Report No.142

ESTIMATION OF PRE AND POST-HARVEST LOSSES AMONG PADDY AND REDGRAM CROPS IN ANDHRA PRADESH

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PREFACE

India, as it attains the status of most populous country in the world not so long in the future, will have to face the greatest challenge of self-sufficiency in food production. Though research in agriculture mostly focused on raising crop yields all through the years, efforts in conserving the grain in pre and post-harvest processes was not given adequate importance. A significant amount is lost in this area. The onus of reducing these losses is on the farmers and the government, as it contributes to the raised income to the former and lessens the burden on the food security programme of the latter by way of lower commodity prices. Studies in this area are far and few.

Though a few studies were conducted in the past by the Agriculture Ministry itself, it felt the need to have a more detailed look at this crucial area. Hence, at the instance of the Ministry of Agriculture, Government of India, Agro-Economic Research Centre, Visakhapatnam, along with other centres, participated in this coordinated study.

As it has been brought out from the study, the pre-harvest losses, at 15 per cent, are nearly 3 times higher than the post-harvest losses. To cut down these losses significantly, a concerted effort is necessary by the government's extension officers and the scientists. Post-harvest losses at 3 to 4.5 per cent are easier to trim down due to its predictability. An accessible subsidized storage infrastructure at village level would go a long way in addressing this issue.

In conducting this study, the team involved had taken meticulous care at every stage of work starting from sample selection to report writing. I take this opportunity to thank them all, especially Mr. N. Ramgopal and Dr. K.V. Giri Babu. I appreciate K Ramesh in word processing the report neatly. I also thank Professor Parmod Kumar, Head, Agricultural Development and Rural Transformation Centre, and Dr Elumalai Kannan, Institute for Social and Economic Change, Bengaluru for timely guidance and coordinating the study.

(Prof P. TARA KUMARI)
Honorary Director

Executive Summary

The area under paddy crop in Andhra Pradesh has increased from 30 in 1990-91 to 39 lakh hectares by 2009-10. The production of paddy crop in Andhra Pradesh has also increased from 92.31 lakh tonnes in TE 1992-93 to 114.95 lakh tonnes in TE 2001-02, and further to 128.15 lakh tonnes by TE 2009-10, showing thereby 40 percent rise in paddy production during the two decades with the decade 2000s showing the major increase in this respect. The substantial increase in paddy production in Andhra Pradesh during the last two decades is due to perceptible increase in yield level of paddy crop during this period, which has increased from 2340.67 kg/ha in TE 1992-93 to as much as 3247.00 kg/ha in TE 2009-10.

As with paddy crop, there has been significant expansion in area under Red gram crop in the state of Andhra Pradesh during the last two decades. This is observed from the fact that the area under Red gram crop in Andhra Pradesh has increased from 2.87 lakh hectares in TE 1992-93 to 4.56 lakh hectares in TE 2001-02, and further to 4.57 lakh hectares in TE 2009-10, showing significant rise in the area under Red gram crop in the state during the last two decades. The production of Red gram crop in Andhra Pradesh has also grown substantially during same period. The yield level of Red gram crop in Andhra Pradesh increased from 268 kg/ha in TE 1992-93 to 420.33 kg/ha in TE 2001-02 with an increase in the same to 514.67 kg/ha by TE 2009-10. Barring one or two districts, all the districts have shown increased yield levels, mainly due to high yielding varieties of seeds.

The total cost of cultivation including the imputed value of family labour (C_2) of paddy crop has grown from Rs. 21040 in 1997-98 to Rs. 37,443 by 2007-08 recording 78 percent rise (CACP). The yields of the crop have recorded a rise of 26 percent as they went up from 44 quintals per hectare in 1997-98 to 55 quintals in 2007-08. The price of the paddy has also risen by 77 percent in the same period reflecting a rise of 2.5 percent in the returns over variable cost. As the variable cost, which was Rs. 13,891 in 1997-98 has grown to Rs. 23,032 by 2007-08 recording 66 percent growth, the total cost has grown by 78 percent. In recent times farmers are complaining about high labour costs and they have attributed it to MGNREGA. In fact, they have observed a crop holiday in East Godavari district for one season.

The total cost of cultivation of Red gram including the imputed value of family labour, C_2, based on CACP reports of Andhra Pradesh has risen significantly from Rs. 8,778 to Rs. 18,042 recording 105 percent increase in the period between 1997-98 and 2007-08. The actual incurred cost in production of Red gram in 2007-08 is Rs. 8,889 in Andhra Pradesh (CACP). Wide fluctuations in the yield and returns are observed in Red gram crop mainly due to the nature of pre-harvest losses. The crop is quite sensitive to climatic conditions and pests before harvest. The yield was 6.14 quintals in 1997-98 and it had risen to 8.05 quintals by 2007-08. Despite fluctuations, returns over variable costs remained encouraging as they have increased from Rs. 5,816 in 1997-98 to Rs. 7573 per quintal in 2007-08. However, net returns after the total costs do not give an encouraging picture.

Most of the sample farmers of Paddy are literate as only 7 per cent illiteracy is reported in the survey. Among the literates, nearly 50 percent of the sample households of paddy crop pursued higher secondary and graduate level education. On the whole 38 percent of the households stopped education at secondary level while 27 percent have done graduate and above courses. Caste composition of the sample households shows OBCs at 16 percent and SCs at 5 percent. Less than 2 percent are STs. Overall income of the sample farmer is Rs. 86,446/-.

In case of Red gram sample farmers, average earners per household is 1.21. Overall illiteracy in the sample is 10.83 percent. Overall average income of Red gram farmer is Rs. 87785-.

As the crop productivity is concerned, the average yield of Paddy in the kharif is 22.73 quintals and in Rabi it stands at 23.47 quintals per acre. Overall yield of Red gram is 6.10 quintals among the selected farmers.

6.1. Pre-Harvest Losses:

Farmers of paddy in the sample have expressed that the problem of pests and diseases is very serious followed by low output prices and high cost of inputs. Red gram farmers reported the same except that they ranked low output prices the third. The major pests attacking the Paddy crop reported by sample cultivators are Paddy stem borer, Leaf folder, swarming caterpillar. Among the diseases, Blast, Sheath blight and Bacterial leaf blight are reported as serious problems. A good majority of farmers, about 70 percent,

reported pod borer as very serious problem for Red gram crop. Most of farmers expressed that pod borer and Aphids are attacking every season. About 5 percent of the sample households felt that pod borer is causing 10-25 percent damage. The average actual production of Paddy after the pest attack among the sample farmers is 20.78 quintals per acre. Normal production without attack on the whole turns out to be 24.00 quintals. The average loss of output is 3.23 quintals. The average loss over normal production in Paddy crop due to pests and disease is 13.44 percent.

Pre harvest loss due to pest, disease and weeds is slightly higher in Red gram crop in the sample area. Actual production even after some infestation is reported as 5.14 quintals per acre. Normal production without any infestation is reported to be 5.93 quintals in the sample as a whole. Loss of production on an average turned out as 0.79 quintals per acre. The percentage of loss over actual production is 15.37 percent. The loss over normal production of Red gram crop is estimated at 13.32 percent on the whole.

It is observed that Paddy farmers in the sample are spending more on insecticides and labour than others like Fungicides and weedicides. Overall, the costs on Insecticides is Rs. 480, Fungicides is Rs. 318 and weedicide is Rs. 177 on Paddy crop in the sample.

Red gram farmers have also reported similar kind of expenditure. On an average Red gram farmers are incurring Rs. 343 on Insecticides, Rs. 166 on Fungicides and Rs. 61 on Weedicides.

When queried about most important channels of information among Paddy farmers 90 percent said they rely on Government extension agents while 37 percent credited it to fellow farmers. Another 67 percent depended on private input dealers. Red gram farmers in the sample households relied exclusively on Government agricultural extension agents for pest and disease management. Roughly 83 percent of farmers also consult fellow farmers but their advice is not so important for them. Private input dealers are also an important channel of information according to 97 percent of Red gram farmers.

6.2. Post-Harvest Losses:

Total post-harvest loss is estimated encompassing loss during harvest, threshing, winnowing, transport, handling and storage. For Paddy, the quantity lost during harvest is

2.38 kg per quintal. In fact, the loss during harvest is quite significant and constitutes nearly 44 percent of total post-harvest losses in paddy. Losses in storage constitute 1.19 kg per quintal. Losses during threshing take the third position with 21 percent with an average of 1.26 kg per quintal. About 3.29 percent of loss per quintal is noticed during transport. Other post-harvest losses that have to be taken into account are winnowing and handling during transport. They are 0.34 kg and 0.14 kg per quintal respectively. Overall, the total post-harvest losses per quintal as reported by sample paddy farmers come to **5.47** kg. Total post-harvest loss in Paddy is about 4.5 per cent.

Red gram crop is mostly lost during storage as reported by sample farmers. It is about 38 percent followed by threshing losses with 18 per cent other losses include harvest losses (14 percent) winnowing (12 percent) and transport (12 percent). Only 5 percent of Red gram crop is lost during handling according to sample farmers. Overall the total post-harvest losses are put at **3.03** kg/quintal by the selected Red gram farmers. The overall post-harvest losses per acre are estimated at 18.18 kgs in Red gram crop. That amounts to a post-harvest loss of 3 per cent.

A notable factor in the study is reduction in quantity of storage. Farmers are not willing to store large quantities of produce for better price. Over the years they have realized that it is not cost effective to store produce for longer periods due to variety of storage losses. Most of the harvest is sold immediately. Remaining small quantity is stored mostly in a portion of the pucca house for feed and seed purpose. Both paddy and Red gram are stored in gunny bags with in the house, with mostly concrete walls and flooring. All of them reported that the condition of storage is good this way and there is no additional cost as the storage is within the house.

Policy Suggestions:

1. Pre-harvest losses can be minimised only when the pests and disease can be identified quite early. Even after identification remedial action can be initiated only with right recommendations. Proper advice from Agricultural extension officers becomes crucial at this stage. Most of the time farmers are depending on the advice of pesticide dealers whose motive could be different at times. Hence, easy and timely access to scientific advice to deal with pests and diseases must be ensured to the farmers.

   Periodic training classes can be conducted to expose the farmers to advanced scientific knowledge.

2. Curtailing post-harvest losses is relatively easier than prevention of pre-harvest loss. Though these losses decreased over the years with increased awareness of harvest process, availability of labour in the crucial time of harvest poses a huge problem for the farmers. As the standing crop loses moisture the grains fall off easily and wasted while harvesting.

3. There is need for more mechanization that is cost effective. Subsidies on Farm Mechanization could be increased by the government. Training must be imparted to enthusiastic young farmers. In transportation, use of Jute Gunny bags may be discouraged and plastic or similar material bags may be made available to the farmers at reasonable price. Farmers may be trained in proper handling to reduce leakages in transportation.

4. Farmers had to sell the produce immediately after harvest at low prices as storage had become a daunting task for them. Construction and maintenance of independent storage had become a big problem for them. It would be a great help for the farmers if community storage space is built at the village level. More stress can be laid in training of farmers in the methods of secure and scientific storage.

   Attention: Department of Agriculture, Andhra Pradesh.

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PROJECT TEAM

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Drafting	:	Sri N. Ramgopal Dr. K.V. Giri Babu
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CHAPTER – I

1.1. Introduction:

Despite the wishes of the planners otherwise, Agriculture remains the major source for employment and sustenance for more than half of the population of Andhra Pradesh. Hence, rapid and sustainable development of agriculture is identified as not only the key driver for economic development but also the base for achieving self-sufficiency and ensuring food security to the people. Over the last few decades Agriculture sector in Andhra Pradesh had witnessed considerable transformation. Initial noteworthy shift was noticed during 1980s when cereal based systems had given place to commercial based crop systems like cotton, oilseeds and sugarcane. This has again changed by 1990s due to crop sector volatility caused by frequent droughts and decelerating crop yields. A move towards high value commodities like fruits, vegetables, milk, meat, poultry and fish was followed. In fact, this has helped in rescuing the agriculture sector to a great extent. With a distinct objective of reducing dependency on agriculture for labour and increasing the productivity target of in excess of four per cent growth is set for Agriculture sector in 11th five year plan period.

1.2. Brief Demographic, Economic and Infrastructure Overview of the State:

Geographic and Demographic Overview:

Andhra [1]Pradesh (A.P.), one of the southern states of India, is India's 4th largest state by area and 5th largest by population. The state is divided into three regions- northern part is the Telangana region, the southern part Rayalaseema and Coastal Andhra. The state has 23 districts with Hyderabad as capital city. Other prominent cities include Visakhapatnam, Vijayawada, Tirupati, Srikakulam etc. The table below gives key demographic statistics.

[1] Pre bifurcation

Table 1.1-Demographic Statistics

Sl.No.	Indication	Year	Unit	Andhra Pradesh	India
1	Geographical area	2011	Lakh Sq. Km	2.75	32.87
2	Population	2011	Crore	8.4	121.02
3	Decadal growth rate	2011	Percentage	11.1	17.64
4	Density of population	2011	Population/ Sq. Km	310	382
5	Urban to total population	2011	Percentage	33.4	31.10
6	Sex Ratio	2011	Female/Male	992	940
7	Literacy rate (LR)	2011	Percentage	67.77	74.04
8	Birth rate	2011	Per 100 Midyear population	17.5	21.80
9	Death rate	2011	Per 100 Midyear population	7.5	7.1

Economic Overview:

The state's GDP is third among Indian states in terms of volume. Andhra Pradesh is a major producer and exporter of agricultural commodities. The service sector accounts for 43 per cent of the GSDP. Some key economic indicators are presented in the following Table.

Table 1.2-Economic Indicators of Andhra Pradesh

	Unit	2009-10	2010-11	2011-12
Gross state Domestic product (GSDP) constant (2004-05) prices	Rs. Crore	3,47,344	3,81,942	4,07,949
Current prices		490411	588963	676234
Economic Growth rate as per GSDP constant prices	Per cent	6.0	10.0	6.8
Per capita Income current prices	Rs.	52814	62912	71540
Growth rate	%	14	19.1	13.7

1.3 Agriculture Scenario:

The Net area sown during 2010-11 was 112.88 lakh hectares or 41.0 per cent of total geographical area. This includes an area of 1.02 lakh hectares under fish ponds. The gross cropped area during 2010-11 is 145.12 lakh hectares. The cropping intensity in 2010-11 is 1.29. Net area irrigated is 50.34 lakh hectares and constituted 44.60 per cent of net area sown in the state. The Net area irrigated by Canals and wells constituted 34.70 per cent and 48.89 per cent respectively during 2010-11. Guntur district is at the top with 4.01 lakh hectares of net area irrigated.

Total production of food grains (cereals and pulses) in the state during 2010-11 stood at 203.14 lakh MT of which cereals and millets production is 188.74 lakh MT and production of pulses is 14.40 lakh MT. Production trends in (lakh MT) of major food grains are given in the following Table.

Table 1.3-Production of Major Food grains

Lakh MT

Crop	2008-09	2009-10	2010-11	2011-12
Rice	142.41	103.38	144.20	128.91
Maize	41.52	27.61	39.53	36.55
Bengal gram	8.57	8.47	7.19	5.10
Red gram	2.02	2.03	2.65	1.46
Jowar	4.36	4.37	3.08	4.96
Black gram	2.20	2.69	2.53	3.67

1.4 Commercial Crops:

Andhra Pradesh is one of the major cotton producing states in the country. Cotton production in the state was 49 lakh bales during 2011-12. Sugarcane and Oilseeds are the major commercial crops in the state. The production statistics of these commercial crops are illustrated in the table below.

Table1.4-Production of commercial crops

Crop	2008-09	2009-10	2010-11	2011-12
Cotton (Lakh bales)	--	32.32	53.00	49.00
Sugarcane (Lakh MT)	15.75	11.84	15.09	16.90
Oilseeds (Lakh MT)	20.57	24.18	30.74	23.30

1.5 Horticulture:

Though the state has significant horticultural production, it decreased in last three years. Mango, which had 40.58 lakh metric tonnes of production in 2009-10 came down to 35.14 lakh metric tonnes by 2011-12. Similarly, citrus production came down sharply from 38.83 lakh MT to 18.86 in the same period.

Table 1.5-Production of Horticultural crops

Crop	Production in Lakh MT		
	2009-10	2010-11	2011-12
Mango	40.58	33.63	35.14
Banana	28.19	27.74	28.99
Citrus	38.83	18.05	18.86
Grapes	00.29	00.27	00.28
Guava	0.15	0.12	0.13
Papaya	15.00	11.38	11.89
Sapota	1.71	1.22	1.27

1.6 Rice:

Rice is the predominant food crop in the state with 47.51 lakh hectares in 2010-11 accounting to 32.74 per cent of total cropped area.

The area irrigated under rice crop is 46.16 lakh hectares in 2010-11 against the average of 38.27 lakh hectares. This amounts to 96.8 per cent of total area under the crop. Rice is the principal crop in the state which is extensively cultivated in all the districts in both kharif and Rabi seasons. It accounted for 32.74 per cent of the total cropped area, 70.99 per cent of the total food grains production during 2010-11. The area under rice during 2010-11 was 47.51 lakh hectares as against 34.41 lakh hectares in 2009-10, recording an increase of 38.07 per cent. The area under rice increased due to a favourable monsoon. West Godavari district is at the top in area under the crop.

The production of rice during 2010-11 was estimated at 144.20 lakh tonnes as against 108.38 lakh tonnes in 2009-10, recording an increase of 33.05 per cent. The productivity of rice is 3035 kgs/ha in 2010-11 as against 3150 kgs/ha in 2009-10.

1.7 Red gram:

The crop is predominantly raised in un-irrigated lands in kharif season. Area under the crop is 6.38 lakh hectares in 2010-11. It is 4.40 per cent of total cropped area in the state. The crop is sown in the months of June to August. It is largely cultivated in Mahbubnagar, Prakasam, Kurnool, Ananthapur, Adilabad, Nalgonda, Rangareddy, Medak and Guntur districts.

The production of Red gram during 2010-11 was 2.65 lakh tonnes as against 2.03 lakh tonnes in 2009-10. This shows an increase of 30.54 per cent due to an increase in area. The yield rate of Red gram was 416 kgs per hectare in 2010-11 as against 438 kgs per hectare in 2009-10.

1.8 Background of Pre and Post-Harvest losses:

Growing needs of food for increasing population do not correspond with growth in area under cultivation. Efforts in raising crop yields should also be matched with securing produce before and after harvest. Training of farmers in curbing pre-harvest losses would enhance their income. Beefing up of storage facilities in a modern way would greatly contribute to reduced consumer prices.

1.8 A Pre-Harvest losses:

Farmers suffer a significant volume of crop loss due to pests and diseases every year. The estimation of this loss is complex in the sense that it varies from crop to crop and season to season. Atmospheric conditions play a crucial role in the extent of loss. The crop loss estimates have been made and updated regularly at global level. The worldwide yield loss due to various types of pest was estimated at as 37.4 per cent in rice, 28.2 per cent in wheat, 31.2 per cent in maize and 26.3 per cent in Soybean (Oerke, 2007). At all India level, crop loss estimates due to insect pests have been provided by Dhaliwal et al (2010).

According to this source, the crop loss was estimated at 25 per cent in rice and maize, 5 per cent in wheat, 15 per cent in pulses and 50 per cent in cotton. The crop loss has increased in the post green revolution period. The severity of pest problems has reportedly been changing with the developments in agricultural technology and cropping pattern. The damage caused by major insect-pests in various crops has also been compiled and reported in Reddy and Zehr (2004). Further a number of studies have established the strong relationship between pest infection and yield loss in various crops in India (Nair, 1975; Dhaliwal and Agora, 1994; Muralidharan, 2003; Rajeswari et.al, 2004; Muralidharan and Pasolu, 2006; Rajeswari and Muralidharan, 2006).

Crop loss is estimated usually as the difference between potential and the actual yield. The potential yield is the absence of pest infestation. By multiplying the area with the estimated yield loss, total loss is obtained. To estimate the crop loss, most of the existing studies have adopted experimental treatment approach (with or without pest attack through artificial infestation) or fields with natural infestation wherein half of the field is protected against the pest while the other half is not. But the results obtained from artificial infestation or natural infestation in the selected plots/fields will not be appropriate for extrapolation over a geographical area (Groote, 2002). It is for the reason that the estimated crop losses under these conditions may not represent the actual field conditions of farmers. Alternatively, the estimates collected directly from the farmers through sample survey may be reliable and could be used for extrapolation in similar geographical settings. However, the farmers' estimates are likely to be subjective and these should be validated with expert estimates of the state department of agriculture.

1.8 B Post-Harvest Losses:

Post-harvest losses occur in food crops during harvesting, threshing, drying, storage, transportation, processing and marketing. Post-harvest the produce face damage by insects, rodents, birds and other pests. Further it may be spoiled by fungi, Yeasts or bacteria. Food grain stocks suffer qualitative and quantitative losses while in storage. The quantitative losses are generally caused by factors such as incidence of insect infestation, rodents, birds and also due to physical changes in temperature, moisture content etc., The qualitative loss is caused by reduction in nutritional value due to factors, such as attack of insect pest, physical changes in the grain and chemical changes in the fats, carbohydrates, protein and also by contamination of mycotoxins. The storage loss is a very sensitive to agro-climatic conditions. In order to minimize the losses during storage it is important to observe optimum condition for storage of that particular product, as well as condition under which insects/pests damage the produce.

A study by FAO reveals that around 70 per cent of farm produce is stored by farmers in India for their own consumption, seed, feed and other purposes. For this they use storage structure made from locally available materials. To keep the produce for longer period in store it has to be cleaned and dried. In addition the design and construction of the storage structure will affect the quality of the grain. Moisture content of the grain is high immediately

after the harvest. If moisture is not reduced before storing it affects the quality in many ways. Normally mud, bamboo, stone and plant material is used for storage structures by farmers. These are usually prone to rodent and fungal attacks. On an average, out of total 6 per cent loss of food grains in such storage structures about half is due to rodents and rest is due to insects and fungi. Farmers also use tar drum bin, domestic hapur bin, chittore stone bin, double walled polyethylene lined bamboo bin, pusa bin and so on.

