jaggery solution is to be initiated when the egg load reaches 2 per plant or one larvae per plant.

8. Second sprays should be with neem seed kernal extract, which is harmless to natural enemies.

9. Third sprya with insecticide.

10. Wherever spraying is not fesible desting with 30 kg per hectare of insecticidal dust may be taken up.

11. Grown up caterpiller can not killed by insecticides hence hand collection ensures elmination of pest.

12. Same insecticides should not be used repeatedly.

13. Effective control is possible by mixing NPV with insecticides.

14. Wherever 4th spraying is necessary use pyrethroids.

15. More than one application of synthetic pyrethroid should be avoided.

16. Avoid use of battery operated ultra low volume sprayer.

17. Use recommended doses of insecticides.