Bulk storage of food grains is done mainly by traders, co-operatives and government agencies like FCI, CWC, SWC and grain marketing co-operatives. There are many kinds of storage systems followed depending on the length of storage and the product to be stored. They are such as cover and plinth storage, community storage structures, rural godowns and scientific warehouses.

1.9 Need for the study:

The available data sources the crop losses caused by pests and diseases are quite significant. But, the knowledge on the crop loss at the farm level is very much limited. In addition to losses that occur during the cultivation of the crop, there is a huge quantity of grains lost during the process of harvesting, threshing, transportation and storage. Therefore, the present study makes a comprehensive attempt to estimate the dimension of losses occurring during the pre and post-harvest stage of some selected crops. The study estimates yield losses due to pest and diseases in the crops namely; Rice and Tur (Pigeon Pea). For the pre-harvest losses, generally animal pests (insects, mites, rodent, snails and birds), plant pathogens (bacteria, fungi, virus and nematodes) and weeds are collectively called as pests, which cause economic damage to crops. This broader definition of pests and diseases is followed in the present study. For estimating post-harvest losses, there is a need to establish the extent of losses during storage under different agro-climatic conditions. Causes of storage losses includes sprouting, transpiration, respiration, rot due to mould and bacteria and attack by insects. Sprouting, transpiration and respiration are physiological activities that depend on the storage environment (mainly temperature and relative humidity). These physiological changes affect the internal composition of the grains and result in destruction of edible material and changes in nutritional quality. But it would be difficult to measure the loss due to physiological changes at the farm level. Nevertheless, an attempt is

made to estimate such losses based on the visual observations and according to farmers' estimates.

With a focus on these losses the following objectives are framed.

1.10 Objectives of the study:

1. To estimate the physical and financial losses caused by pests and diseases in Rice and Tur at farm level.
2. To examine the measures of pest and disease management to reduce the crop loss due to pests and diseases at farm level.
3. To arrive at post-harvest losses in Rice and Tur under different agro-climatic conditions.
4. To identify factors responsible for such losses and suggest crop and means to reduce the extent of losses in different operations in order to increase productivity at national level.

1.11 Database and Methodology:

The estimation of crop losses will be mainly based on farm level data. The crop production constraints particularly infestation by pests and diseases, and losses caused by them will be worked out based on the estimates provided by the farmers. Pests and diseases cause crop damage when their population reach a threshold level. There are also other bio-economic factors like soil fertility. Water scarcity, poor seed quality, high input costs and low output prices that result in considerable financial loss to farmers post-harvest losses during the process of harvesting collection and threshing, transportation and storage will also be quantified based on the estimates used by the farmers. It is essential to identify the structure of storage at the farmers' level and enumerate the losses occurring at this level.

Primary data is collected in these districts for each crop i.e., Rice and Tur. The reference period is kharif 2011-12. The districts were selected in such a way that they represent major production areas of respective crops and spread over different agro-climatic regions. From each district two villages with one nearer to the market and another far away were selected. A random sample of 30 farmers are selected from each village and thus constituting a total sample of 120 farmers for each crop (Table 1.6).

Table 1.6

Area selection for Paddy and Red gram crops in Andhra Pradesh

District	Selected crop	Selected Mandal	Name of the selected villages	Sampled Farmers				
				Marginal	Small	Medium	Large	Total
Guntur	Paddy	Pedakakani	Gollamudi	10	10	8	3	31
			Namburu	10	10	6	3	29
West Godavari	Paddy	Tadepalli Gudem	Jagnnadhapuram	10	11	7	3	31
			Nandamuru	10	9	7	3	29
Total:				**40**	**40**	**28**	**12**	**120**
Guntur	Red gram	Vinukonda	Naragayapalem	10	10	7	3	30
			Brahmanapalli	10	10	7	3	30
Kurnool	Red gram	Done	Somapuram	11	10	7	3	31
		Veldurty	Narsapuram	9	10	7	3	29
Total:				**40**	**40**	**28**	**12**	**120**
Grand Total:				**80**	**80**	**56**	**24**	**240**

1.12 Organization of the report:

While introduction occupies the first chapter, Area, production and productivity of Rice and Tur is presented in second chapter. Socio-economic profile of sample households consisting of household characteristics, cropping pattern and production structure is presented in third chapter. Fourth chapter deals with estimation of losses due to pests and diseases before harvest and measures to mitigate them. Production loss during and after harvest, as in transportation, handling and storage is dealt in fifth chapter. Conclusions and Policy Suggestions are given in the sixth and final chapter.

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CHAPTER – II

2.1. Area, Production, Yield of Paddy and Red gram in Andhra Pradesh:

This chapter deals with the trends in area, production and productivity of paddy and Red gram crops in Andhra Pradesh and the changing cost structure of these crops on basis of CACP reports. Also a review is carried out on estimated losses caused by pests and diseases on these crops.

2.1.1 Area, Production and Yield of Paddy crop in Andhra Pradesh:

The details of Area, production and productivity of paddy are presented in the Table 2.1. Wide fluctuations are observed in the area and production under paddy over a period of 20 years. The year to year variations of area and production of paddy showed a declining trend. The reason for the decline may be attributed to the erratic conditions of rain fall and inadequacy of irrigation facilities.

The estimates relating to structural changes in area, production and yield of paddy crop cultivated across different districts of Andhra Pradesh during the period between TE 1992-93 and TE 2009-10 are brought out in Table 2.1.

The estimates presented in Table 2.1 reveal that the area under paddy crop in Andhra Pradesh has increased from 30 to 39 lakh hectares by 2009-10. Various districts belonging to Andhra Pradesh have also not shown much difference in area under paddy crop during the last two decades. However, variations are noticed in terms of share of different districts in total area under paddy crop in Andhra Pradesh Table 2.2.

It is to be noted that West Godavari has the highest area, accounting for 11.02 percent share in the total area under paddy crop in Andhra Pradesh. The share of West Godavari is 11.02 percent in TE 1992-93 and declined to 7.22 percent by 2009-10. Similarly Krishna district accounting for 10.00 percent share in TE 1992-93 declined to 9.52 percent by TE 2009-10. The district East Godavari has shown a marginal increase in its share of paddy crop area. It increased from 9.64 percent in TE 1992-93 to 9.88 percent by TE 2009-10. Similarly share of paddy crop has increased from TE 1992-93 to TE 2009-10 on Guntur, Nellore, Nizamabad, Mahboobnagar, Nalgonda, Warangal, Khammam and Karimnagar

Districts. There are variations in area under paddy crop across the districts of the state during this period.

The production of paddy crop in Andhra Pradesh has increased from 92.31 lakh tonnes in TE 1992-93 to 114.95 lakh tonnes in TE 2001-02, and further to 128.015 lakh tonnes by TE 2009-10, showing thereby 40 percent rise in paddy production during the two decades with the decade 2000s showing the major increase in this respect. Of districts that had contributed significantly towards rise in paddy production of Andhra Pradesh, West Godavari had the major share at 11.03 lakh tonnes in TE 1992-93, 15.30 lakh tonnes in TE 2001-02 and 14.52 lakh tonnes in TE 2009-10. During the period between TE 1992-93 to TE 2009-10, the paddy production in Andhra Pradesh increased from 8.3 lakh tonnes to 13.68 lakh tonnes in East Godavari district, 11.03 lakh tonnes to 14.51 lakh tonnes in West Godavari, 10.05 lakh tonnes to 13.11 lakh tonnes in Krishna districts.

It may be noted that while paddy production in West Godavari declined from 11.95 percent in TE 1992-93 to 11.34 percent in TE 2009-10, the share of East Godavari district in this respect increased from 9.08 percent to 10.69 percent during the same period (Table 2.2). The share of Krishna district in paddy crop production of Andhra Pradesh is noticed to have declined from 10.90 percent in TE 1992-93 to 10.25 percent in TE 2009-10. On the other hand, the share of Nellore district in paddy crop production of Andhra Pradesh has marginally increased from 5.61 percent in TE 19192-93 to 7.43 percent in TE 2009-10. The other districts like Kurnool, Nizamabad, Medak, Mahboobnagar, Nalgonda, Warangal, Khammam, Karimnagar and Adilabad have shown marginal increase in terms of their contribution towards total paddy crop production of the state.

It is observed that there has been significant rise in area under paddy crop in Andhra Pradesh during the last two decades. The substantial increase in paddy production in Andhra Pradesh during the last two decades is due to perceptible increase in yield level of paddy crop during this period, which has increased from 2340.67 kg/ha in TE 1992-93 to as much as 3247.00 kg/ha in TE 2009-10. East Godavari district has shown tremendous increase in the yield levels of paddy crop. For instance, during the period between TE 1992-93 and TE 2009-10, the yield level of paddy crop has increased from 2360.33kg/ha to 3629.00 kg/ha. An increase is observed from 2664.33 kg/ha to 3542.67 kg/ ha in West Godavari district, 3056.67 kg/ha to 3473.67 kg/ha in Guntur district and 2574.33 kg/ha to

3686.00 kg/ha in Prakasam district. During the period between TE 1992-93 and TE 2009-10, the yield level of paddy crop has increased from 2529.33kg/ha to 3393.67 kg/ha in Kurnool district, 2245.33 kg/ha to 3446.00 kg/ha in Nizamabad district, 1852.00 kg/ha to 2655.00 kg/ha in Medak district, 2037.00 kg/ha to 2744.33 kg/ha in Mahboobnagar district and 2543.33 kg/ha to 3386.33 kg/ha I Karimnagar district. The other districts like Nellore, Anantapur, Chittoor, Nalgonda, Warangal, Khammam and Adilabad districts have also shown perceptible increase in their yield levels of paddy crop during the period between TE 1992-92 to TE 2009-10.

Table 2.1: Structural changes in Area, Production and Yield of Paddy crop in Andhra Pradesh 1990-91 to 2009-10

(Area in hectares, Production in tonnes, yield in kgs)

Districts	AREA (in hectares)			Production(in tonnes)			Yield (in kgs.)		
	TE	TE	TE	TE	TE	TE	TE	TE	TE
	1992-93	2001-02	2009-10	1992-93	2001-02	2009-10	1992-93	2001-02	2009-10
Srikakulam	214067	193215	196325	445293	375936	470683	2177.00	1978.33	2387.67
Vizianagaram	133608	125467	121755	293150	229280	306583	2273.67	1854.00	2504.67
VIsakhapatnam	114213	104985	89910	183163	162494	148960	1624.67	1561.33	1596.33
East Godavari	371864	403208	375816	838359	1323464	1368317	2360.33	3331.67	3629.00
West Godavari	425262	448775	274453	1103264	1530793	1451525	2664.33	3445.00	3542.67
Krishna	385777	381383	362050	1005702	1214108	1311874	2682.67	3213.33	3623.00
Guntur	300995	1266686	314329	896357	1058571	1091549	3056.67	3408.67	3473.67
Prakasam	138898	139983	129426	347991	437872	477082	2574.33	3123.67	3686.00
Nellore	220243	198840	252805	518001	596255	951532	2449.67	3027.00	3764.33
Kurnool	77532	94315	115592	193026	275650	391524	2529.33	2913.67	3393.67
Anantapur	50753	63750	48289	115462	176727	141786	2282.33	2776.00	2938.33
Cuddapah	61812	68406	64313	164742	172924	166809	2757.00	2538.33	2598.00
Chittoor	96903	78892	54292	216172	188193	164147	2262.00	2393.33	3023.33
Rangareddy	53912	52688	32620	121797	129512	87231	2246.33	2463.33	2673.67
Nizamabad	134247	169715	146250	305417	443567	507203	2245.33	2608.67	3446.00
Medak	110792	114815	99948	207988	278319	290563	1852.00	2416.33	2655.00
Mahabubnagar	124145	145572	152143	261203	328325	415784	2037.00	2059.33	2744.33
Nalgonda	258470	240295	315326	695287	655738	1019707	2694.33	2718.00	3241.67
Warangal	151809	196256	180688	341787	518184	521953	2210.33	2624.00	2839.00
Khammam	158142	166363	158059	344572	432312	483436	2173.00	2614.67	3047.00
Karimnagar	210479	279744	260055	538805	790283	891628	2543.33	3164.33	3386.33
Adilabad	64573	77328	59189	91804	176689	140201	1409.67	2285.00	2328.67
Andhra Pradesh	3010061	4027239	3937298	9231850	11495240	12801067	2340.67	2874.67	3247.00

Source: Statistical Abstract of Andhra Pradesh, Directorate of Economics & Statistics, Hyderabad

Table 2.2: Share of Districts in total Area and Production of Paddy crop in Andhra Pradesh: 1990-91 to 2009-10

(In percent)

Districts	AREA			Production		
	TE	TE	TE	TE	TE	TE
	1992-93	2001-02	2009-10	1992-93	2001-02	2009-10
Srikakulam	5.55	3.86	5.16	4.82	3.27	3.68
Vizianagaram	3.46	2.50	3.20	3.18	1.99	2.40
VIsakhapatnam	2.96	2.10	2.36	1.98	1.41	1.16
East Godavari	9.64	8.05	9.88	9.08	11.51	10.69
West Godavari	11.02	8.96	7.22	11.95	13.32	11.34
Krishna	10.00	7.61	9.52	10.90	10.56	10.25
Guntur	7.80	7.73	8.26	9.71	9.21	8.53
Prakasam	3.60	2.79	3.40	3.77	3.81	3.73
Nellore	5.71	3.97	6.65	5.61	5.19	7.43
Kurnool	2.01	1.88	3.04	2.09	2.40	3.06
Anantapur	1.32	1.27	1.27	1.25	1.54	1.11
Cuddapah	1.60	1.37	1.69	1.78	1.50	1.30
Chittoor	2.51	1.57	1.43	2.34	1.64	1.28
Rangareddy	1.40	1.05	0.86	1.32	1.13	0.68
Nizamabad	3.48	3.39	3.85	3.31	3.86	3.96
Medak	2.87	2.29	2.63	2.25	2.42	2.27
Mahabubnagar	3.22	2.91	4.00	2.83	2.86	3.25
Nalgonda	6.70	4.80	8.29	7.53	5.70	7.97
Warangal	3.93	3.92	4.75	3.70	4.51	4.08
Khammam	4.10	3.32	4.16	3.73	3.76	3.78
Karimnagar	5.45	5.58	6.84	5.84	6.87	6.97
Adilabad	1.67	1.54	1.56	0.99	1.54	1.10
Andhra Pradesh	100	100	100	100	100	100

Source: Statistical Abstract of Andhra Pradesh, Directorate of Economics & Statistics, Hyderabad

The Compound annual growth rate of district-wise area, production and yield of paddy crop in Andhra Pradesh during 1990-91 to 2009-10 is shown in Table 2.3. The area under paddy cultivation increases at compound annual growth from 5.61 percent in 1990-91 to 1999-2000 and declines at -2.07 percent in 2000-01 to 2009-10. There was negative growth rate of 0.79 percent in Andhra Pradesh during 1990-91 to 2009-10 periods due to inadequate supply of water and rainfall.

The CAGR of production of paddy in Andhra Pradesh decreased to 0.98 percent in 1990-91 to 1999-2000 to -1.38 percent during 2000-01 to 2009-10. Therefore the growth rate increased at 0.58 percent in 1990-91 to 2009-10 during the 20 years period.

The compound annual growth rate of yield of paddy in Andhra Pradesh decreased from 1.05 percent in 1990-91 to 1999-2000 to 0.71 percent in 2000-01 to 2009-10.

Therefore the overall period increase of yield in Andhra Pradesh is 1.28 percent between 1990-91 and 2009-10.

Among the districts, Guntur had highest Area of CAGR of 26.31 percent during 1990-2000, followed by Karimnagar (3.08 percent). The average annual compound growth rate of by Anantapur (2.39 percent), Kurnool (1.60 percent) and Adilabad (1.20 percent) was the result of the extension in the cultivated area during 1990-2000. During 2000-01 to 2009-10, Nellore (3.57 percent), Kurnool (1.69 percent) and Nalgonda (0.42 percent) had exhibited positive growth trend. There was also extension in the cultivation of land area under paddy cultivation in Kurnool from 1.60 percent in 1990-2000 to 1.69 percent in 2000 -10.

During 1990-2000, East Godavari was highest producing district with an average annual compound growth rate at 5.40 percent, followed by Adilabad (4.88 percent), West Godavari (3.84 percent), Anantapur (3.78 percent), and Kurnool (3.12). The average annual compound growth rate of Krishna (2.62 percent) and Karimnagar (1.12 percent) have shown increasing trend in production.

Among the districts of Andhra Pradesh, Nellore was one of the leading districts in production with CAGR of (6.42 percent) during 2000-10, followed by Kurnool (1.83 percent) and Nalgonda (1.44 percent). The total period 1990-2010 in the compound annual growth rate are highest production in 3.92 percent in Kurnool district followed by Nellore (2.78 percent), Mahboobnagar (2.17 percent) and (1.79 percent) in East Godavari and Ananthapur district.

Among the districts, the compound annual growth rate of yield in paddy crop in Andhra Pradesh, East Godavari had highest yield rate at (4.79 percent) during 1990-2000, followed by Adilabad (3.64 percent), West Godavari (3.30 percent) and Krishna (1.90 percent). The CAGR of paddy yields are reported in the period 2000-10 are Vizianagaram are the highest (2.85 percent) followed by Nellore (2.75 percent), Chittoor (2.26 percent) and Prakasam (1.66 percent). Overall the total period 1990-2010 yields are represented by east Godavari are the highest yield rate in (2.71 percent) followed by Nellore (1.69 percent), Kurnool (1.50 percent) and Khammam (1.36 percent). The dynamics of cultivation of paddy crop in Andhra Pradesh show that there are wide variations are in area, production and productivity of paddy among districts.

Table 2.3: Compound Annual Growth Rates (CAGR) of Area, Production and Yield of Paddy crop in Andhra Pradesh 1990-91 to 2009-10

Districts	AREA (in hectares)			Production(in tonnes)			Yield (in kgs.)		
	1990-91 to 1999-2000	2000-01 to 2009-2010	1990-91 to 2009-2010	1990-91 to 1999-2000	2000-01 to 2009-2010	1990-91 to 2009-2010	1990-91 to 1999-2000	2000-01 to 2009-2010	1990-91 to 2009-2010
Srikakulam	-1.17	-1.47	-0.88	-0.77	-0.59	0.31	0.41	0.90	0.97
Vizianagaram	-0.10	-1.97	-1.12	-1.14	0.82	-0.95	-1.05	2.85	0.00
VIsakhapatnam	-0.96	-5.32	-2.66	-2.31	-9.05	-4.45	-1.37	-3.94	-1.94
East Godavari	0.60	-3.03	-1.10	5.40	-2.39	1.79	4.79	0.65	2.71
West Godavari	0.52	-3.55	-1.42	3.84	-3.86	0.51	3.30	-0.32	1.82
Krishna	0.71	-1.57	-0.59	2.62	-0.54	0.97	1.90	1.04	1.41
Guntur	26.31	-0.09	-0.07	0.48	0.28	0.45	0.19	0.37	0.40
Prakasam	-1.13	-1.32	-0.41	-2.21	0.33	1.01	-1.09	1.66	1.28
Nellore	-1.24	3.57	0.87	-0.64	6.42	2.78	0.60	2.75	1.69
Kurnool	1.60	1.69	2.31	3.12	1.83	3.92	1.50	0.14	1.50
Anantapur	2.39	-1.81	0.58	3.78	-1.63	1.79	1.36	0.18	1.13
Cuddapah	-0.41	-0.38	0.08	-2.07	0.64	0.17	-1.67	1.03	-0.02
Chittoor	-2.33	-3.10	-2.70	-4.55	-0.91	-1.76	-2.27	2.26	0.83
Rangareddy	-0.88	-4.84	-2.46	-1.91	-4.59	-2.07	-1.03	0.27	0.40
Nizamabad	0.54	-3.91	-1.42	0.87	-2.44	-0.09	0.32	1.53	1.34
Medak	-1.41	-3.86	-2.21	-2.39	-3.61	-0.98	-0.99	-2.84	-0.31
Mahabubnagar	0.03	-0.16	1.06	-1.44	-0.73	2.17	-1.48	1.58	1.10
Nalgonda	-1.19	0.42	0.08	-2.16	1.44	1.25	-0.99	1.02	1.17
Warangal	-0.20	-5.76	-2.04	-1.53	-6.95	-1.80	-1.33	-1.27	0.25
Khammam	0.70	-5.59	-2.34	0.63	-4.86	-1.01	-0.08	0.78	1.36
Karimnagar	3.08	-5.01	-1.91	1.12	-5.30	-1.16	1.39	-0.31	0.77
Adilabad	1.20	-4.65	-1.76	4.88	-5.16	-0.88	3.64	-0.53	0.90
Andhra Pradesh	5.61	-2.07	-0.79	0.98	-1.38	0.58	1.05	0.71	1.28

Source: Statistical Abstract of Andhra Pradesh, Directorate of Economics & Statistics, Hyderabad

2.1.2: Area, Production and Yield of Red gram Crop in Andhra Pradesh:

The Red gram crop is cultivated in all the districts of Andhra Pradesh. The estimates relating to structural changes in area, production and yield of Red gram crop cultivated across different districts of Andhra Pradesh during the period between TE 1992-93 and TE 2009-10 are shown in Table 2.4.

Unlike paddy crop, there has been significant expansion in area under Red gram crop in the state of Andhra Pradesh during the last two decades. This is observed from the fact that the area under Red gram crop in Andhra Pradesh has increased from 2.87 lakh hectares in TE 1992-93 to 4.56 lakh hectares in TE 2001-02, and further to 4.57 lakh hectares in TE 2009-10, showing significant rise in the area under Red gram crop in the State during the last two decades (Table 2.4).

The share of districts in area and production of Red gram crop in Andhra Pradesh during the last two decades is presented in Table 2.5. The area under Red gram crop in Mahboobnagar district increased from 0.46 lakh hectares in TE 1992-93 to 0.62 lakh hectares in TE 2001-02 and 0.80 lakh hectares in TE 2009-10, showing thereby the area rise in the Red gram crop in last two decades. The district Mahboobnagar is accounted for 13.93 percent share in total Red gram crop area of Andhra Pradesh in TE 1992-93, which decreased to 13.52 percent, and further increased to 17.62 percent in TE 2009-10. Among the various districts , The district of Prakasam showed its area under Red gram crop to increase from 0.29 lakh hectares in TE 1992-93 to 0.71 lakh hectares in TE 2001-02 and decreased form 0.66 lakh hectares in TE 2009-10. Even the share of Prakasam district in total Red gram crop in Andhra Pradesh increased from 8.84 percent in TE 1992-93 to 15.68 percent in 2001-02 and decreased to 14.60 percent in TE 2009-10.

Although Ananthapur district accounted for about 7.78 percent in TE 1992-93 it decreased to 6.65 percent in TE 2009-10. However, in absolute terms, the area under Red gram crop decreased from 0.25 lakh hectares in TE 1992-93 to 0.30 lakh hectares in TE 2009-10.The decline share of Adilabad district is accounted for 13.48 percent in TE 1992-93 to 9.34 percent in TE 2009-10. In absolute terms 0.44 lakh hectares in TE 1992-93 decreased to 0.42 lakh hectares in 2009-10.

The production of Red gram crop in Andhra Pradesh has also grown substantially during the last two decades. The production of Red gram crop increased in Andhra Pradesh from 0.89 lakh tonnes in TE 1992-93 to 1.87 lakh tonnes in TE 2001-02 and 2.35 lakh tonnes in TE 2009-10. The share of Prakasam district in total Red gram crop production of Andhra Pradesh has increased from 13.18 percent in TE 1992-93 to 15.49 percent in TE 2009-10. The share of Guntur district in total Red gram crop production in Andhra Pradesh has increased from 8.71 percent in TE 1992-93 to 10.13 percent in TE 2009-10.The share of Mahboobnagar, Nalgonda, Warangal and Adilabad are also increased in TE 1992-93 to TE 2009-10. Contrary to this, the share of Kurnool district in total Red gram crop production of Andhra Pradesh has declined sharply and steadily from 7.53 percent in TE 1992-93 to 6.28 percent in TE 2001-02, and further increased to 7.01percent in TE 2009-10. The share of Anantapur, Cuddapah, Chittoor and Khammam has decreased from TE 1992-93 to TE 2009-10.

The increase in Red gram crop production of Andhra Pradesh over the last two decades is noticed due to area expansion and enhanced yield levels. The yield level of Red gram crop in Andhra Pradesh increased from 268 kg/ha in TE 1992-93 to 420.33 kg/ha in TE 2001-02 with an increase in the same to 514.67 kg/ha in TE 2009-10. The district belonging to Srikakulam, Vizianagaram, West Godavari, Guntur, Prakasam, Nellore, Kurnool, Anantapur, Chittoor, Medak, Mahboobnagar, Nalgonda, Khammam, Karimnagar and Adilabad have shown similar trend of rise in yield level of Red gram crop from TE 1992-93 to TE 2001-02 and subsequent rise in TE 2009-10. The yield level of Red gram in Guntur is the highest with 544.67 kg/ha that has increased to 977.3 kg/ha between TE 1992-93 and TE 2009-10. There is sharp increase in this period. The same trend is seen with Mahboobnagar district. Its yield has gone up from 147.67 kg/ha in TE 1992-93 to 348.67 in TE 2001-02, and further increased to 405.0 kg/ha in TE 2009-10. Barring one or two districts, all the districts have shown increased yield levels, mainly due to high yielding varieties of seeds.

Table 2.4: Structural changes in Area, Production and Yield of Red gram crop in Andhra Pradesh 1990-91 to 2009-10

(Area in hectares, Production in tonnes, yield in kgs)

Districts	AREA (in hectares)			Production(in tonnes)			Yield (in kgs.)		
	TE	TE	TE	TE	TE	TE	TE	TE	TE
	1992-93	2001-02	2009-10	1992-93	2001-02	2009-10	1992-93	2001-02	2009-10
Srikakulam	1873	1658	1323	863	856	852	458.00	522.00	638.33
Vizianagaram	1074	1368	1853	502	708	1174	458.00	522.00	638.33
VIsakhapatnam	6400	5765	3010	2257	1977	1288	352.67	340.67	432.00
East Godavari	6247	1622	993	3880	763	643	641.67	477.67	638.33
West Godavari	1123	441	564	512	228	370	458.00	522.00	638.33
Krishna	9064	9309	3833	4176	6436	2314	458.33	686.33	616.00
Guntur	14235	40472	24776	7773	23231	23840	544.67	579.33	977.33
Prakasam	29410	71356	66762	11767	35186	36444	406.00	462.00	526.00
Nellore	1525	1584	1457	731	841	953	458.00	522.00	638.33
Kurnool	22686	31507	32872	6726	11768	16506	295.67	365.00	496.33
Anantapur	25890	27297	30411	4907	6468	12081	192.33	232.33	381.67
Cuddapah	9405	13252	12254	2868	6458	2347	300.67	482.33	182.00
Chittoor	7948	5510	6800	945	1244	1755	119.33	218.67	255.33
Rangareddy	28023	35330	33201	6282	14850	21129	224.00	419.67	666.00
Nizamabad	3065	2571	3356	643	797	3323	208.33	344.67	983.00
Medak	12722	19292	24727	1846	7934	10977	175.00	414.00	448.00
Mahabubnagar	46335	61534	80592	6991	21666	30794	147.67	348.67	405.00
Nalgonda	20504	27572	40319	4789	7907	18526	231.00	285.00	460.67
Warangal	9146	27619	21510	3485	9307	10603	388.00	344.67	517.67
Khammam	26922	24472	15311	12265	13103	8513	452.00	532.33	550.00
Karimnagar	4278	6447	8701	942	2639	5400	208.33	416.00	685.00
Adilabad	44860	39177	42709	4118	13070	25470	92.00	334.00	602.33
Andhra Pradesh	287081	455154	456434	89271	187438	235301	268.00	420.33	514.67

Source: Statistical Abstract of Andhra Pradesh, Directorate of Economics & Statistics, Hyderabad

Table 2.5: Share of Districts in total Area and Production of Red gram crop in Andhra Pradesh: 1990-91 to 2009-10

(In percent)

Districts	AREA			Production		
	TE	TE	TE	TE	TE	TE
	1992-93	2001-02	2009-10	1992-93	2001-02	2009-10
Srikakulam	0.56	0.36	0.29	0.97	0.46	0.36
Vizianagaram	0.32	0.30	0.41	0.56	0.38	0.50
VIsakhapatnam	1.92	1.27	0.66	2.53	1.05	0.55
East Godavari	1.88	0.36	0.22	4.35	0.41	0.27
West Godavari	0.34	0.10	0.12	0.57	0.12	0.16
Krishna	2.72	2.05	0.84	4.68	3.43	0.98
Guntur	4.28	8.89	5.42	8.71	12.39	10.13
Prakasam	8.84	15.68	14.60	13.18	18.77	15.49
Nellore	0.46	0.35	0.32	0.82	0.45	0.41
Kurnool	6.82	6.92	7.19	7.53	6.28	7.01
Anantapur	7.78	6.00	6.65	5.50	3.45	5.13
Cuddapah	2.83	2.91	2.68	3.21	3.45	1.00
Chittoor	2.39	1.21	1.49	1.06	0.66	0.75
Rangareddy	8.42	7.76	7.26	7.04	7.92	8.98
Nizamabad	0.92	0.56	0.73	0.72	0.43	1.41
Medak	3.82	4.24	5.41	2.07	4.23	4.67
Mahabubnagar	13.93	13.52	17.62	7.83	11.56	13.09
Nalgonda	6.16	6.06	8.82	5.36	4.22	7.87
Warangal	2.75	6.07	4.70	3.90	4.97	4.51
Khammam	8.09	5.38	3.35	13.74	6.99	3.62
Karimnagar	1.29	1.42	1.90	1.05	1.41	2.29
Adilabad	13.48	8.61	9.34	4.61	6.97	10.82
Andhra Pradesh	100.00	100.00	100.00	100.00	100.00	100.00

Source: Statistical Abstract of Andhra Pradesh, Directorate of Economics & Statistics, Hyderabad

The annual average growth rate estimates with respect to area, production and yield of Red gram crop for different districts of Andhra Pradesh for the time periods viz. from 1990-91 to 1999-2000, 2000-2001 to 2009-10 and 1990-91 to 2009-10 are shown in Table 2.6. These represent growth in area, production and yield of Red gram crop districts of Andhra Pradesh for 1990s, 2000s and the overall period.

There has been marginal change in area under Red gram crop in Andhra Pradesh, with overall compound annual growth rate of 1.47 percent during the period between 1990-91 and 2009-10. 2.26 percent in 1990-91 to 1999-2000 and -1.02 percent declines the period from 2000-01 to 2009-10.

The CAGR of production of Red gram crop in Andhra Pradesh decreased to7.68 percent in 1990-91 to 1999-2000 to -0.77 percent during 2000-01 to 2009-10. Therefore the growth rate increased at 5.18 percent in 1990-91 to 2009-10 during the 20 years period.

Table 2.6: Compound Annual Growth Rates (CAGR) of Area, Production and Yield of Red gram crop in Andhra Pradesh 1990-91 to 2009-10

Districts	AREA (in hectares)			Production(in tonnes)			Yield (in kgs.)		
	1990-91 to 1999-2000	2000-01 to 2009-2010	1990-91 to 2009-2010	1990-91 to 1999-2000	2000-01 to 2009-2010	1990-91 to 2009-2010	1990-91 to 1999-2000	2000-01 to 2009-2010	1990-91 to 2009-2010
Srikakulam	0.09	-4.72	-2.51	4.13	-3.00	1.62	4.03	1.80	4.23
Vizianagaram	5.59	4.44	4.32	9.82	6.32	8.73	4.03	1.80	4.23
VIsakhapatnam	-0.22	-9.06	-4.80	2.53	-4.45	-1.73	2.75	5.06	3.21
East Godavari	-13.12	-2.31	-7.44	-14.02	0.23	-4.78	-1.03	2.60	2.88
West Godavari	-9.37	4.98	-0.21	-5.73	6.85	4.02	4.03	1.80	4.23
Krishna	1.42	-10.29	-4.84	6.82	-9.29	-2.68	5.32	1.12	2.28
Guntur	11.05	-2.52	4.76	19.06	6.06	11.01	7.21	8.81	5.97
Prakasam	7.09	-6.32	2.82	9.76	-8.43	7.27	2.49	-2.25	4.33
Nellore	-0.02	-4.16	3.12	4.02	-2.44	7.49	4.03	1.80	4.23
Kurnool	1.16	-1.23	1.48	1.59	0.14	5.06	0.42	1.39	3.53
Anantapur	-1.44	-3.93	-1.32	7.36	-2.69	5.91	8.93	1.28	7.33
Cuddapah	1.27	-2.02	0.73	8.12	-12.94	1.07	6.76	-11.15	0.34
Chittoor	-4.53	1.01	-0.97	-5.74	-4.07	1.11	-1.27	-5.02	2.10
Rangareddy	3.05	-0.30	1.08	8.25	1.68	2.94	5.04	3.62	2.65
Nizamabad	-2.79	4.13	0.22	2.75	14.62	8.07	5.69	10.08	7.83
Medak	2.20	2.02	3.15	11.19	-0.31	5.04	8.80	-2.29	1.83
Mahabubnagar	2.14	3.44	3.17	10.37	-3.37	5.08	8.06	-6.59	1.84
Nalgonda	3.11	3.52	3.48	9.80	6.85	8.91	6.49	3.22	5.25
Warangal	9.61	-1.89	4.52	8.16	1.44	7.12	-1.32	3.40	2.49
Khammam	-0.81	-7.29	-3.91	0.62	-8.48	-4.14	1.44	-1.29	-0.23
Karimnagar	4.85	3.95	3.96	9.64	8.08	8.36	5.69	7.44	6.53
Adilabad	-1.92	2.05	0.19	13.26	11.04	11.27	15.48	8.81	11.07
Andhra Pradesh	2.26	-1.02	1.47	7.68	-0.77	5.18	6.05	0.25	3.65

Source: Various Statistical Abstract of Andhra Pradesh, Directorate of Economics & Statistics, Hyderabad

The compound annual growth rate of yield of paddy in Andhra Pradesh decreased from 6.05 percent in 1990-91 to 1999-2000 to 0.25 percent in 20001-01 to 2009-10. Therefore the overall period from yield in Andhra Pradesh is 3.65 percent in 1990-91 to 2009-10.

Among the districts, Guntur had highest Area of CAGR In general the area of Red gram crop in Andhra Pradesh is seen to have grown area in (11.05 percent) during 1990-2000 followed by Warangal (9.61 percent), Prakasam (7.09 percent) and Vizianagaram (5.59 percent).

During 2000s with a compound annual growth rate of 2000-01 to 2009-10 West Godavari district is the highest rate (4.98 percent) followed by vizianagarm (4.44 percent), Nizamabad (4.13 percent) and Karimnagar district (3.95 percent) with an overall average growth rate in this respect at Guntur (4.76 percent) per annum during the period between

1990-91 and 2009-10 followed by Warangal (4.52 percent), Vizianagaram (4.32 percent) and Nalgonda (3.48 percent) respectively.

Among the districts of Andhra Pradesh, Guntur was one of the leading districts in production with CAGR of production of Red gram in the first period from 1990-91 to 1999-2000 in the districts belonging to Guntur (19.06 percent) followed by Adilabad (13.26 percent), Medak (11.19 percent) and Mahboobnagar (10.37 percent). In the second sub period from 2000-01 to 2009-10 represented by Nizamabad is the highest district in this period 14.62 percent of growth rate followed by Adilabad (11.04 percent), Karimnagar (8.08 percent) and Nalgonda (6.85 percent). Overall period from 1990-91 to 2009-10 represented by compound annual growth rates are highest in Adilabad (11.27 percent), followed by Guntur (11.01 percent), Nalgonda (8.91 percent) and Vizianagaram (8.73 percent).

Among the districts, the compound annual growth rate of yield in Red gram crop in Andhra Pradesh, Adilabad had highest yield rate at (154.48 percent) during 1990-2000, followed by Anantapur (8.93 percent), Medak (8.80 percent) and Mahboobnagar (8.06 percent). In the second period the CAGR of 2000-01 to 2009-10 are Nizamabad is the highest growth rate (10.08 percent) followed by Guntur (8.81 percent), Karimnagar (7.44 per cent) and Visakhapatnam (5.06 percent). In the overall period 1990-91 to 2009-10 compound annual growth rates are Adilabad is the highest rate (11.07 percent) followed by Nizamabad (7.83 per cent), Anantapur (7.33 percent) and Karimnagar (6.53 percent) respectively.

2.2 Changes in costs and Profitability:

The Commission for Agricultural Costs and Prices provides costs based on different concepts and returns on the basis of those costs for major crops in different states. An attempt is made in the following pages to analyse the returns of Paddy and Red gram crops taking into account different cost concepts over the years.

2.2.1 Changes in costs and profitability of paddy crop:

The costs of cultivation of paddy based on various cost concepts over a period between 1997-98 and 2007-08 in Andhra Pradesh are estimated and presented in Table 2.7. Breakup of cost of cultivation of paddy crop, that includes cost incurred in labour, seed,

fertilizer and manure, insecticides, irrigation, interest on working capital etc., covering the period between 1997-98 and 2007-08 is given in Table 2.8.

The total cost of cultivation including the imputed value of family labour (C_2) of paddy crop has grown from Rs. 21040 in 1997-98 to Rs. 37,443 by 2007-08 recording 78 percent rise. The share of cost A_2 and cost B_2 in 1997-98 were 56 percent and 89 percent. The share of Cost A_2 in cost C_2 has slightly came down to 53 percent by 2007-08. In the same period the share of cost B_2 has grown to 91 percent. The share of Cost A_2 + imputed value of family labour has also came down to 62 percent from 67 percent. In the same period cost B_2, which includes rental value of owned land and rent paid for leased in land has taken a little higher share of 91 percent when compared with 1997-98.

A closer look at the breakup of costs in C_2 reveals that the share of variable costs have decreased from 66 percent in 1997-98 t 61.5 percent in 2007-08 (Table 2.8). Human labour with a share of 33 percent remained the same and fertilizers and manure with 13 percent came down to 9 percent in a decade. On the contrary the share of costs of hiring machinery and insecticides has risen by 2 and 1 percent in the same period for paddy crop.

The profitability indicators of paddy in Andhra Pradesh based on the reports of Commission for Agricultural costs and prices are given in Table 2.9. The yields of the crop have recorded a rise of 26 percent as they went up from 44 quintals per hectare in 1997-98 to 55 quintals in 2007-08. The price of the paddy has also risen by 77 percent in the same period reflecting a rise of 2.5 percent in the returns over variable cost. The MSP of the crop recorded 55 percent growth in the same decade. As the variable cost, which was Rs. 13,891 in 1997-98 has grown to Rs. 23,032 by 2007-08 recording 66 percent growth the total cost has grown by 78 percent. In recent times farmers are complaining about high labour costs and they have attributed it to MGNREGA. In fact, they have observed a crop holiday in East Godavari district for one season.

Table 2.7 - Cost of cultivation of Paddy based on various cost concepts: AP

Year	A1	A2	A2+FL	B1	B2	C1	C2
1997-98	11738.27	11861.41	14208.42	12459.99	18693.02	14807	21040.03
1998-99	11851.5	12121.28	14608.21	12434.55	20310.19	14921.48	22797.12
1999-2000	13620.95	13781.31	16558.03	14483.75	22548.57	17260.47	25325.29
2000-01	14240.13	14348.81	17497.11	14985.3	23028.24	18133.6	26176.54
2001-02	15264.17	15342.69	18190.8	16029.68	24195.34	18877.79	27043.45
2002-03	15031	15790.13	18029.37	16404.97	26271.83	19441.21	29311.06
2003-04	14733.87	15182.15	18258.15	15661.16	25456.78	18737.14	28532.78
2004-05	15067.4	15872.4	18812.4	15931.9	26318.1	18871.9	29056.1
2005-06	15950.8	16319.7	18787.2	17083	26789.5	19550.5	29257
2006-07	16617.8	17068.89	19778.72	17457.77	27781.68	20167.61	30658.25
2007-08	1968.40	19907.66	23285.29	20677.63	34068.00	24055.24	37443.61
	Share (%)						
1997-98	55.79	56.38	67.53	59.22	88.85	70.38	100.00
1998-99	51.99	53.17	64.08	54.54	89.09	65.45	100.00
1999-2000	53.78	54.42	65.38	57.19	89.04	68.16	100.00
2000-01	54.40	54.82	66.84	57.25	87.97	69.27	100.00
2001-02	56.44	56.73	67.27	59.27	89.47	69.81	100.00
2002-03	51.28	53.87	61.51	55.97	89.63	66.33	100.00
2003-04	51.64	53.21	63.99	54.89	89.22	65.67	100.00
2004-05	51.86	54.63	64.75	54.83	90.58	64.95	100.00
2005-06	54.52	55.78	64.21	58.39	91.57	66.82	100.00
2006-07	54.20	55.67	64.51	56.94	90.62	65.78	100.00
2007-08	53.06	53.17	62.19	55.22	90.98	64.24	100.00

Source: Reports of the Commission for Agricultural Costs and Prices, Department of Agriculture and Co-Operation, GOI.

Table 2.8 Break-up of cost of cultivation (C2) of Paddy crop

YEAR	Labour			Seed	Fert. & Manure	Insecticide	Irrigation	Int..on working capital	Misc.	Variable Cost	Fixed Cost	Total Cost (c2)
	Human	Bullock	Machine									
1997-98	6980.51	721.24	1237.91	600.87	2637.27	469.52	861.71	349.83	32.65	13891.51	7148.52	21040.03
1998-99	7456.73	645.72	1178.46	634.52	2693.98	417.36	757.02	353.55	16.79	14154.13	8642.99	22797.12
1999-2000	8553.66	555.32	1494.13	819.39	2569.83	793.2	997.73	406.62	5.15	16195.03	9130.26	25325.29
2000-01	8974.88	585.26	1553.31	804.19	2828.13	790.51	1206.94	424.98	4.44	17172.64	9003.9	26176.54
2001-02	8752.58	1233.29	1818.69	798.47	2680.25	860.72	1225.68	454.25	14.29	17838.22	9205.23	27043.45
2002-03	8705.92	1281.08	1522.43	765.87	2982.46	1057.42	1275.2	454.98	5.06	18050.42	11260.78	29311.2
2003-04	8548.46	813.44	1741.22	794.36	2919.09	1180.79	1070.14	437.67	13.94	17519.11	11013.68	28532.79
2004-05	8587.78	887.5	1839.98	802.98	2875.44	1121.88	937.17	448.22	31.16	17532.11	11524.74	29056.85
2005-06	9291.49	661.78	2306.49	890.65	2962.71	900.32	665.06	476.53	41.23	18196.26	11060.62	29256.88
2006-07	9600.66	728.21	2883.09	890.8	3140.73	945.51	610.54	487.87	38.53	19325.94	11351.96	30677.9
2007-08	12475.9	774.82	3036.24	962.51	3508.48	1054.81	564.92	595.59	58.96	23032.23	14411.57	37443.8
	Share in cost C2 (%)											
1997-98	33.18	3.43	5.88	2.86	12.53	2.23	4.10	1.66	0.16	66.02	33.98	100.00
1998-99	32.71	2.83	5.17	2.78	11.82	1.83	3.32	1.55	0.07	62.09	37.91	100.00
1999-2000	33.78	2.19	5.90	3.24	10.15	3.13	3.94	1.61	0.02	63.95	36.05	100.00
2000-01	34.29	2.24	5.93	3.07	10.80	3.02	4.61	1.62	0.02	65.60	34.40	100.00
2001-02	32.36	4.56	6.73	2.95	9.91	3.18	4.53	1.68	0.05	65.96	34.04	100.00
2002-03	29.70	4.37	5.19	2.61	10.18	3.61	4.35	1.55	0.02	61.58	38.42	100.00
2003-04	29.96	2.85	6.10	2.78	10.23	4.14	3.75	1.53	0.05	61.40	38.60	100.00
2004-05	29.56	3.05	6.33	2.76	9.90	3.86	3.23	1.54	0.11	60.34	39.66	100.00
2005-06	31.76	2.26	7.88	3.04	10.13	3.08	2.27	1.63	0.14	62.19	37.81	100.00
2006-07	31.30	2.37	9.40	2.90	10.24	3.08	1.99	1.59	0.13	63.00	37.00	100.00
2007-08	33.32	2.07	8.11	2.57	9.37	2.82	1.51	1.59	0.16	61.51	38.49	100.00

Table 2.9 - Profitability Indicators of Paddy crop in Andhra Pradesh

Year	Yield (Q/Ha)	Implicit Price (Rs/Q)	Price (Rs/Q) MSP	Value Main Product	Value By Product	Gross Returns	Variable Cost	Total Cost	Returns over Variable Cost	Net Returns
1997-98	43.83	430.76	415	18879.3	1873.78	20753.08	13891.53	21040.03	6861.55	-286.95
1998-99	48.55	492.15	440	23894.03	2044.84	25938.87	14154.13	22797.12	11784.74	3141.75
1999-2000	46.75	539.73	490	25232.4	1538.45	26770.85	16195.03	25465.66	10575.82	1305.19
2000-01	49.00	511.42	510	25059.7	1736.61	26796.31	17172.64	26278.84	9623.67	517.47
2001-02	46.67	544.42	530	25407.91	1776.68	27184.59	17838.22	27191.98	9346.37	-7.39
2002-03	49.7	607.74	550	30204.9	2503.96	32708.86	18050.42	29311.2	14658.44	3397.66
2003-04	63.72	583.3	550	30280.4	2498.43	32778.83	17519.11	28532.79	15259.72	4246.04
2004-05	53.7	591	560	31708.6	2351.4	34060	17532.11	29056.85	16527.89	5003.15
2005-06	50.2	594.4	570	29848.6	2280.9	32129.5	18196.26	29256.88	13933.24	2872.62
2006-07	51.1	526.7	620	32024.22	2293.44	34317.66	19325.94	30677.9	14991.72	3639.76
2007-08	55.11	762.02	645	41994.88	2637.05	44631.93	23032.23	37443.8	21599.7	7188.13

Source: Reports of the Commission for Agricultural Costs and Prices, Department of Agriculture and Co-Operation, GOI.

Table 2.10 Cost of Cultivation of Tur based on various cost concepts: AP

YEAR	A1	A2	A2+FL	B1	B2	C1	C2
1997-98	5239.24	5447.8	6488.5	5607.26	7737.46	6647.96	8778.16
1998-99	5323.69	5386.55	6260.07	5693.31	8288.2	6566.83	9161.72
1999-2000	4856.39	5118.44	6714.12	5563.21	8810.77	7158.89	10406.45
2000-01	6119.03	6268.11	7780.51	6981.99	9118.99	8494.39	10623.58
2001-02	7001.55	7235.92	8472.98	8333.43	11532.1	9569.49	12788.15
2002-03	8535.93	6642.44	8007.23	8580.87	13995.43	9963.46	15713.16
2003-04	5749.73	5759.03	2988.6	7121.9	10974.3	8349.57	12201.98
2004-05	8909.54	5943.84	7320.57	6708.19	11394.04	8065.51	12771.37
2005-06	6401.01	6406.92	8006.65	7723.97	12537.18	9323.71	14136.92
2006-07	7515.62	7918.62	8538.88	8506.03	12729.05	10017.3	14150.32
2007-08	8889.48	8889.48	11243.12	10182.42	15589.01	12536.06	18042.85
	Share (%)						
1997-98	59.68	62.06	73.92	63.88	88.14	75.73	100.00
1998-99	58.11	58.79	68.33	62.14	90.47	71.68	100.00
1999-2000	46.67	49.19	64.52	53.46	84.67	68.79	100.00
2000-01	57.60	59.00	73.24	65.72	85.84	79.96	100.00
2001-02	54.75	56.58	66.26	65.17	90.18	74.83	100.00
2002-03	54.32	42.27	50.96	54.61	89.07	63.41	100.00
2003-04	47.12	47.20	24.49	58.37	89.94	68.43	100.00
2004-05	69.76	46.54	57.32	52.53	89.22	63.15	100.00
2005-06	45.28	45.32	56.64	54.64	88.68	65.95	100.00
2006-07	53.11	55.96	60.34	60.11	89.96	70.79	100.00
2007-08	49.27	49.27	62.31	56.43	86.40	69.48	100.00

Source: Reports of the Commission for Agricultural Costs and Prices, Department of Agriculture and Co-Operation, GOI.

2.2.2 Cost and Profitability – Red gram:

The total cost of cultivation of Red gram including the imputed value of family labour, C_2, based on CACP reports of Andhra Pradesh has risen significantly from Rs. 8,778 to Rs. 18,042 recording 105 percent increase in the period between 1997-98 and 2007-08. The actual costs incurred in production, C_1 and A_1 increased by 70 percent in the same period. While A_1 and A_2 had a share of 60 percent and 62 percent in C_2 respectively in 1997-98 it decreased to 49 percent in 2007-08. Cost B_2, which excludes imputed value of family labour had a share of 88 percent in 1997-98 and it came down to 86 percent by 2007-08 (Table-2.10). The actual incurred cost in production of Red gram in 2007-08 is Rs. 8,889 in Andhra Pradesh (CACP).

A further analysis drawn from Table 2.11 has revealed that Human labour that contributed 27 percent in 1997-98 has risen to 33 percent by 2007-08. But the share of Bullock labour and costs on machine labour which were 18 percent and 5 percent respectively in 1997-98 had come down to 10 and 4 percent by 2007-08. Similarly the share of cost of seed, fertilizers and manures and insecticides in cost C_2 had also come down to 2 percent, 6 percent and 2 percent by 2007-08. The reduction of costs on insecticide in notable as it come down from Rs. 488 ha to Rs. 329 in a decade. Another significant observation is the share of variable cost, which was 70 percent came down to 60 and share of fixed cost was 30 percent had gone up to 40 percent in the period between 1997-98 and 2007-08.

The profitability indicators of Red gram crop in Andhra Pradesh based on reports of the Commission for Agricultural Costs and Prices are presented in Table 2.12. Wide fluctuations in the yield and returns are observed in Red gram crop mainly due to the nature of pre-harvest losses. The crop is quite sensitive to climatic conditions and pests before harvest. The yield was 6.14 quintals in 1997-98 and it had risen to 8.05 quintals by 2007-08. Keeping in view of the rising variable costs the MSP was also raised periodically. From Rs. 900 in 1997-98 it went up to Rs. 1550 by 2007-08. The price of Red gram increased from Rs. 1856 to Rs. 2241 in the same period.

Considerable increase was also observed in Gross returns. It increased from Rs. 11963 to Rs. 18355 in the same decade. As Gross returns increased by 53 percent, the variable costs have grown by 75 percent. When the total costs are considered they went up 106 percent between 1997-98 and 2007-08. Despite fluctuations, returns over variable costs remained encouraging as they have increased from Rs. 5,816 in 1997-98 to Rs. 7573 per quintal in 2007-08. However, net returns after the total costs do not give an encouraging picture.

Table 2.11 - Break up of cost of cultivation (C2) of Tur Crop

YEAR	Labour			Seed	Fert. & Manure	Insecticide	Irrigation	Int.on working capital	Misc.	Variable Cost	Fixed Cost	Total Cost (c2)
	Human	Bullock	Machine									
1997-98	2379.26	1537.38	479.01	203.79	814.94	488.34	90.08	154.75	--	6147.55	2630.6	8778.15
1998-99	2652.87	1443.14	314.73	285.7	494.51	577.94	140.93	157.38	--	6067.2	3094.52	9161.72
1999-2000	2912.1	783.84	186.49	336.72	781.67	979.11		137.01	0.1	6117.04	4289.41	10406.45
2000-01	3040.61	1250.72	255.24	363.04	1302.59	829.99	7.62	173.04	--	7222.85	3400.73	10623.58
2001-02	3616.05	1041.91	277.92	354.9	1356.47	608.76	32.25	196.56	5.84	7490.66	5078.59	12569.25
2002-03	3019.4	1810.28	274.32	487.03	1107.31	368.53	66.42	188.83	11.89	7334.01	7764.11	15098.12
2003-04	2575.78	1452.88	692.54	333.24	908.88	434.05	66.23	163.62	--	6627.22	5574.73	12201.95
2004-05	3251.29	1343.57	485.88	400.11	853.73	190.47	97.05	163.91	--	6786.01	5985.08	12771.09
2005-06	3643.01	1276.27	756.96	502.27	652.7	386.78	14.57	176.05	0.81	7409.42	6727.5	14136.92
2006-07	4045.91	1216.49	879.17	458.38	839.12	720.15		210.75	6.09	8376.06	5774.31	14150.37
2007-08	6010.92	1805.6	796.08	379.99	1157.54	328.98		255.44	48.19	10782.74	7259.52	18042.26
	Share in cost C2 (%)											
1997-98	27.10	17.51	5.46	2.32	9.28	5.56	1.03	1.76	0.00	70.03	29.97	100.00
1998-99	28.96	15.75	3.44	3.12	5.40	6.31	1.54	1.72	0.00	66.22	33.78	100.00
1999-2000	27.98	7.53	1.79	3.24	7.51	9.41	0.00	1.32	0.00	58.78	41.22	100.00
2000-01	28.62	11.77	2.40	3.42	12.26	7.81	0.07	1.63	0.00	67.99	32.01	100.00
2001-02	28.77	8.29	2.21	2.82	10.79	4.84	0.26	1.56	0.05	59.60	40.40	100.00
2002-03	20.00	11.99	1.82	3.23	7.33	2.44	0.44	1.25	0.08	48.58	51.42	100.00
2003-04	21.11	11.91	5.68	2.73	7.45	3.56	0.54	1.34	0.00	54.31	45.69	100.00
2004-05	25.46	10.52	3.80	3.13	6.68	1.49	0.76	1.28	0.00	53.14	46.86	100.00
2005-06	25.77	9.03	5.35	3.55	4.62	2.74	0.10	1.25	0.01	52.41	47.59	100.00
2006-07	28.59	8.60	6.21	3.24	5.93	5.09	0.00	1.49	0.04	59.19	40.81	100.00
2007-08	33.32	10.01	4.41	2.11	6.42	1.82	0.00	1.42	0.27	59.76	40.24	100.00

Source: Reports of the Commission for Agricultural Costs and Prices, Department of Agriculture and Co-Operation, GOI.

Table 2.12 Profitability Indicators of Tur crop in Andhra Pradesh

YEAR	Yield (Q/Ha)	Implicit Price (Rs/Q)	Price (Rs/Q) MSP	Value Main Product	Value By Product	Gross Returns	Variable Cost	Total Cost	Returns over Variable Cost	Net Returns
1997-98	6.14	1856.53	900	11399.1	564.47	11963.57	6147.55	8778.15	5816.02	3185.42
1998-99	8.31	1749.33	960	14536.96	783.53	15320.49	6067.2	9161.72	9253.29	6158.77
1999-2000	6.19	1656.6	1105	10254.35	649.11	10903.46	6117.04	10406.45	4786.42	497.01
2000-01	4.49	1431.92	1200	6429.32	557.85	6987.17	7222.85	10623.58	-235.68	3636.41
2001-02	8.95	1558.73	1320	10633.18	661.8	11294.98	7490.66	12569.25	3804.32	1274.27
2002-03	10.56	1655.12	1370	17488.58	482.74	17971.32	7334.01	15098.12	10637.31	2873.2
2003-04	8.39	1495.21	1370	12544.83	289.27	12834.1	6627.22	12201.95	6206.88	632.15
2004-05	9.37	1803.09	1410	15020.99	583.62	15604.61	6786.01	12771.09	8818.6	2833.52
2005-06	10.04	1571.57	1400	15778.55	266.24	16044.79	7409.42	14136.92	8635.37	1907.87
2006-07	7.14	1871.84	1750	13363.5	613.21	13976.71	8376.06	14150.37	5600.65	-173.66
2007-08	8.05	2241.49	1550	18042.35	312.93	18355.28	10782.74	18042.26	7572.54	313.02

Source: Reports of the Commission for Agricultural Costs and Prices, Department of Agriculture and Co-Operation, GOI.

2.3. Secondary Estimates of Losses caused by pests and Diseases of Selected crops Review:

The loss of food grains in the post-harvest system is not new; it has always been a problem for mankind. Various empirical studies estimated the pre-and post-harvest losses in India as well as in the World. Both the losses varied from region to region. In Pre-harvest losses, pests and diseases play a major role. The studies relating to losses caused by pests and diseases for various food grains, oilseeds and other crops are not very many. At all-India level and across various states, there are quite a few studies that pin their attention to the post-harvest losses of food grains and other crops. For instance, Birewar (1977) estimated post-harvest losses of food grains at 10 percent in India. Singh and Khosla (1978), while estimating losses at various post-harvest stages of food grains, found losses on account of transit to storage operation to be between 1.03 percent and 1.09 percent of the value of sales during 1969-73, and with respect to rice the total range of loss at various post-harvest operations was estimated at 10-37 percent.

Grant Singleton (2003) observes that losses due to rodents to production of rice are 5-10 percent per annum. In many areas, farmers actually withdraw from planting a second or third rice crop because of the expectation of severe rodent damage. The assessment of the impact of rodents on pre-and post-harvest operations in influencing food security for the rural poor is essential. In India, rodents have long been reported as having a substantial impact on rice crops (Rao and Joshi 1986). It is now, the main constraint to rice production, irrespective of production system (Parshad 1999, Rao 2003). Some 25 years ago, rodents are reported to consume between 10-15 percent of the national production of all grains in India (Barnett and Prakash 1975). Recently, Hart (2001) claimed that the overall losses of grain to rodents in India are approximately 25 percent and 25 to 30 percent during pre-and post-harvest seasons.

The range of losses during various storage operations is reported to vary from 5 to 50 percent (Swaminathan, 1977). The study conducted by Boxall et.al. (1979) on farm level storage of paddy in coastal Andhra Pradesh attempted to asses losses occurring at farm-and home-level storage operations. The authors found information on storage losses both quantitative and qualitative terms – of food grains other than wheat and rice, such as sorghum, millet, and legumes, extremely limited as it was based more on laboratory experiments than on field survey. Reduction of weight losses in bulk storage of grain was

found to be directly sum-able in financial terms, and the cost-benefit ratio turned out to be highly convincing factor for research and development in improved storage structures. The authors argued that as against the problems of commercial storage, those of farm and home storage received low priority because the damage was insidious and often difficult to quantify. The study conducted by Pushpamma and Uma Reddy (1979) on the changes in the quality of rice and jowar stored for up to one year in three different agro-climatic regions of Andhra Pradesh, found progressive increase in insect infestation in both grains during storage. The range of weight loss varied between 3.9 and 5.10 percent at the end of 12 months of storage. The insect infestation was higher for the samples drawn from coastal region of Andhra Pradesh. Except for rice samples drawn from coastal region of Andhra Pradesh. Except for rice samples stored for one year in the coastal region, al the jowar and rice samples had uric acid contents below the safe level.

Post –harvest loss is an important one in the production process. The losses occur form harvesting to marketing stage of the product. Various empirical studies point out that post-harvest losses happen during harvesting seasons. According to World Bank study (1999), post-harvest losses of food grains are 7-10 percent of the total production from farm to market level in India. Losses have been worked out to be 11-15 million Mt of food grains annually, which included 3-4 million Mt of wheat and 5-7 million MT of rice. These losses would be enough to feed about 70-100 million people, about one-third of poor in India or the entire populations of Bihar and Haryana together for about one year. Hence, it is evident that post-harvest losses have impact on micro and macro level of the economy.

Ministry of Agriculture (2004) conducted a millennium study on post-harvest losses in the case of the Indian farmers. The study indicates that the highest average post-harvest losses are incurred by rice at 11 percent, followed by jowar (10 percent), gram (9 percent) and wheat (8 percent) in India. Another study revealed post-harvest losses of major agricultural commodities in India conducted during 2005-07. The results indicated that the highest average losses are reported in the case of wheat at (6 percent), followed by pulses (5.67 percent), rice (5.2 percent), bajra (4.80 percent), gram (4.30 percent) during post-harvest seasons in India (Indian Council of Agricultural Research (2010). The comparative commodity -wise study of post-harvest losses of major food grains indicate that there has been reduction in quantum of losses indicated and there are wide variations between two periods.

A very recent study conducted by Ramasamy and Selvaraj (2002) found harvesting of pulses in India by hand as the major cause of wastage, besides wastages occurring owing to insects and storage problems. The study estimated the domestic supply of pulses at 82 percent with seed accounting for 6 percent, feed 9 percent and waste 3 percent. The study categorically emphasized on the fact that nearly 4-5 lakh tonnes of pulses are wasted in the country, which stands higher than the imports in almost all the decades except during 1990's, and that there would not be any need for imports if waste of pulses could have been minimized through appropriate post-harvest measures. Lack of infrastructure, underdeveloped market competitiveness. Added to this, the value addition procedures such as grading, packaging, storage and processing are not well developed for pulses.

In case of pulses, a number of pests damage the produce during storage. These pests cause both quantitative and qualitative losses. Pests of Red gram also damage seed viability and nutritive value of the produce. The infestation of these depends on various factors like moisture content of the grain, relative humidity, temperature, storages structures, storage period, processing, unhygienic condition measures are pulse beetle (Callosobruchus sps.), Khapra beetle (Trichoderma granarium), Dried bean weevil (Acanthoscelides obtectus), Rice moth (Corcyra cephalonica), Confused flour beetle (Tribolium confusum J.du.V., Rodents, etc.

The study conducted by Kumar, et, al, (2011) made an attempt to assess post-harvest losses of pulses in Uttarakhand and specifically focused on storage losses, seed germination losses, etc. Improper storage condition was cited as the main reason that reduced the yield of pulses. Further, the main reasons for the declining yield level of pulses were traced in non-availability of HYV seeds, improper storage conditions, and lack of knowledge about recently released seeds, and poor technical guidance and other related problems. The study found maximum post-harvest losses of pulses on account of storage operations, which were caused pulses Beetle, Rodent, rice moth, etc. According to Deshpande and Singh (2001), among storage losses, pulses are most susceptible to damage due to insects (5 percent) as compared to wheat (2.5 percent) paddy (2 percent) maize (3.5 percent). In case of pulses, processing, threshing and transportations are found to cause 1 percent, 0.5 percent and 0.5 percent losses, respectively (Birewar, 1984). In case of traditional storage, Caswell (1973) recorded 50 to 60 percent of grain loss of pulses after six

months on account of insects. Mukherjee et. Al. (1970) had reported that leguminous seeds were more damaged by pulse beetle (32.64 percent) as compared with those of vegetable oil seeds (3 percent).

2.4 Summary:

The area under paddy crop in Andhra Pradesh has increased from 30 in 1990-91 to 39 lakh hectares by 2009-10. West Godavari district has the highest area, accounting for 11.02 percent share in the total area under paddy crop in Andhra Pradesh. The production of paddy crop in Andhra Pradesh has increased from 92.31 lakh tonnes in TE 1992-93 to 114.95 lakh tonnes in TE 2001-02, and further to 128.15 lakh tonnes by TE 2009-10, showing thereby 40 percent rise in paddy production during the two decades with the decade 2000s showing the major increase in this respect. Of districts that had contributed significantly towards rise in paddy production of Andhra Pradesh, West Godavari had the major share at 11.03 lakh tonnes in TE 1992-93, 15.30 lakh tonnes in TE 2001-02 and 14.52 lakh tonnes in TE 2009-10. During the period between TE 1992-93 to TE 2009-10, the paddy production in Andhra Pradesh increased from 8.3 lakh tonnes to 13.68 lakh tonnes in East Godavari district, 11.03 lakh tonnes to 14.51 lakh tonnes in West Godavari, 10.05 lakh tonnes to 13.11 lakh tonnes in Krishna districts. It is observed that there has been significant rise in area under paddy crop in Andhra Pradesh during the last two decades. The substantial increase in paddy production in Andhra Pradesh during the last two decades is due to perceptible increase in yield level of paddy crop during this period, which has increased from 2340.67 kg/ha in TE 1992-93 to as much as 3247.00 kg/ha in TE 2009-10. East Godavari district has shown tremendous increase in the yield levels of paddy crop. For instance, during the period between TE 1992-93 and TE 2009-10, the yield level of paddy crop has increased from 2360.33kg/ha to 3629.00 kg/ha.

Among the districts, Guntur had highest Area of CAGR of 26.31 percent during 1990-2000, followed by Karimnagar (3.08 percent). The total period 1990-2010 in the compound annual growth rate are highest production in 3.92 percent in Kurnool district followed by Nellore (2.78 percent), Mahboobnagar (2.17 percent) and (1.79 percent) in East Godavari and Ananthapur district. Overall, in the period 1990-2010, East Godavari shows the highest yield rate (2.71 percent) followed by Nellore (1.69 percent), Kurnool (1.50 percent) and Khammam (1.36 percent). The dynamics of cultivation of paddy crop in Andhra Pradesh show that there are wide variations are in area, production and productivity of paddy among districts.

As with paddy crop, there has been significant expansion in area under Red gram crop in the state of Andhra Pradesh during the last two decades. This is observed from the fact that the area under Red gram crop in Andhra Pradesh has increased from 2.87 lakh hectares in TE 1992-93 to 4.56 lakh hectares in TE 2001-02, and further to 4.57 lakh hectares in TE 2009-10, showing significant rise in the area under Red gram crop in the state during the last two decades. The production of Red gram crop in Andhra Pradesh has also grown substantially during the last two decades. The production of Red gram crop increased in Andhra Pradesh from 0.89 lakh tonnes in TE 1992-93 to 1.87 lakh tonnes by TE 2001-02 and 2.35 lakh tonnes in TE 2009-10. The increase in Red gram crop production of Andhra Pradesh over the last two decades is noticed due to area expansion and enhanced yield levels. The yield level of Red gram crop in Andhra Pradesh increased from 268 kg/ha in TE 1992-93 to 420.33 kg/ha in TE 2001-02 with an increase in the same to 514.67 kg/ha in TE 2009-10. Barring one or two districts, all the districts have shown increased yield levels, mainly due to high yielding varieties of seeds.

The total cost of cultivation including the imputed value of family labour (C_2) of paddy crop has grown from Rs. 21040 in 1997-98 to Rs. 37,443 by 2007-08 recording 78 percent rise. The yields of the crop have recorded a rise of 26 percent as they went up from 44 quintals per hectare in 1997-98 to 55 quintals in 2007-08. The price of the paddy has also risen by 77 percent in the same period reflecting a rise of 2.5 percent in the returns over variable cost. As the variable cost, which was Rs. 13,891 in 1997-98 has grown to Rs. 23,032 by 2007-08 recording 66 percent growth, the total cost has grown by 78 percent. In recent times farmers are complaining about high labour costs and they have attributed it to MGNREGA. In fact, they have observed a crop holiday in East Godavari district for one season.

The total cost of cultivation of Red gram including the imputed value of family labour, C_2, based on CACP reports of Andhra Pradesh has risen significantly from Rs. 8,778 to Rs. 18,042 recording 105 percent increase in the period between 1997-98 and 2007-08. The actual incurred cost in production of Red gram in 2007-08 is Rs. 8,889 in Andhra Pradesh (CACP). Wide fluctuations in the yield and returns are observed in Red gram crop mainly due to the nature of pre-harvest losses. The crop is quite sensitive to climatic conditions and pests before harvest. The yield was 6.14 quintals in 1997-98 and it had risen to 8.05 quintals by 2007-08. Despite fluctuations, returns over variable costs remained encouraging as they have increased from Rs. 5,816 in 1997-98 to Rs. 7573 per quintal in 2007-08. However, net returns after the total costs do not give an encouraging picture.

* * *

CHAPTER – III

Household Characteristics, Cropping Pattern and Production Structure

Socio-economic profile of the sample farmers is discussed in this chapter. Composition of family by age, education will usually impact crop management and net income of the farming household. To this end, an attempt was made to enumerate members in a household by sex, age and education status. As caste has profound influence on one's socioeconomic status, it was also taken into consideration in the analysis. Average number of earners in a household in relation to its annual income was also discussed in the following chapter.

3.1. Socio-Economic Characteristics of the selected farmers:

A total of 120 households were selected for paddy crop. In this, Marginal and Small farmers constitute 40 each while 28 medium and 12 large farmers form other part. Size of the household is slightly bigger at 5 in Medium category followed by 4.33 in large category. Average size of the household is 4.38. All the sample households have reported only one earner in the family irrespective of farm size.

When family members are analysed by sex, large category households have reported slightly higher number of adult females while Marginal households have equal number of males and females. The other two categories of Small and Medium households have males dominating in number. Highest number of children below fifteen years of age is found in large category (20.37 percent). The lowest is seen in Marginal category with 11.89 percent. Small and Medium farmers report 15.48 and 14.29 percent respectively. The average percentage of children is 14.66 in the sample. The respondents in the sample are invariably other than the Head of the household. All the respondents are above the age of 25. The percentage of respondents between the ages of 25 to 40 varied from 32.5 in Marginal category to 42.86 in the Medium group. Overall this age group forms 36 percent. Respondents above the age of 40 varied from 57.14 percent in Medium category to 67.50 in the Marginal category. Overall 64 percent of respondents are above 40. When education of the sample households is examined, only Marginal and Small farmer groups reported 10 percent illiteracy. On the whole the figure is only 7 percent. Among the literates, nearly 50 percent of the sample households of paddy crop pursued higher secondary and graduate level education. In the category of secondary level education Marginal farmers dominate

with 42.50 percent. Understandably, more number of people in large category pursued higher secondary and graduate courses. On the whole 38 percent of the households stopped education at secondary level while 27 percent have done graduate and above courses. Caste composition of the sample households shows OBCs at 16 percent and SCs at 5 percent. Less than 2 percent are STs. These castes are conspicuously absent in Large farm size group. Though most of the farmers sell the produce in the village, others have to travel 15 km to reach the main market. When income is examined, it increased in proportion to farm size. Marginal farmers reported Rs. 57,125/-, Small farmers reported Rs. 84,125/-, Medium farmers reported Rs. 1,00,536/- while the largest income of Rs. 1,53,462/- is recorded in Large farmer group. Overall income of the sample farmer is Rs. 86,446/-. Detailed figures are presented in Table No. 3.1.

Table 3.1: Demographic profile of the selected Paddy farmers

Characteristics		Marginal	Small	Medium	Large	Total
No. of HH		40	40	28	12	120
House hold size numbers		4.3	4.03	5	4.33	4.38
Average Number of Earners		1.00	1.00	1.00	1.08	1.00
Proportion of Male/female/children (%)	Male>15	44.06	45.16	44.64	38.89	43.97
	Female>15	44.06	39.35	41.07	40.74	41.38
	Children<15	11.89	15.48	14.29	20.37	14.66
Identity of Respondent (%)	Head	-	-	-	-	-
	Others	100.00	100.00	100.00	100.00	100.00
Average age of the Respondent (% households)	Less than 25	0	0	0	0	0
	Between 25 to 40	32.50	35.00	42.86	33.33	35.83
	Above 40	67.50	65.00	57.14	66.67	64.17
Highest Education status of family members % households	Illiterate	10.00	10.00	0.00	0.00	6.67
	Primary	10.00	7.50	14.29	0.00	9.17
	Secondary	42.50	35.00	35.71	33.33	37.50
	Higher Secondary	22.50	17.50	17.86	25.00	20.00
	Graduate & above	15.00	30.00	32.14	41.67	26.67
Caste (% of households)	SC	5.00	2.50	10.71	0.00	5.00
	ST	2.50	2.50	0.00	0.00	1.67
	OBC	22.50	17.50	10.71	0.00	15.83
	General	70.00	77.50	78.57	100.00	77.50
Distance from the main market	kms	15.38	15.08	15.00	15.58	15.21
Annual Income in Rs.		57125	84125	100536	153462	86446

Source: Field survey

As in case of paddy crop, the sample households in Red gram constitute 40 Marginal, 40 Small, 28 Medium and 12 large category farmers amounting to 120. Average size of the household varies from 4.3 in Marginal category to 5 in Medium category. Overall it is 4.38. Average earners per household is 1.21. Dependents, i.e., children below 15 years vary from 19.23 percent in large category to 22.14 percent in Medium category with an overall

average of 21.14 percent. Respondent is the head of the household in 30 percent of cases. About 58 percent of respondents are above 40 years of age. Another 40 percent of them belong to the age group of 25 to 40. Illiteracy seems to be high among Marginal farmers at 22.50 percent. Overall illiteracy in the sample is 10.83 percent. About 34 percent of responding households have completed secondary education. Another 42 percent have continued their education and 28 percent have gone beyond graduation level. Caste Composition reveals 8.33 percent of SCs and among these Small farmers have reported a little high percentage of 10. There are no scheduled tribe farmers in the sample. More OBC farmers are found in large category farmers with an overall percentage of 25. On the whole 67 percent farmers belong to general category.

Main Agricultural Market for the Red gram farmers is about 28 kms away. The per household annual income has increased in correspondence with farm size. Large farmers have reported an annual income of Rs. 1,58,846/- while Marginal farmers got only Rs. 58,625/-. The figures are presented in Table 3.1 R.

Table 3.1R: Demographic profile of the selected Red gram farmers

Characteristics		Marginal	Small	Medium	Large	Total
No. of HH		40	40	28	12	120
House hold size numbers		4.3	4.03	5	4.33	4.38
Average Number of Earner		1.05	1.25	1.43	1.08	1.21
Proportion of Male/female/children (%)	Male>15	37.21	43.48	40.00	44.23	40.57
	Female>15	42.44	34.78	37.86	36.54	38.29
	Children<15	20.35	21.74	22.14	19.23	21.14
Identity of Respondent (%)	Head	25.00	27.50	32.14	50.00	30.00
	Others	75.00	72.50	67.86	50.00	70.00
Average age of the Respondent (% households)	Less than 25	-	7.5	-	-	2.5
	Between 25 to 40	32.50	42.50	42.86	50.00	40.00
	Above 40	67.50	50.00	57.14	50.00	57.50
Highest Education status of family members % households	Illiterate	22.50	7.50		8.33	10.83
	Primary	12.50	12.50	10.79	16.67	12.50
	Secondary	37.50	32.50	39.29	16.67	34.17
	Higher Secondary	10.00	17.50	14.29	25.00	15.00
	Graduate & above	17.50	30.00	35.71	33.33	27.50
Caste (% of households)	SC	7.50	10.00	7.14	8.33	8.33
	ST	-	-	-	-	-
	OBC	27.50	15.00	28.57	41.67	25.00
	General	65.00	75.00	64.29	50.00	66.67
Distance from the main market	kms	28.30	27.23	28.29	27.50	27.86
Annual Income in Rs.		58625	74375	115607	158846	87785

Source: Field survey

3.2 Characteristics of Operational holdings:

Size of the land holding and channels of irrigation do have a significant impact on crop pattern and production. Particulars of land owned and leased was also collected from sample holdings of both paddy and Red gram farmers to arrive at net operated area. Area under irrigation was also taken into account to determine gross cropped area and crop intensity. The per household owned land of Marginal farmers for paddy crop is 1.51 acres and it increased gradually and recorded 12.33 acres in Large farmer group. Overall average for owned land is 4.22 acres per household. The leased in land is also higher in large size group reflecting in net operated area. On the whole leased-in land is nearly 5 times higher than the leased out land. The average leased in land is 1.45 acres. The average net operated area stands at 5.35 acres for the sample households.

The irrigated area per household is only 2 acres in Marginal group, where as it is 15.25 acres is large size group. The same kind of huge variation is reflected in Gross cropped area with large size group reporting 23.67 acres against 3 acres in Marginal farmer group. Crop intensity does not show much variation and stands at 1.54 on the whole. The relevant data is presented in Table 3.2.

Table 3.2 Characteristics of Operational Holdings (acres per household) of Paddy farmers

Farm size	Owned land	Uncultivated Land	Leased in land	Leased out land	NOA	Irrigated Area	GCA	Crop Intensity
Marginal	1.51	-	0.46	-	1.97	1.97	3.01	1.53
Small	3.84	-	1.20	0.80	4.24	4.23	6.75	1.59
Medium	5.17	-	2.46	0.11	7.53	7.45	11.25	1.49
Large	12.33	-	3.17	0.25	15.25	15.25	23.67	1.55
Total	4.22	-	1.45	0.32	5.35	5.33	8.24	1.54

Source: Field survey

3.2.1. The structure of operational holdings of Red gram farmers is analysed in Table 3.2 R. Details about owned and leased land, area under irrigation, net operated area, gross cropped area and crop intensity are discussed in the following chapter.

Table 3.2R Characteristics of Operational Holding (acres per household) of Red gram farmers

Farm size	Owned land	Uncultivated Land	Leased in land	Leased out land	NOA	Irrigated Area	GCA	Crop Intensity
Marginal	1.98	-	0.13	0.25	1.85	1.97	1.85	1.00
Small	3.84	-	0.40	-	4.24	1.99	4.24	1.00
Medium	6.65	-	0.63	-	7.28	2.71	7.28	1.00
Large	11.42	-	2.00	0.33	13.08	5.67	13.08	1.00
Total	4.63	-	0.52	0.12	5.04	2.52	5.04	1.00

Source: Field survey

Marginal farmers reported 1.98 acres of owned land per household. It increased to 11.42 acres in large farmer group. The average owned land is 4.63 acres. Leasing of land is limited to less than 1 acre except in large farmer group, where it is 2 acres. Irrigation facility is also limited to 2 acres. Only Large farmers have 5.67 acres under irrigation. Overall average is only 2.52 acres.

As there is no second crop gross cropped area is equal to net operated area in the sample farms.

3.3. Sources of Irrigation:

Paddy is basically an irrigated crop in the selected area. Major source of irrigation is canal followed by Tube well. In the latter about 16 percent of irrigated area is under electrical motors and the rest is under diesel motors. The largest area (208.70 ac) under irrigation is reported by Medium farmers. The Large farmer group has only 183 acres under irrigation. This is closely followed by Small farmers with 169.2 acres. Marginal farmers have only 78.85 acres of irrigated area and all of it is only under canal. About 81.29 acres is under canal irrigation. The rest of the irrigation is done by tube wells. Medium farmers have reported only electrical motors that irrigate about 14 percent of the area. Overall, 16 percent of the irrigation is done by electrical motors in the sample paddy fields. Table No.3.3.

Table 3.3: Source of Irrigation and net irrigated area (%) for Paddy Crop farmers

Farm size	Irrigated area (Acres)	Only Canals	Canal + Tube well	**Only Tube well**		Tank	Open well	Any other
				Electrical	**Diesel**			
Marginal	78.85	100.00	-			-	-	-
Small	169.2	77.13	-	20.98	1.89	-	-	-
Medium	208.7	85.63	-	14.37	0.00	-	-	-
Large	183	72.13	-	19.67	8.20	-	-	-
Total	639.75	81.29	-	15.87	2.84	-	-	-

Source: Field survey

Red gram crop does not demand much irrigation. The sample farmers of this crop reported 58 percent of irrigated area under canal irrigation. It is followed by Tube wells (38 percent) and a small area (4 percent) under open wells. Small size farmers have more area, about 80 acres, under irrigation than the large farmers, where it is only 68 acres. Even Marginal and Medium farmers have more area under irrigation than large farmers. The relevant data is presented in Table No. 3.3. R. Medium size farmers have reported the highest percentage of irrigated land, 85 percent, under canal. The proportion of irrigated land under Electrical motors is high among Small size farmer group with 48 percent. More Marginal farmers are depending on diesel motors in the sample. Overall canal irrigation is dominant with 58 percent followed by 28 percent by electrical motors. Irrigation through open wells is about 4 percent in the Red gram farmers' sample.

Table 3.3R: Source of Irrigation and net irrigated area (%) for Red gram Crop farmers

Farm size	Irrigated area (Acres)	Only Canals	Canal + Tube well	Only Tube well		Tank	Open well	Any other
				Electrical	Diesel			
Marginal	74.00	45.95	-	20.27	33.78	-	-	-
Small	79.50	44.03	-	47.80	8.18	-	-	-
Medium	76.00	84.87	-	12.50	-	-	2.63	-
Large	68.00	57.35	-	27.94	-	-	14.71	-
Total	297.50	57.98	-	27.39	10.59	-	4.03	-

Source: Field survey

3.4 Cropping Pattern:

The variety of crops grown in an area reflects the development of the region, the sources of irrigation, technological absorption of the people, the growth of infrastructure and marketing channels. All the above factors contribute to crop diversification and a significant shift towards commercial crops.

The sample area under paddy crop is traditionally a paddy growing area with mostly canal irrigation and well established marketing channels and rice mills. The sample farmers grow paddy both in kharif and Rabi. Until now there are no compelling factors to diversify. But it may not continue with demands for higher wages are growing with MGNREGA causing ripples in agricultural labour markets.

Paddy is grown in both kharif and Rabi seasons. Later the fields are left idle until the next kharif season. About one third of the gross cropped area is grown in Rabi season. On the whole Medium size farmers have highest gross cropped area of 314.90 acres under the paddy crop. Total gross cropped area of paddy is 989.25 acres (Table 3.4).

Table 3.4: Cropping pattern of selected Paddy crop farmers (% of GCA for the whole year)

Name of the crop	Marginal	Small	Medium	Large	Total
Kharif crops					
Paddy	65.52	62.78	66.91	64.44	64.9
Rabi crops					
Paddy	34.48	37.22	33.09	35.56	35.1
Summer crops					
	NA	NA	NA	NA	NA
Perennial crops					
	NA	NA	NA	NA	NA
Gross cropped area (acs)	100 (120.35)	100 (270.00)	100 (314.90)	100 (284.00)	100 (989.25)

Source: Field survey

3.4.1. The sample farmers of Red gram crop are also raising other crops like cotton. Paddy, Groundnut and Vegetable crops. Groundnut and Vegetables are grown in Rabi season. Marginal farmers seem to be more dependent on Red gram crop as they have reported 85 percent of cropped area under this crop. On the other end large farmer group reported only 35 percent under Red gram as they have more stress on paddy crop (25 percent) when compared with other groups. Similarly large farmers have allocated 17 percent of total cropped area for vegetables with Groundnut following at 12 percent. Medium farmers have reported highest acreage of gross cropped area of 200 followed by Small farmers with 170 acres and large farmers with 155 acres. Total gross cropped area of Red gram farmers is 599 acres. Detail figures are given in Table 3.4 R.

Table 3.4R: Cropping pattern of selected Red gram farmers (% of GCA for the whole year)

Name of the crop	Marginal	Small	Medium	Large	Total
Kharif					
Red gram	85.14	56.34	54.18	34.84	53.61
Cotton	6.08	10.91	10.24	10.97	10.1
Paddy	8.78	20.65	19.48	25.16	19.96
Rabi					
Groundnut		0.59	5.49	12.26	5.18
Other Vegetables		11.50	10.61	16.77	11.15
Summer					
-	-	-	-	-	-
Perennial crops					
-	-	-	-	-	-
Gross cropped area (acs)	100 (74.00)	100 (169.50)	100 (200.25)	100 (155.00)	100 (598.75)

Source: Field survey

3.5. Percentage of Area under High Yielding Varieties:

Farmers' adoption of technological advances invariably indicates their ability in crop management. It may have a bearing on reduction of pre and post-harvest losses. Keeping this in view area under HYVs was enumerated among sample farmers of both paddy and Red gram crops. As paddy crop was main component in Green Revolution all the area under sample households in under High Yielding Varieties (Table 3.5).

Table 3.5: Percentage of area under HYV for Paddy farmers

Name of the crop	Marginal	Small	Medium	Large	Total
Kharif					
Paddy	100.00	100.00	100.00	100.00	100.00
Rabi					
Paddy	100.00	100.00	100.00	100.00	100.00
Summer crops					
-	-	-	-	-	-
Perennial crops					
-	-	-	-	-	-

Source: Field survey

3.5.1. Even the selected households for Red gram crop have reported the whole area under High Yielding Varieties. But, it is not the same case with other crops they are raising. Though the Large farmer group has higher adoption rate of 83 percent for Groundnut, 67 percent for vegetables and 25 percent for paddy the other groups do not have at least a quarter of area under HYVs. Overall, 25 percent of area under vegetables 20

percent under paddy, 17 percent under groundnut and 100 percent under Red gram is under High Yielding Varieties in the sample households (Table 3.5 R).

Table 3.5R: Percentage of area under HYV for Red gram farmers

Name of the crop	Marginal	Small	Medium	Large	Total
Kharif					
Red gram	100.00	100.00	100.00	100.00	100.00
Cotton	6.08	10.91	10.24	10.97	10.10
Paddy	8.78	20.65	19.48	25.16	19.96
Rabi					
Groundnut		4.35	35.71	83.33	17.19
Other Vegetables		26.09	42.86	66.67	25.00
Summer crops					
-	-	-	-	-	-
Perennial crops					
-	-	-	-	-	-

Source: Field survey

3.6. Crop Productivity:

The selected districts are traditionally paddy growing coastal districts. All the sample farmers are reaping fairly good yields. It is significant to note that farmers in the lower farm size are getting better yields than those belonging to higher groups. It could be attributed to better focused crop management. In Kharif farmers in the large group have harvested 21.83 quintals of paddy whereas those in the Marginal group could get 24.22 quintals. It increased as the farm size decreased in the sample. It continued even in Rabi season also. In Coastal districts paddy yields in Rabi season are generally higher due to less pest attack. In Rabi Marginal farmers reported 25.06 quintals of yield while large farmers could harvest 22.38 quintals. Overall, the average yield in the kharif is 22.73 quintals and in Rabi it stands at 23.47 quintals (Table 3.6).

Table 3.6: Average Yield of major crops grown by the Sampled Paddy households (Quintals per acre)

Name of the crop	Marginal	Small	Medium	Large	Total
Kharif crops					
Paddy	24.22	23.44	22.39	21.83	22.73
Rabi crops					
Paddy	25.06	24.33	23.08	22.38	23.47
Summer crops					
-	-	-	-	-	-
Perennial crops					
-	-	-	-	-	-

Source: Field survey

3.6.1. Large farmers of Red gram have reported lower yield of 4.93 quintals per acre. It varied from 6.12 in Small farmer group to 6.92 in Marginal farmer group. Overall yield is 6.10 among the selected farmers.

Yields of cotton among the sampled cultivators of Red gram are lower due to nature of the soils and less irrigation. Large and Medium farmers have reported a yield of 5.76 quintals and 7.66 quintals respectively. While Marginal farmers reported a yield of 9.78 quintals Small farmers had only 6.92 quintals. Overall the average yield is 7.06 quintals which is almost 40 to 50 percent less than the yields in the district. Paddy is grown only in kharif season in the Red gram sample area. Paddy yields could be compared favourably with average yields of the district. It ranges from 22.56 quintals in large size group to 23.85 quintals in Marginal size group. Overall, the average yield is 23.35 quintals.

Red gram farmers have reported less than average yields with respect to groundnut crop which is cultivated in Rabi season in the area. It ranged from 3 quintals in Small farmer group to 5.32 quintals in large farmer group. The average yield is 4.52 quintals. Vegetables are also grown in Rabi season where irrigation is available. In fact income from vegetables sustain them in the lean season.

Yield of vegetables of Small farmers is less than half of the yield of large farmers. It could partly due to lesser application of high value inputs like fertilizers and pesticides. While the yield is only 4.46 quintals in the smaller group it is 11.96 quintals in large farmer group. The average yield on the whole stands at 9.24 quintals (Table 3.6 R).

Table 3.6R: Average Yield of major crops grown by the sampled Red gram households (quintals per acre)

Name of the crop	Marginal	Small	Medium	Large	Total
Kharif crops					
Red gram	6.92	6.12	6.19	4.93	6.10
Cotton	9.78	6.92	7.66	5.76	7.06
Paddy	23.85	23.97	23.49	22.56	23.35
Rabi crops					
Groundnut		3.00	3.27	5.32	4.52
Other Vegetables		4.46	10.31	11.96	9.24
Summer crops					
-	-	-	-	-	-
Perennial crops					
-	-	-	-	-	-

Source: Field survey

3.7. Produce Marketed:

Marginal farmers in the paddy sample are selling lower percentage of 79.48 in their produce due to higher storage for consumption. Large farmers on the other hand are marketing as much as 93.49 percent of their paddy crop. Overall average is 89.71 percent in the kharif season. In the Rabi season, higher proportion of produce is marketed. Since short duration varieties are grown in Rabi season, farmers do not prefer these varieties for consumption. Consequently higher percentage of marketing is reported. The Marketed surplus is 86.83 percent in Marginal group and 97.35 percent in large farmer group. The average marketed surplus is 93.53 percent (Table 3.7).

Table 3.7: Percentage of Output marketed by the selected Paddy Households

Name of the crop	Marginal	Small	Medium	Large	Total
Kharif crops					
Paddy	79.48	87.97	92.11	93.49	89.71
Rabi crops					
Paddy	86.63	92.33	94.18	97.35	93.53
Summer crops					
-	-	-	-	-	-
Perennial crops					
-	-	-	-	-	-

Source: Field survey

3.7.1. The selected Red gram farmers raise a number of crops mainly for marketing. Except Paddy they sell most of the other produce. The marketed surplus of the Red gram crop is 97.60 percent in Small farmer group and it increases to 98.87 percent in large farmer group. The overall average percentage is 98.16. Cotton crop is exclusively a cash crop for the sample farmers and sell all the produce. Some portion of the paddy crop in kharif season is stored for consumption and the marketed surplus varies from 58.06 in Marginal group to 89.20 percent in large farmer group. On the whole the sample farmers market about 77 percent of their paddy crop in kharif season.

Groundnut and vegetables are marketed in Rabi season. While Small and Medium farmers in the sample are marketing all the produce of Groundnut crop large farmers are selling 95 percent of the produce. Overall marketed surplus for Groundnut is 96.43 percent. Except the Small farmer group, where the marketed surplus is 66.67 percent farmers in higher groups are selling all the vegetables crop. An average of 95.30 percent of vegetable crop is going to the market in Red gram sample farmers' group (Table 3.7 R).

Table 3.7R: Percentage of Output marketed by the selected Red gram Crop Households

Name of the crop	Marginal	Small	Medium	Large	Total
Kharif crops					
Red gram	97.94	97.60	98.51	98.87	98.16
Cotton	100.00	98.44	100.00	100.00	99.53
Paddy	58.06	67.34	77.51	89.20	77.06
Rabi crops					
Groundnut		100.00	100.00	95.05	96.43
Other Vegetables		66.67	100.00	100.00	95.30
Summer crops					
	NA	NA	NA	NA	NA
Perennial crops					
	NA	NA	NA	NA	NA

Source: Field survey

3.8. Value of Total Produce and Marketed Surplus:

The value of total output per household for sample paddy farmers ranged from Rs. 80,128/- in Marginal farmer group to Rs. 5,65,600/- in Large size group. It increased as farm size increased. When per acre value is analysed in Table No. 3.8 a converse picture emerges as Marginal farmer group reported Rs. 26,661/-. Overall the per household value is Rs. 2,05,072/- and per acre value is Rs. 24,876/- for the total produce of the paddy farmers. The same kind of trend is seen when the value of marketed surplus of all crops is studied except that the Marginal farmers have reported a lower per acre value than the average of Rs. 21,207/-. The per household marketed value of all crops on an average is Rs. 1,74,824/-. The proportion of total produce marketed also has shown an increasing trend as the farm size increased. It ranged from 82 percent in Marginal group to 95 percent in large group, the average being 91 percent.

Table 3.8: Value of output and marketed surplus (aggregate of all crops) for Paddy Farmers

Farm size	Value of output (main + by product)		Value of marketed surplus		% of output marketed
	Rs. Per household	Rs. Per acre	Rs. Per household	Rs. Per acre	
Marginal	80218	26661	61415	20412	82.07
Small	170863	25313	145494	21555	89.59
Medium	277793	24701	239503	21296	92.81
Large	565600	23899	499702	21114	94.88
Total	205072	24876	174824	21207	91.08

Source: Field survey

3.8.1 . The per household value of total crops for Red gram sample farmers has increased correspondingly with farm size from Rs. 45,843/- in Marginal group to Rs. 1,16,583/- in Large group. The same trend is seen with per household value of marketed surplus. The average per household value of total produce is Rs. 76,102/- and it come down to Rs. 74,920/- for value of marketed surplus. The overall per acre average value of total produce is Rs. 23,938/- and the per acre value of marketed surplus is Rs. 23,566/-. On the whole 88 percent of production of all the crops is marketed in the sample Red gram farmer group (Table 3.8 R).

Table 3.8R: Value of output and marketed surplus (aggregate of all crops) for Red gram Crop Farmers

Farm size	Value of output (main + by product)		Value of marketed surplus		% of output marketed
	Rs. Per household	Rs. Per acre	Rs. Per household	Rs. Per acre	
Marginal	45843	27166	44986	26658	88.35
Small	68096	23893	66634	23380	80.56
Medium	113418	24618	112075	24326	89.20
Large	116583	19704	115627	19543	93.78
Total	76102	23938	74920	23566	88.00

Source: Field survey

3.9 Summary:

Most of the sample farmers are literate as only 7 per cent illiteracy is reported in the survey. Among the literates, nearly 50 percent of the sample households of paddy crop pursued higher secondary and graduate level education. In the category of secondary level education Marginal farmers dominate with 42.50 percent. Understandably, more number of people in large category pursued higher secondary and graduate courses. On the whole 38 percent of the households stopped education at secondary level while 27 percent have done graduate and above courses. Caste composition of the sample households shows OBCs at 16 percent and SCs at 5 percent. Less than 2 percent are STs. Income increased in proportion to farm size. Marginal farmers reported Rs. 57,125/-, Small farmers reported Rs. 84,125/-, Medium farmers reported Rs. 1,00,536/- while the largest income of Rs. 1,53,462/- is recorded in Large farmer group. Overall income of the sample farmer is Rs. 86,446/-.

In case of Red gram sample farmers, average earners per household is 1.21. Dependents, i.e., children below 15 years vary from 19.23 percent in large category to 22.14 percent in Medium category with an overall average of 21.14 percent. Overall illiteracy in the sample is 10.83 percent. About 34 percent of responding households have completed

secondary education. Another 42 percent have continued their education and 28 percent have gone beyond graduation level. Caste Composition reveals 8.33 percent of SCs and among these Small farmers have reported a little high percentage of 10. There are no scheduled tribe farmers in the sample. More OBC farmers are found in large category farmers with an overall percentage of 25. On the whole 67 percent farmers belong to general category. The annual income per household has increased in correspondence with farm size. Large farmers have reported an annual income of Rs. 1,58,846/- while Marginal farmers got only Rs. 58,625/-. Overall average income is Rs. 87785-.

Paddy farmers own 4.22 acres on an average. The average leased in land is 1.45 acres. The average net operated area stands at 5.35 acres for the paddy sample households.

For Red gram farmers, the average owned land is 4.63 acres. Leasing of land is limited to less than 1 acre except in large farmer group, where it is 2 acres. Irrigation facility is also limited to 2 acres. Only Large farmers have 5.67 acres under irrigation. Overall average is only 2.52 acres. The sample farmers of this crop reported 58 percent of irrigated area under canal irrigation.

Paddy is grown in both kharif and Rabi seasons. Later the fields are left idle until the next kharif season. About one third of the gross cropped area is grown in Rabi season. On the whole Medium size farmers have highest gross cropped area of 314.90 acres under the paddy crop. Total gross cropped area of paddy is 989.25 acres and total gross cropped area of Red gram farmers is 599 acres. As paddy crop was main component in Green Revolution all the area under sample households in under High Yielding Varieties. Even the selected households for Red gram crop have reported the whole area under High Yielding Varieties.

As the crop productivity is concerned, the average yield in the kharif is 22.73 quintals and in Rabi it stands at 23.47 quintals per acre for Paddy. Overall yield of Red gram is 6.10 quintals among the selected farmers.

Overall the per household value of the total produce is Rs. 2,05,072/- and per acre value is Rs. 24,876/- for the total produce of the paddy farmers. For Red gram farmers, the overall per acre average value of total produce is Rs. 23,938/- and the value of per acre marketed surplus is Rs. 23,566/-.

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CHAPTER – IV

Assessment of Pre-harvest losses:

Farmers cultivating Paddy and Red gram continue to face a number of constraints in reaping a good harvest. Starting with lack of good quality seed, fighting varied pests and diseases including weeds, procuring a timely loan to buy seed, fertilizers, pesticides and to pay labour they sometime end up with low harvest price. This chapter attempts to analyse the farmers' perception and ability to tackle these problems and steps he is taking to minimize crop losses before harvest.

4.1 Constraints in Cultivation of Paddy and Red gram:

Table 4.1 presents how the respondents perceive the severity of the problem. About 53.33 percent of Paddy cultivators highlighted the problem of pests and diseases as most important. Next to this, low market prices are the most important problem to tackle. High cost of inputs follows this as 38 percent perceive it as most important. Only 10 percent of respondents reported poor quality of seed as most important and 75 percent said it is least important. Irrigation is categorized as least important by 83 percent as most of the cropped land is fed by canals. About 55 percent of sample households felt high cost of inputs as important constraint followed by low output prices (42 percent) and poor seed quality (15 percent).

Table 4.1 Constraints faced in cultivation of Paddy crop (Percentage of households)

Constraints faced (multiple answer)	Most Important	Important	Least Important
Poor seed quality	10.00	15.00	75.00
Water deficiency	5.83	11.67	82.50
Pest and disease problem	53.33	33.33	13.33
High cost of inputs	37.50	55.00	7.50
Low output prices	45.00	41.67	13.33
Others like, problem of wild animals and not suitable environment	-	-	-

Source: Field survey

When compared with Paddy farmers, Red gram farmers in the sample have categorized most of the constraints as very important. Among these the problem of pests and diseases is very prominent at 93 percent. It is followed by high cost of inputs (76 percent), lack of irrigation (71 percent) low harvest prices (70 percent). Majority of these farmers (65 percent) reported poor seed quality as an important constraint. Other important problems include poor irrigation (24 percent), high cost of inputs (21.67 percent) and low output prices (18 percent). Details are given in Table No.4.1 R.

Table 4.1R Constraints faced in cultivation of Red gram crop (Percentage of households)

Constraints faced (multiple answer)	Most Important	Important	Least Important
Poor seed quality	10.00	65.00	25.00
Water deficiency	70.83	24.17	5.00
Pest and disease problem	92.50	7.50	0.00
High cost of inputs	75.83	21.67	2.50
Low output prices	69.17	18.33	12.50
Others like, problem of wild animals and not suitable environment	-	-	-

Source: Field survey

4.2 Assessment of Incidence of pests and diseases-paddy

As indicated earlier, more than half of Paddy farmers report pest and disease problem as very important to deal with. When asked about their assessment of the problem 40 percent of Paddy farmers could do it quantitatively while 35 percent did it qualitatively. Only 25 percent of them could assess the seriousness of the problem in both ways. In case of Red gram farmers, 9 percent of sample farmers could assess severity of the attack quantitatively while 60 percent of them could do qualitatively. About 31 percent of Red gram farmers are able to estimate the severity of attack both quantitatively and qualitatively (Table 4.2 R).

Table 4.2. Identification of Pest and Disease Attack: Paddy crop (Percentage of households)

Description		% of Households
Household able to distinguish pests and disease Attack		100.00
Assessment about the severity of the attack	Quantitative assessment	40.00
	Qualitative assessment	34.70
	Both	25.30

Source: Field survey

Table 4.2R Identification of Pest and Disease Attack: Red gram crop (Percentage of households)

Description		% of Households
Household able to distinguish pests and disease Attack		100.00
Assessment about the severity of the attack	Quantitative assessment	8.60
	Qualitative assessment	60.30
	Both	31.10

Source: Field survey

The major pests attacking the Paddy crop reported by sample cultivators are Paddy stem borer, Leaf folder, swarming caterpillar. About 26 percent of the farmers reported Paddy stem borer as very serious problem. Leaf folder and swarming caterpillar are described as serious problems by 20 percent and 18 percent of respondents respectively (Table-4.3).

Table 4.3 Incidence of major pests and disease (Percentage of households) Paddy

	Rank of severity			Frequency of attack			Indicate % of production loss				
Name of the Pest/Disease /Weed	Very serious	Serious	Not serious	Every season	Once in two season	Once in three season	<5%	5 – 10%	10 - 25%	25 - 50%	>50%
Major pests											
Paddy stem borer	25.83	10.83	0.00	26.67	9.17	0.83	28.33	3.33	3.33	0.83	0.00
Leaf folder	6.67	20.83	8.33	24.17	10.83	0.83	10.83	15.83	10.00	0.00	0.00
Swarming caterpillar	8.33	18.33	1.67	21.67	6.67	0.00	22.50	5.00	0.83	0.00	0.00
Green leaf hopper	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Major disease											
Blast	61.67	20.00	0.00	50.00	29.17	2.50	59.17	15.83	6.67	0.00	0.00
Bacteria leaf bight	18.33	5.83	1.67	13.33	11.67	0.83	17.50	6.67	1.67	0.00	0.00
Sheath rot	5.83	19.17	20.00	30.00	13.33	1.67	25.00	18.33	1.67	0.00	0.00
Sheath blight	24.17	47.50	15.83	47.50	36.67	4.17	50.83	29.17	5.00	0.83	0.00
False smut	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Major weeds											
Barnyard grass	63.33	13.33	2.50	56.67	20.00	2.50	65.00	12.50	1.67	0.00	0.00.
Bermuda grass	9.17	43.33	5.83	25.83	30.00	2.50	33.33	18.33	6.67	0.00	0.00

Source: Field survey

Among the diseases, Blast, Sheath blight and Bacterial leaf blight are reported as serious problem by 62 percent, 24 percent and 18 percent of the sample households of Paddy crop. As 47 percent consider sheath blight as serious problem, 20 percent say blast as serious and another 19 percent give that status to Sheath rot. Barnyard grass seems to be very serious problem according to 63 percent farmers while another 43 percent described Bermuda grass as

serious. A quarter of the sample farmers said pest attack is occurring once in every season. The same is reported once in two seasons by 6 to 11 percent of the sample. Blast is occurring every season according to 50 percent while it is once in two seasons (29 percent) as of others. Sheath blight and sheath rot are attacking every season or once in two seasons.

Paddy stem borer is causing damage to the crop up to 5 percent according to 28 percent of Paddy farmers. Another 22 percent farmers felt that swarming caterpillars are also damaging the crop up to that extent.

The damage is more severe up to 25 percent, when leaf folder attacks the crop. Among the diseases Blast, Sheath blight are causing moderate damage, up to 5 percent, according to half of the sample Paddy farmers. About 17 to 25 percent of farmers attributed the same amount of damage to sheath rot and Bacterial leaf blight. Some of them have reported that the loss is sometimes more and would extend up to 10 percent. Barnyard grass and Bermuda grass are the common weeds that are responsible to affect the production up to 5 percent as reported by 65 per cent and 33 per cent of households respectively. Another 13 to 18 per cent farmers felt that the damage may extend up to 10 per cent some times.

4.2 .1 Assessment of Incidence of pests and diseases –Red gram:

A good majority of farmers, about 70 percent, reported pod borer as very serious problem followed by Aphids (30 percent), Plume moth (27 percent) and Tur pod fly (22 percent). Some farmers, 35 percent felt aphids as serious problems. Pod borers are also causing equal damage as reported by 24 percent of Red gram sample cultivators. Major diseases that are categorized as very serious problem are dry root rot (73 percent farmers) followed by powdery Mildew (55 percent). Fusarium wilt is also a serious problem according to 15 percent sample cultivators. Majority of farmers expressed pod borer and Aphids are attacking every season. About a quarter of the sample farmers felt that plume moth and Tur pod fly are damaging the crops every season. Among the diseases Dry root rot and powdery Mildew also attack regularly every season according to more than half of the farmers (Table.4.3 R).

Table 4.3R Incidence of major pests and disease (Percentage of households) Red gram

Name of the pests/Disease/ Weed	Rank of severity			Frequency of attack			Indicate % of production loss				
	Very Serious	Serious	Not Serious	Every season	Once in two season	Once in three season	<5%	5 – 10%	10 - 25%	25 - 50%	>50%
Major pests											
Pod borer	70.00	24.17	0.83	81.67	10.83	2.50	36.67	52.50	5.00	1.67	0.00
Plum both	27.50	4.17	0.00	29.17	2.50	0.00	6.67	22.50	2.50	0.00	0.00
Aphids	30.00	35.00	0.83	59.17	5.83	0.83	25.00	37.50	3.33	0.00	0.00
Tur pod fly	22.50	2.50	5.00	25.00	5.00	0.00	22.50	5.83	1.67	0.00	0.00
Major disease											
Dry root rot	73.33	0.83	0.00	74.17	0.00	0.00	25.00	49.17	0.00	0.00	0.00
Powdery didew	55.00	0.83	0.00	55.83	0.00	0.00	10.00	45.83	0.00	0.00	0.00
Fusarium wilt	5.00	15.00	0.00	19.17	0.83	0.00	15.83	4.17	0.00	0.00	0.00
Major weeds											
Grass	16.67	10.00	1.67	23.33	0.83	4.17	18.33	10.00	0.00	0.00	0.00.

Source: Field survey

When the quantum of production loss is estimated, 5 to 10 percent of the crop is lost due to pod borer, dry Root Rot and powdery mildew. This observation is made by nearly 50 percent of sample farmers. About 5 percent of the sample households felt that pod borer is causing 10-25 percent damage.

4.3 Magnitude of crop loss:

The quantum of crop loss due to pests and disease in Paddy is analysed with the help of figures in Table 4.4. The average actual production of Paddy even after the attack among the sample farmers is 20.78 quintals per acre. Large farmers reported a little higher quantity of 22.06. Normal production on the whole turns out to be 24.00 quintals. The average loss of output is 3.23 quintals. The percentage loss over actual production varied from 15.59 in larger farmers to 14.77 in medium farmers. Overall, it is 15.52 percent. The average loss over normal production in Paddy crop due to pests and disease is 13.44 percent. The same is observed to be low, 12.87 percent in medium farmer group (Table 4.4).

Table 4.4: The magnitude of crop loss due to pests, disease and weed infestation – Paddy

Description	Marginal	Small	Medium	Large	Total
Actual Production with attack (quintal/acre)	20.34	20.66	20.04	22.06	20.78
Normal production without attack (quintal/acre)	23.50	24.00	23.00	25.50	24.00
Loss of output (quintal/acre)	3.16	3.14	2.96	3.44	3.23
Percentage of loss over actual production	15.54	16.67	14.77	15.59	15.52
Percentage of loss over normal production	13.45	13.92	12.87	13.49	13.44

Source: Field Survey

Table 4.4R: The magnitude of crop loss due to pests, disease and weed infestation – Red gram

Description	Marginal	Small	Medium	Large	Total
Actual Production with attack (quintal/acre)	5.25	5.06	5.38	4.88	5.14
Normal production without attack (quintal/acre)	6.00	5.95	5.90	5.85	5.93
Loss of output (quintal/acre)	0.75	0.89	0.52	0.97	0.79
Percentage of loss over actual production	14.29	17.59	9.67	19.88	15.37
Percentage of loss over normal production	12.50	14.96	8.81	16.58	13.32

Source: Field Survey

4.3.1 Magnitude of crop loss: Red gram:

Pre-Harvest losses due to pest, disease and weeds is slightly higher in Red gram crop in the sample area. The figures are presented in Table 4.4 R. Actual production even after some infestation is reported as 4.88 quintals per acre in large group to 5.38 quintals per acre in medium farmer group. On the whole it is 5.14 quintals per acre. Normal production without any infestation is reported to be 5.93 quintals in the sample as a whole. Loss of production on an average turned out as 0.79 quintals per acre. The percentage of loss over actual production varied from 9.67 in medium group to 19.88 in large farmer group. Overall, it is 15.37 percent. The loss over normal production of Red gram crop is estimated at 13.32 percent on the whole. This figure varied from 8.81 in Medium group to 16.58 in large size group.

To minimize the crop losses due to pests and diseases farmers of both Paddy and Red gram are incurring significant costs. It includes material and labour costs.

It is observed that Paddy farmers in the sample are spending more on insecticides and labour than others like Fungicides and weedicides. An interesting fact that emerges out of the

analysis is that marginal farmers are spending more money in minimizing the pre harvest losses caused by pests and diseases. Cost of insecticide comes about to Rs. 1074 followed by Fungicide (Rs. 839) and weedicide (Rs. 434). On the other hand the large farmer category is spending the lowest among the groups. They are spending Rs. 224, Rs. 142 and Rs. 101 on Insecticide, fungicide and weedicides respectively. Overall, the costs on Insecticides is Rs. 480, Fungicides is Rs. 318 and weedicide is Rs. 177 on Paddy crop in the sample (Table 4.5).

Table 4.5 Cost of Chemical methods adopted for pests and disease control (Rs/acre) – Paddy

Particulars	Marginal	Small	Medium	Large	Total
% of Households adopted control measures	100.00	100.00	100.00	100.00	100.00
Weedicide					
No. of sprays/acre	0.90	0.45	0.19	0.07	0.31
Cost of chemicals	231.52	136.40	59.23	82.45	107.38
Labour charges	202.92	91.45	45.56	18.30	69.23
Total cost	434.43	227.85	104.79	100.76	176.61
Insecticide					
No. of sprays/acre	1.76	0.79	0.41	0.23	0.63
Cost of chemicals	634.50	434.99	290.01	184.02	340.38
Labour charges	439.44	172.86	85.67	40.44	139.24
Total cost	1073.94	607.85	375.68	224.45	479.62
Fungicide					
No. of sprays/acre	1.29	0.58	0.30	0.15	0.45
Cost of chemicals	551.55	256.43	142.29	111.20	213.82
Labour charges	287.89	134.81	73.56	31.15	103.96
Total cost	839.44	391.24	215.85	142.35	317.79

Source: Field survey

Table 4.5R. Cost of Chemical methods adopted for pests and disease control (Rs/acre) – Red gram

Particulars	Marginal	Small	Medium	Large	Total
% of Households adopted control measures	100.00	100.00	100.00	100.00	100.00
Weedicide					
No. of sprays/acre	0.24	0.14	0.06	0.05	0.07
Cost of chemicals	104.73	76.70	39.51	23.89	41.04
Labour charges	58.11	39.53	19.63	10.19	20.36
Total cost	162.84	116.22	59.14	34.08	61.40
Insecticide					
No. of sprays/acre	1.35	0.60	0.38	0.24	0.37
Cost of chemicals	873.38	357.23	257.23	234.08	250.58
Labour charges	417.57	147.67	96.25	66.24	92.91
Total cost	1290.95	504.90	353.47	300.32	343.48
Fungicide					
No. of sprays/acre	1.24	0.36	0.22	0.06	0.20
Cost of chemicals	728.92	209.20	143.95	25.67	116.04
Labour charges	331.08	92.15	55.51	14.01	50.03
Total cost	1060.00	301.36	199.46	39.68	166.07

Source: Field survey

Red gram farmers have also reported similar kind of expenditure when compared among size groups. Marginal farmers have reported higher expenditure than the large farmers on pests and diseases. Again costs on Insecticides exceeds the costs of Fungicides and weedicides. When compared with Paddy crop the crop loss due to pests and diseases is more in Red gram. Accordingly a higher amount of Rs. 1290 is spent on Insecticides followed by Rs. 1060 and Rs. 163 on Fungicides and weedicides respectively by Marginal farmers. On the other hand, large farmers have reported Rs. 300 on insecticide Rs. 40 on Fungicides and Rs. 34 on Weedicides (Table 4.5 R). On an average Red gram farmers are incurring Rs. 343 on Insecticides, Rs. 166 on Fungicides and Rs. 61 on Weedicides.

Table 4.6 Details of biological methods adopted for pests and disease control – Paddy

Item		Percentage of Household adopted this method	Details about the method
Biological methods		42.5	Trichoderma
Other control measures	Yes	68.00	a) use of Neem, oil,
	No	32.00	

Source: Field survey

Table 4.6R Details of biological methods adopted for pests and disease control – Red gram

Item		Percentage of Household adopted this method	Details about the method
Biological methods		62.5	Trichoderma
Other control measures	Yes	68.00	a) use of Neem, oil,
	No	32.00	

Source: Field survey

4.4. Sources of Information for Pest and Disease Control:

Farmers face a daunting task in controlling pests and diseases. They need to upgrade their technical knowledge in consonance with evolving scientific advances in the field. There is lot of stress on usage of less amount of pesticides and higher adoption of Biological methods in crop management. They acquire this knowledge through a number of channels like Government of Agricultural extension agents, private input dealers, fellow farmers, Mass Media, agricultural Research stations and Krishi Vignan Kendras.

When queried about most important channels of information among Paddy farmers 90 percent said they rely on Government extension agents while 37 percent credited it to fellow farmers. Another 67 percent depended on private input dealers followed by fellow farmers (15 percent) as important source of information (Table 4.7). Though the reach of the Mass Media is extensive the sample farmers gave only minor importance for source of information.

Table 4.7 Extension services on pests and disease control management (percentage of household) – Paddy

Percentage of Household seeking advice	100			
Rank of source	Most Important	Impor-tant	Least Important	Details of Advice
Government extension agent	90.00	5.00	4.17	Provide useful information about pest and disease control
Private input dealer	5.83	67.50	25.83	Provide useful information about various inputs for pest and disease control
Fellow farmers	36.67	15.00	50.00	Share their experience
TV/Radio Service/News Paper	9.17	5.83	0.83	Information about new process and new product of agriculture
Agricultural University/KVK	0.00	3.33	12.50	Provide basic information
Any other				

Source: Field survey

Table 4.7R Extension services on pests and disease control management (percentage of household) – Red gram

Percentage of Household seeking advice	100			
Sources of Advice	Most Important	Impor-tant	Least Important	Details of Advice
Government extension agent	100.00	0.00	0.00	Provide useful information about pest and disease control
Private input dealer	0.83	96.67	2.50	Provide useful information about various inputs for pest and disease control
Fellow farmers	20.83	0.00	82.50	Share their experience
TV/Radio Service/News Paper	10.00	7.50	0.00	Information about new process and new product of agriculture
Agricultural University/KVK	0.83	0.83	15.83	Provide basic information
Any other	0.00	0.00	0.00	

Source: Field survey

4.4.1 Sources of Information for Pest and Disease Control: Red gram

Red gram farmers in the sample households relied exclusively on Government agricultural extension agents for pest and disease management. Roughly 83 percent of farmers also consult fellow farmers but their advice is not so important for them. Private input dealers are also an important channel of information according to 97 percent of Red gram farmers. Only 7 to 10 percent of farmers reported T.V and newspapers as main sources of knowledge. About 16 percent of sample cultivators also consult agricultural scientists from the University and Krishi Vignan Kendra.

4.5 Summary:

Farmers of paddy in the sample have expressed that the problem of pests and diseases is very serious followed by low output prices and high cost of inputs. Red gram farmers reported the same except that they ranked low output prices the third. The major pests attacking the Paddy crop reported by sample cultivators are Paddy stem borer, Leaf folder, swarming caterpillar. Among the diseases, Blast, Sheath blight and Bacterial leaf blight are reported as serious problems. A good majority of farmers, about 70 percent, reported pod borer as very serious problem for Red gram crop. Most of farmers expressed that pod borer and Aphids are attacking every season. About 5 percent of the sample households felt that pod borer is causing 10-25 percent damage.

The average actual production of Paddy after the pest attack among the sample farmers is 20.78 quintals per acre. Normal production without attack on the whole turns out to be 24.00 quintals. The average loss of output is 3.23 quintals. The average loss over normal production in Paddy crop due to pests and disease is 13.44 percent.

Pre harvest loss due to pest, disease and weeds is slightly higher in Red gram crop in the sample area. Actual production even after some infestation is reported as 5.14 quintals per acre. Normal production without any infestation is reported to be 5.93 quintals in the sample as a whole. Loss of production on an average turned out as 0.79 quintals per acre. The percentage of loss over actual production is 15.37 percent. The loss over normal production of Red gram crop is estimated at 13.32 percent on the whole.

It is observed that Paddy farmers in the sample are spending more on insecticides and labour than others like Fungicides and weedicides. Overall, the costs on Insecticides is Rs. 480, Fungicides is Rs. 318 and weedicide is Rs. 177 on Paddy crop in the sample.

Red gram farmers have also reported similar kind of expenditure. On an average Red gram farmers are incurring Rs. 343 on Insecticides, Rs. 166 on Fungicides and Rs. 61 on Weedicides.

When queried about most important channels of information among Paddy farmers 90 percent said they rely on Government extension agents while 37 percent credited it to fellow farmers. Another 67 percent depended on private input dealers. Red gram farmers in the sample households relied exclusively on Government agricultural extension agents for pest and disease management. Roughly 83 percent of farmers also consult fellow farmers but their advice is not so important for them. Private input dealers are also an important channel of information according to 97 percent of Red gram farmers.

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CHAPTER – V

Assessment of Post-Harvest Losses:

In addition to pre-harvest losses farmers continue to lose crop in the process of harvesting, threshing, winnowing, transportation and handling. Significant amounts are also lost during storage before marketing. An effort is made in this chapter to estimate the quantum of such losses. Capacity utilization of storage and the practices adopted by the sample cultivators of Paddy and Red gram are analysed in these pages.

5.1 Crop loss during harvest:

Weather and timing of harvest in the paddy crop is important because over dried plant tend to lose more grain while cutting and stacking. Area harvested per household is 2.96 acres for mid-season and 2.39 acres for late season. The sample farmers have reported only HYVs. About 55.39 percent is harvested in the mid-season while 44.61 percent is harvested in the late season. Manual harvesting is limited to 12.19 percent while the rest of the crop is harvested by mechanical harvesters. Among the mid-season harvesters 62.5 percent felt that crop loss in harvesting is low. In the late harvesters the corresponding figure is 18.33 (Table 5.1). Crop loss per acre is 5.24 kgs in mid-category and 2.58 kgs in late category. Crop loss per quintal is reported as 1.38 kg in mid category and 1.00 kgs in late category by paddy farmers in the sample households.

Table 5.1: Quantity lost at different stages of harvest – Paddy crop

Stages of harvest and variety		Early		Mid		Late	
		Local	HYV	Local	HYV	Local	HYV
Area harvested per hh (acres)		-	-	-	2.96	-	2.39
Percentage area harvested (early, mid and late)		-	-	-	55.39	-	44.61
Area Manually harvested (percentage)		-	-	-	82.11	-	17.89
Area Mechanically harvested (percentage)		-	-	-	51.68	-	48.32
Rank of loss (percentage of households)	High	-	-	-	-	-	-
	Medium	-	-	-	11.67	-	4.17
	Low	-	-	-	62.5	-	18.33
Quantity lost during harvest	Kg per acre of harvest	-	-	-	5.24	-	2.58
	Kg per quintal of harvest	-	-	-	1.38	-	1.00
	Loss % of harvest amount	-	-	-	1.38	-	1.00

Source: Field survey

Red gram farmers in the sample households have raised only High Yielding Varieties and all of them harvested the crop in the mid-season. The area harvested per household is

2.73 acres. Mechanization in harvesting seems to be low as only 28 percent of farmers have perceived the loss in harvesting as low while 26 percent felt that it is medium. Only 18 percent categorised the loss as high. Quantity lost during harvest is estimated as 2.50 kgs per acre and 0.41 kgs per quintal for Red gram crop (Table 5.2).

Table 5.2: Quantity lost at different stages of harvest – Red gram crop

Stages of harvest and variety		Early		Mid		Late	
		Local	HYV	Local	HYV	Local	HYV
Area harvested per hh (acres)		-	-	-	2.73	-	-
Percentage area harvested (early, mid and late)		-	-	-	100	-	-
Area Manually harvested (percentage)		-	-	-	71.67	-	-
Area Mechanically harvested (percentage)		-	-	-	28.33	-	-
Rank of loss (percentage of households)	High	-	-	-	18.33	-	-
	Medium	-	-	-	25.83	-	-
	Low	-	-	-	55.83	-	-
Quantity lost during harvest	Kg per acre of harvest	-	-	-	2.51	-	-
	Kg per quintal of harvest	-	-	-	0.41	-	-
	Loss % of harvest amount	-	-	-	0.41	-	-

Source: Field survey

5.2 Crop loss during threshing and winnowing:

All the threshing and winnowing is done mechanically in paddy crop. Losses in threshing are low according to 77.50 percent of sample farmers. Others categorised the losses as medium. Average loss per quintal in this process is 1.26 kg while it is 5.12 kg per acre. About 75 per cent of farmers felt the loss in mechanical winnowing is low. Average loss is 4.92 kg per acre and 0.34 kg per quintal in this process.

Red gram farmers have reported that 91 percent of the crop is threshed manually only 9.17 percent is done mechanically. Majority (66 percent) farmers felt that losses in this manual process are low. About 32 percent categorised it as medium. Average loss in manual threshing is 0.55 kg per quintal and 3.16 kgs per acre (Table 5.3).

Table 5.3: Quantity lost during threshing and winnowing

Stages of harvest and variety		(Paddy)		(Red gram)	
		Local	HYV	Local	HYV
Area/quantity manually& mechanically threshed (%of hh)		-	100	-	100
Manual		-	-	-	90.83
Mechanical		-	100	-	9.17
Rank of loss Manually (Percentage of HH)	High	-	-	-	1.67
	Medium	-	-	-	32.5
	Low	-	-	-	65.83
Rank of loss Mechanically (Percentage of HH)	High	-	-	-	-
	Medium	-	22.50	-	-
	Low	-	77.50	-	-
Quantity lost during	Average loss (Kg per acre)	-	-	-	3.16
manual threshing	Average loss (Kg per qt)	-	-	-	0.55
	Loss % of threshed amount	-	-	-	0.55
Quantity lost during	Average loss (Kg per acre)	-	5.12	-	-
mechanical threshing	Average loss (Kg per qt)	-	1.26	-	-
	Loss % of threshed amount	-	1.26	-	-
Area/quantity manually& mechanically winnowed (%of hh)		-	100	-	100
Manual		-	-	-	100
Mechanical		-	100.00	-	-
Rank of loss Manually (Percentage of HH)	High	-	-	-	2.5
	Medium	-	-	-	20.83
	Low	-	-	-	76.67
Rank of loss Mechanically (Percentage of HH)	High	-	-	-	-
	Medium	-	25.00	-	-
	Low	-	75.00	-	-
Quantity lost during	Average loss (Kg per acre)	-	-	-	2.28
manual Winnowing	Average loss (Kg per qt)	-	-	-	0.38
	Loss % of threshed amount	-	-	-	0.38
Quantity lost during	Average loss (Kg per acre)	-	4.92	-	-
mechanical Winnowing	Average loss (Kg per qt)	--	0.34	-	-
	Loss % of threshed amount	-	0.34	-	-

Source: Field survey

In manual winnowing of Red gram crop the average loss is 2.28 per acre and 0.38 kg per quintal. This loss is categorised as low by 77 percent of farmers. Other 21 percent felt it as medium.

5.3 Loss during transportation and handling:

Farmers continue to loss produce while transporting from farm to home and later to marketing centre due to old gunny bags and improper handling. On an average paddy farmers have transported 35.45 quintals per household covering a distance of 2.15 km to home and incurred a cost of Rs. 5 per quintal. They have lost 0.10 kg per quintal in transporting and 0.09 kgs per quintal in handling (Table 5.4).

Table 5.4: Quantity lost during Transportation and handling of paddy

Mode of Transportation	Head load	Bullock cart	Trolley Tractor	Tempo	Truck	Others	Total
Field to Home							
Average quantity transported (qtls per hh)		-	35.45	-	-	-	35.45
Average distance covered (Kms)		-	2.15	-	-	-	2.15
Transportation cost (Rs per quintal)		-	5	-	-	-	5
Rank of loss (Percentage of hh)	High	-		-	-	-	-
	Medium	-		-	-	-	-
	Low	-	100	-	-	-	100
Quantity lost during transport	Average loss (Kg per qtl of amount transported)	-	0.10	-	-	-	0.10
		-		-	-	-	-
		-		-	-	-	-
	% of loss transported	-	0.10	-	-	-	0.10
		-		-	-	-	-
Quantity lost during handling	Average loss (Kg per qtl of amount handled)	-	0.09	-	-	-	0.09
		-		-	-	-	-
		-		-	-	-	-
	% of loss handled	-	0.09	-	-	-	0.09
		-		-	-	-	-
Home to Market		-		-	-	-	-
Average quantity transported (qtls per hh)		-	5.64	-	-	-	5.64
Average distance covered (Kms)		-	6.97	-	-	-	6.97
Transportation cost (Rs per quintal)		-	15	-	-	-	15
Rank of loss (Percentage of hh)	High	-	-	-	-	-	-
	Medium	-	-	-	-	-	-
	Low	-	-	-	-	-	
Quantity lost during transport	Average loss (Kg per qtl of amount transported)	-	0.08	-	-	-	0.08
		-	-	-	-	-	-
	% of loss transported	-	0.08	-	-	-	0.08
		-	-	-	-	-	-
Quantity lost during handling	Average loss (Kg per qtl of amount handled)	-	0.05	-	-	-	0.05
		-	-	-	-	-	-
		-	-	-	-	-	-
	% of loss handled	-	0.05	-	-	-	0.05
		-	-	-	-	-	-

Source: Field survey

Though most of the produce is sold to agents at home or at field very little amounts are transported to market place and sold. On an average 5.64 quintals are transported to market place per household by tractors. Covering a distance of 6.97 kms incurring a cost of Rs. 15 per quintals. All of the sample farmers of paddy felt that output lost in the process of transport and handling is insignificant. Only 0.13 kg is lost in this process.

Production losses in Red gram crop due to transportation and handling is discussed with the help of Table 5.5. Red gram crop is mostly transported to home first and sold later. All of the farmers felt that losses in transport and handling are low. On an average 6.07 quintals of Red gram is transported to home per household. They are incurring a cost of Rs. 6 for transporting a distance of 1.5 km by tractor trolley (Table 5.5).

Table 5.5: Quantity lost during Transportation and handling of Red gram

Mode of Transportation	Head load	Bullock cart	Trolley Tractor	Tempo	Truck	Others	Total
Field to Home							
Average quantity transported (qtls per hh)		-	6.07	-	-	-	6.07
Average distance covered (Kms)		-	1.5	-	-	-	1.5
Transportation cost (Rs per quintal)		-	6	-	-	-	6
Rank of loss (Percentage of hh)	High	-	-	-	-	-	-
	Medium	-	-	-	-	-	-
	Low	-	100	-	-	-	100
Quantity lost during transport	Average loss (Kg per qtl of amount transported)	-	0.20	-	-	-	0.20
		-	-	-	-	-	-
		-	-	-	-	-	-
	% of loss transported	-	0.20	-	-	-	0.20
		-	-	-	-	-	-
Quantity lost during handling	Average loss (Kg per qtl of amount handled)	-	0.10	-	-	-	0.10
		-	-	-	-	-	-
		-	-	-	-	-	-
	% of loss handled	-	0.10	-	-	-	0.10
		-	-	-	-	-	-
Home to Market		-	-	-	-	-	-
Average quantity transported (qtls per hh)		-	5.51	-	-	-	5.51
Average distance covered (Kms)		-	6.52	-	-	-	6.52
Transportation cost (Rs per quintal)		-	8	-	-	-	8
Rank of loss (Percentage of hh)	High	--	-	-	-	-	-
	Medium	-	-	-	-	-	-
	Low	-	100	-	-	-	100
Quantity lost during transport	Average loss (Kg per qtl of amount transported)	-	0.18	-	-	-	0.18
		-	-	-	-	-	-
		-	-	-	-	-	-
	% of loss transported	-	0.18	-	-	-	0.18
		-	-	-	-	-	-
Quantity lost during handling	Average loss (Kg per qtl of amount handled)	-	0.06	-	-	-	0.06
		-	-	-	-	-	-
		-	-	-	-	-	-
	% of loss handled	-	0.06	-	-	-	0.06

Source: Field survey

By using gunny bags, all they lose on an average 0.20 kg per quintal in the process of transporting from field to home. Another 0.10 kg is lost in handling either at field or home. After few days of storage, about 5.51 quintals per household is transported to market place leaving some quantity for food and seed. Farmers are spending Rs. 8 to transport a quintal of Red gram to the nearest market covering a distance of 6.52 km. All of them reported that the loss in transport and handling is low. Average loss in transportation is 0.18 kg and 0.06 kg in handling.

5.4 Production loss during storage:

Storage of produce is a major problem especially for marginal and small farmers. Losses occurs due to drying, rodents and fungus infestation. Over the years paddy farmers have reduced the period of storage. Produce kept for food and seed is stored for long. The rest is marketed within short time. Hence large storage structures are not maintained. Produce is kept in gunny bags in a separate room in the house and protected from insects and rodents. Storage details are given in Table 5.6.

Table 5.6: Quantity lost during storage

Place of Storage		Paddy				Red gram			
		1	2	3	4	1	2	3	4
Mode of storage (percentage of amount stored)	Open	-	-	-	-	-	-	-	-
	Gunny/Plastic bag	-	100	-	-	-	100	-	-
	Kothi/bin kutcha, pucca*	-	-	-	-	-	-	-	-
	steel drums	-	-	-	-	-	-	-	-
	others	-	-	-	-	-	-	-	-
Amount stored (Qtls per hh)		-	35.45	-	-	-	6.07	-	-
Percentage of hh who dried before storing		-	--	-	-	-	5	-	-
Average number of days stored (per hh)		-	149	-	-	-	12	-	-
Rank of loss in storage	High	-	-	-	-	-	-	-	-
	Medium	-	-	-	-	-	-	-	-
	Low	-	100	-	-	-	100	-	-
Quantity lost during storage (kgs per quintal of storage)	Due to weight loss	-	1.00	-	-	-	0.56	-	-
	Due to rodents	-	0.19	-	-	-	0.60	-	-
	Due to fungus	-	-	-	-	-	-	-	-
Storage cost Rs. Per quintal		-	5	-	-	-	5	-	-

Source: Field survey

Note: * Kutcha House =1, Pucca House = 2, Scientific Godown/Ware House = 3, Others =4.

All the produce kept for long are stored in Gunny or plastic bags. Paddy farmer's households on an average are storing 35.45 quintals for different periods of time. Produce kept for food and seed purposes are obviously stored for long. The period of storage varies

from one to seven months for paddy farmers. On an average it is 149 days per household. About 1.00 kgs of paddy is lost due to drying in storage and another 0.19 kgs is damaged by rodents on the whole. The cost of storage is reported to be Rs. 5 per quintal.

Red gram farmers are not storing the produce for long as they have reported an average of 12 days of storage. The amount stored per household is 6.07 quintals. Only 5 percent of farmers have dried the produce before storing. All of them felt that the storage loss in Red gram is low. Weight loss in storage is accounted for 0.15 kg and rodents damaged 0.10 kg per quintal. They reported the cost of storage for Red gram could be Rs. 5 per quintal.

Both Paddy and Red gram farmers are storing the produce in pucca houses.

5.5 Capacity Utilization of storage:

Paddy farmers in the sample households traditionally stored produce in bins made of paddy hay. First hay ropes were made and they were spun around circular hay structures where in paddy grain was emptied from gunny bags. Sometimes produce from 10 acres of paddy field was stored in one such structure. Again paddy straw was covered abundantly over the structure. It was built in the open on an earthen mound. Though it could survive well in rain and shine rodents used to damage quite a large amount of paddy. Over the years they realised that by storing long periods they did not receive proportionate advantage as interest on loans increased and fluctuating market prices caused distress. In recent years most of the paddy is marketed soon after the harvest at the field or at home. Hence, interest on individual storage structures decreased. Paddy is mostly stored in gunny bags in a portion of the house.

Though the storage capacity is 14962 quintals actual storage remained at 2029 quintals. So the capacity utilization is 13.56.

Red gram is treated mostly as a cash crop. Normally it is marketed soon after harvest unless the market price is low. As the output is also low when compared to paddy, its storage is not a big problem. After keeping a portion of the produce for seed and consumption the rest is stored in gunny bags in well ventilated areas of the house until they receive a good market price. The storage capacity for Red gram is 1990.5 quintals among

the sample farmers. As the actual storage is 250 quintals the capacity utilization comes to 12.56. The details were given in Table 5.7.

Table 5.7: Utilization of storage by the households

Mode of storage	Paddy			Red gram		
	Capacity (Qtls)	Actual storage (qtls)	Capacity utilization	Capacity (Qtls)	Actual storage (qtls)	Capacity utilization
Open	-	-	-	-	-	-
Gunny plastic bag	14962	2029	13.56	1990.5	250	12.56
Kothi/bukkari/bin kacha	-	-	-	-	-	-
Kothi/bukkhari/bin made of	-	-	-	-	-	-
cement	-	-	-	-	-	-
Steel drums	-	-	-	-	-	-
Others	-	-	-	-	-	-

Source: Field survey

5.6 Total Post-Harvest loss:

Total post-harvest loss is estimated encompassing loss during harvest, threshing, winnowing, transport, handling and finally storage. These details are provided in Table 5.8.

Table 5.8: Total Post Harvest losses per quintal by farm size

Particulars	Paddy					Red gram				
	Marginal	Small	Medium	Large	Total	Marginal	Small	Medium	Large	Total
Quantity lost in harvest (Kg per qtl)	2.60	2.34	2.24	2.31	2.38	0.57	0.47	0.28	0.30	0.41
Quantity lost in threshing (Kg per qtl)	1.50	1.27	1.15	1.11	1.26	0.43	0.51	0.48	0.79	0.55
Quantity lost in winnowing (Kg per qtl)	0.50	0.3	0.25	0.29	0.34	0.42	0.42	0.31	0.36	0.38
Quantity lost in transport (Kg per qtl)	0.24	0.16	0.15	0.15	0.18	0.37	0.35	0.39	0.39	0.38
Quantity lost in handling (Kg per qtl)	0.18	0.13	0.13	0.10	0.14	0.19	0.16	0.17	0.13	0.16
Quantity lost in storage (Kg per qtl)	0.88	1.27	1.36	1.25	1.19	1.2	1.31	0.98	1.15	1.16
Total post-harvest loss (kg per qtl)	5.91	5.47	5.28	5.21	5.47	3.18	3.22	2.61	3.12	3.03
Total post-harvest loss (kg per acre)	118.2	109.4	105.6	104.2	109.4	22.09	19.37	15.89	16.01	18.18

Source: Field survey

The quantity lost during harvest varies from 2.24 kg in medium category to 2.60 kgs per quintal in marginal category of farmers. Overall, the loss is 2.38 kg per quintal. In fact, the loss during harvest is quite significant and constitutes nearly 44 percent of total post-harvest losses in paddy. Losses in storage constitute 1.19 kg per quintal. These losses vary

from 0.88 kg in marginal farmers to 1.36 kg in medium farmers. Losses during threshing take the third position with 21 percent with an average of 1.26 kg per quintal. Large farmers have reported the lowest loss of 1.11 kg while marginal farmers put it at 1.50 kgs per quintal for this operation. About 3.29 percent of loss per quintal is noticed during transport. The same is put at 0.15 kg per quintal by large and medium farmers while marginal farmers reported the same as 0.24 kgs per quintal. Other post-harvest losses that have to be taken into account are winnowing and handling during transport. They are 0.34 kg and 0.14 kg per quintal respectively.

Overall, the total post-harvest losses per quintal as reported by sample paddy farmers come to 5.47 kg.

Operation wise Post-harvest losses of Red gram crop are discussed below with Table 5.8. Contrary to Paddy crop, Red gram crop is mostly lost during storage as reported by sample farmers. It is about 38 percent followed by threshing losses with 18 per cent other losses include harvest losses (14 percent) winnowing (12 percent) and transport (12 percent). In storage losses small farmers have reported the highest of 1.31 kgs per quintal followed by large farmers with 1.15 kgs. In threshing large farmers reported a high of 0.79 kgs/quintal while small farmers put it at 0.51 kg/quintal. Harvest losses are more with marginal farmer group at 0.57 kg/quintal followed by 0.47 kg/quintal in small farmer group. Lowest of 0.28 kg/quintal is reported by medium farmer group. Only 5 percent of Red gram crop is lost during handling according to sample farmers. Overall the total post-harvest losses are put at 3.03 kg/quintal by the selected Red gram farmers. Among them, medium farmers have reported the lowest of 2.61 kg/quintal while small farmers put the same at 3.22 kg/quintal. They are followed by marginal farmer with 3.18 kg/quintal and large farmers with 3.12 kgs.

The overall post-harvest losses per acre are estimated at 18.18 kgs.

5.7 Storage structures and pest control measures:

As significant losses are found in storage of produce an attempt is made to quantify the storage facilities and enumerate the methods used in protecting the grain from different sources of damage.

A notable factor in the study is reduction in quantity of storage. Farmers are not willing to store large quantities of produce for better price. Over the years they have realized that it is not cost effective to store produce for longer periods due to variety of storage losses. Most of the harvest is sold immediately. Remaining small quantity is stored mostly in a portion of the pucca house for feed and seed purpose. Both paddy and Red gram are stored in gunny bags with in the house, with mostly concrete walls and flooring. All of them reported that the condition of storage is good this way and there is no additional cost as the storage is within the house. They are also not taking any additional maintenance measures (Table 5.9).

Table 5.9: Some quantitative aspects of storage (Percentage of households)

Nature of Storage structure		Paddy	Red gram
Roof made of	Grass thatched	0	0
	Crop by product	0	0
	Plastic cover	0	0
	metal/cemented	100	100
	Asbestos sheet	0	0
	Others	0	0
Walls made of	Burnt bricks/ cemented	100	100
	Woven basket	0	0
	Mud	0	0
	Crib	0	0
	Open wall	0	0
	others	0	0
Floor made of	Concrete	100	100
	Earth	0	0
	Woven basket	0	0
	Wooden	0	0
it has platform	yes	0	0
	no	100	100
	others	0	0
physical condition of storage			
roof	leak	0	0
	good	100	100
walls	damaged	0	0
	good	100	100
guards	installed	0	0
	no	100	100
floor	good	100	100
	bad	0	0
Percentage of Households having platform	Height of the plat	0	0
	Roof	0	0
	Walls	0	0

	Guards	0	0
	Floor	100	100
Cost of storage			
the average age of the storage structure		0	0
Cost of Permanent storage e.g. steel drums etc., Rs. Per households		0	0
Cos t of kutcha or cement house for storage Rs. Per households		0	0
Maintenance status - Frequency of repair of grain storage			
Roof	Every year	0	0
	Every two years	0	0
	2-5 years	0	0
	No maintenance required	100	100
Walls	Every year	0	0
	Every two years	0	0
	2-5 years	0	0
	No maintenance required	100	100
Rat guards	Every year	0	0
	Every two years	0	0
	2-5 years	0	0
	No maintenance required	100	100
Storage best Control measures Sun drying	Monthly	38.33	0
	Quarterly	59.17	0
	By-annual	0	0
	Annual	0	0
	Never	0	100
Removal of infected grain from storage and destroying it	Monthly	100	0
	Quarterly	0	0
	By-annual	0	0
	Annual	0	0
	Never	0	100
Admixing with ash and other plant materials	Monthly	0	0
	Quarterly	0	0
	By-annual	0	0
	Annual	0	0
	Never	100	100
Smoking	Monthly	0	0
	Quarterly	0	0
	By-annual	0	0
	Annual	0	0
	Never	100	100
Others	Monthly	0	0
	Quarterly	0	0
	By-annual	0	0
	Annual	0	0
	Never	100	100

5.8 Suggestions on Minimizing Post-Harvest Losses:

Suggestions were sought from the sample farmers in securing the crop in post-harvest processes. For paddy, all of them insisted on proper time for harvest. Subsidies for storage is of utmost importance as felt by all farmers. Eighty five percent farmers asked for streamlined marketing facilities to avoid exploitative middlemen. Another 80 per cent felt that rural godowns could be built in every village to secure better price for the farmers. Good roads are required according to 70 per cent sample farmers to save losses in transporting (Table 5.10).

Table 5.10: Household suggestions on Minimizing Post-Harvest Losses

Sl.No.	**Paddy Crop Cultivation**	% of HHs
1	Timely harvesting	100.00
2	Setting up of rural godown in every village	80.00
3	long storage may be avoided because of rodents, pests and fungus	30.00
4	Protection from rats and keeping produce in dry place	65.00
5	Adequate and proper care during transportation and marketing	55.00
6	Conditions of roads should be improved	70.00
7	subsidies should be given to individual farmer	100.00
8	easy marketing	85.00
	Red Gram	
1	Proper care during harvesting , threshing & winnowing	100.00
2	Immediate marketing after harvesting to avoid weight loss	65.00
3	Proper storage condition	56.00
4	Timely supervision of stored grains	40.00
5	Installation of rat guards	35.00
6	Adequate and proper care during transportation and marketing	75.00
7	Clean the store with earth, lime or ashes to prevent storage losses	49.00
8	community storage facilities may be provided in the village	79.00

All Red gram farmers in the sample suggested training in proper care in harvesting, threshing and winnowing of the produce. About 79 per cent have asked for community storage facilities at the village level to enable them to wait for better price.

5.9 Summary:

Total post-harvest loss is estimated encompassing loss during harvest, threshing, winnowing, transport, handling and storage. For Paddy, the quantity lost during harvest varies from 2.24 kg in medium category to 2.60 kgs per quintal in marginal category of farmers. Overall, the loss is 2.38 kg per quintal. In fact, the loss during harvest is quite significant and constitutes nearly 44 percent of total post-harvest losses in paddy. Losses in

storage constitute 1.19 kg per quintal. These losses vary from 0.88 kg in marginal farmers to 1.36 kg in medium farmers. Losses during threshing take the third position with 21 percent with an average of 1.26 kg per quintal. Large farmers have reported the lowest loss of 1.11 kg while marginal farmers put it at 1.50 kgs per quintal for this operation. About 3.29 percent of loss per quintal is noticed during transport. The same is put at 0.15 kg per quintal by large and medium farmers while marginal farmers reported the same as 0.24 kgs per quintal. Other post-harvest losses that have to be taken into account are winnowing and handling during transport. They are 0.34 kg and 0.14 kg per quintal respectively. Overall, the total post-harvest losses per quintal as reported by sample paddy farmers come to **5.47** kg. Total post-harvest loss in Paddy is about 4.5 per cent.

Red gram crop is mostly lost during storage as reported by sample farmers. It is about 38 percent followed by threshing losses with 18 per cent other losses include harvest losses (14 percent) winnowing (12 percent) and transport (12 percent). In storage losses small farmers have reported the highest of 1.31 kgs per quintal followed by large farmers with 1.15 kgs. In threshing large farmers reported a high of 0.79 kgs/quintal while small farmers put it at 0.51 kg/quintal. Harvest losses are more with marginal farmer group at 0.57 kg/quintal followed by 0.47 kg/quintal in small farmer group. Lowest of 0.28 kg/quintal is reported by medium farmer group. Only 5 percent of Red gram crop is lost during handling according to sample farmers. Overall the total post-harvest losses are put at **3.03** kg/quintal by the selected Red gram farmers. Among them, medium farmers have reported the lowest of 2.61 kg/quintal while small farmers put the same at 3.22 kg/quintal. They are followed by marginal farmer with 3.18 kg/quintal and large farmers with 3.12 kgs. The overall post-harvest losses per acre are estimated at 18.18 kgs in Red gram crop. That amounts to a post-harvest loss of 3 per cent.

A notable factor in the study is reduction in quantity of storage. Farmers are not willing to store large quantities of produce for better price. Over the years they have realized that it is not cost effective to store produce for longer periods due to variety of storage losses. Most of the harvest is sold immediately. Remaining small quantity is stored mostly in a portion of the pucca house for feed and seed purpose. Both paddy and Red gram are stored in gunny bags with in the house, with mostly concrete walls and flooring. All of them reported that the condition of storage is good this way and there is no additional cost as the storage is within the house.

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CHAPTER – VI

Summary and Conclusions:

The area under paddy crop in Andhra Pradesh has increased from 30 in 1990-91 to 39 lakh hectares by 2009-10. The production of paddy crop in Andhra Pradesh has also increased from 92.31 lakh tonnes in TE 1992-93 to 114.95 lakh tonnes in TE 2001-02, and further to 128.15 lakh tonnes by TE 2009-10, showing thereby 40 percent rise in paddy production during the two decades with the decade 2000s showing the major increase in this respect. The substantial increase in paddy production in Andhra Pradesh during the last two decades is due to perceptible increase in yield level of paddy crop during this period, which has increased from 2340.67 kg/ha in TE 1992-93 to as much as 3247.00 kg/ha in TE 2009-10.

As with paddy crop, there has been significant expansion in area under Red gram crop in the state of Andhra Pradesh during the last two decades. This is observed from the fact that the area under Red gram crop in Andhra Pradesh has increased from 2.87 lakh hectares in TE 1992-93 to 4.56 lakh hectares in TE 2001-02, and further to 4.57 lakh hectares in TE 2009-10, showing significant rise in the area under Red gram crop in the state during the last two decades. The production of Red gram crop in Andhra Pradesh has also grown substantially during same period. The yield level of Red gram crop in Andhra Pradesh increased from 268 kg/ha in TE 1992-93 to 420.33 kg/ha in TE 2001-02 with an increase in the same to 514.67 kg/ha by TE 2009-10. Barring one or two districts, all the districts have shown increased yield levels, mainly due to high yielding varieties of seeds.

The total cost of cultivation including the imputed value of family labour (C_2) of paddy crop has grown from Rs. 21040 in 1997-98 to Rs. 37,443 by 2007-08 recording 78 percent rise (CACP). The yields of the crop have recorded a rise of 26 percent as they went up from 44 quintals per hectare in 1997-98 to 55 quintals in 2007-08. The price of the paddy has also risen by 77 percent in the same period reflecting a rise of 2.5 percent in the returns over variable cost. As the variable cost, which was Rs. 13,891 in 1997-98 has grown to Rs. 23,032 by 2007-08 recording 66 percent growth, the total cost has grown by 78 percent. In recent times farmers are complaining about high labour costs and they have attributed it to MGNREGA. In fact, they have observed a crop holiday in East Godavari district for one season.

The total cost of cultivation of Red gram including the imputed value of family labour, C_2, based on CACP reports of Andhra Pradesh has risen significantly from Rs. 8,778 to Rs. 18,042 recording 105 percent increase in the period between 1997-98 and 2007-08. The actual incurred cost in production of Red gram in 2007-08 is Rs. 8,889 in Andhra Pradesh (CACP). Wide fluctuations in the yield and returns are observed in Red gram crop mainly due to the nature of pre-harvest losses. The crop is quite sensitive to climatic conditions and pests before harvest. The yield was 6.14 quintals in 1997-98 and it had risen to 8.05 quintals by 2007-08. Despite fluctuations, returns over variable costs remained encouraging as they have increased from Rs. 5,816 in 1997-98 to Rs. 7573 per quintal in 2007-08. However, net returns after the total costs do not give an encouraging picture.

Most of the sample farmers of Paddy are literate as only 7 per cent illiteracy is reported in the survey. Among the literates, nearly 50 percent of the sample households of paddy crop pursued higher secondary and graduate level education. On the whole 38 percent of the households stopped education at secondary level while 27 percent have done graduate and above courses. Caste composition of the sample households shows OBCs at 16 percent and SCs at 5 percent. Less than 2 percent are STs. Overall income of the sample farmer is Rs. 86,446/-.

In case of Red gram sample farmers, average earners per household is 1.21. Overall illiteracy in the sample is 10.83 percent. Overall average income of Red gram farmer is Rs. 87785-.

As the crop productivity is concerned, the average yield of Paddy in the kharif is 22.73 quintals and in Rabi it stands at 23.47 quintals per acre. Overall yield of Red gram is 6.10 quintals among the selected farmers.

6.1. Pre-Harvest Losses:

Farmers of paddy in the sample have expressed that the problem of pests and diseases is very serious followed by low output prices and high cost of inputs. Red gram farmers reported the same except that they ranked low output prices the third. The major pests attacking the Paddy crop reported by sample cultivators are Paddy stem borer, Leaf folder, swarming caterpillar. Among the diseases, Blast, Sheath blight and Bacterial leaf blight are reported as serious problems. A good majority of farmers, about 70 percent,

reported pod borer as very serious problem for Red gram crop. Most of farmers expressed that pod borer and Aphids are attacking every season. About 5 percent of the sample households felt that pod borer is causing 10-25 percent damage. The average actual production of Paddy after the pest attack among the sample farmers is 20.78 quintals per acre. Normal production without attack on the whole turns out to be 24.00 quintals. The average loss of output is 3.23 quintals. The average loss over normal production in Paddy crop due to pests and disease is 13.44 percent.

Pre harvest loss due to pest, disease and weeds is slightly higher in Red gram crop in the sample area. Actual production even after some infestation is reported as 5.14 quintals per acre. Normal production without any infestation is reported to be 5.93 quintals in the sample as a whole. Loss of production on an average turned out as 0.79 quintals per acre. The percentage of loss over actual production is 15.37 percent. The loss over normal production of Red gram crop is estimated at 13.32 percent on the whole.

It is observed that Paddy farmers in the sample are spending more on insecticides and labour than others like Fungicides and weedicides. Overall, the costs on Insecticides is Rs. 480, Fungicides is Rs. 318 and weedicide is Rs. 177 on Paddy crop in the sample.

Red gram farmers have also reported similar kind of expenditure. On an average Red gram farmers are incurring Rs. 343 on Insecticides, Rs. 166 on Fungicides and Rs. 61 on Weedicides.

When queried about most important channels of information among Paddy farmers 90 percent said they rely on Government extension agents while 37 percent credited it to fellow farmers. Another 67 percent depended on private input dealers. Red gram farmers in the sample households relied exclusively on Government agricultural extension agents for pest and disease management. Roughly 83 percent of farmers also consult fellow farmers but their advice is not so important for them. Private input dealers are also an important channel of information according to 97 percent of Red gram farmers.

6.2. Post-Harvest Losses:

Total post-harvest loss is estimated encompassing loss during harvest, threshing, winnowing, transport, handling and storage. For Paddy, the quantity lost during harvest is

2.38 kg per quintal. In fact, the loss during harvest is quite significant and constitutes nearly 44 percent of total post-harvest losses in paddy. Losses in storage constitute 1.19 kg per quintal. Losses during threshing take the third position with 21 percent with an average of 1.26 kg per quintal. About 3.29 percent of loss per quintal is noticed during transport. Other post-harvest losses that have to be taken into account are winnowing and handling during transport. They are 0.34 kg and 0.14 kg per quintal respectively. Overall, the total post-harvest losses per quintal as reported by sample paddy farmers come to **5.47** kg. Total post-harvest loss in Paddy is about 4.5 per cent.

Red gram crop is mostly lost during storage as reported by sample farmers. It is about 38 percent followed by threshing losses with 18 per cent other losses include harvest losses (14 percent) winnowing (12 percent) and transport (12 percent). Only 5 percent of Red gram crop is lost during handling according to sample farmers. Overall the total post-harvest losses are put at **3.03** kg/quintal by the selected Red gram farmers. The overall post-harvest losses per acre are estimated at 18.18 kgs in Red gram crop. That amounts to a post-harvest loss of 3 per cent.

A notable factor in the study is reduction in quantity of storage. Farmers are not willing to store large quantities of produce for better price. Over the years they have realized that it is not cost effective to store produce for longer periods due to variety of storage losses. Most of the harvest is sold immediately. Remaining small quantity is stored mostly in a portion of the pucca house for feed and seed purpose. Both paddy and Red gram are stored in gunny bags with in the house, with mostly concrete walls and flooring. All of them reported that the condition of storage is good this way and there is no additional cost as the storage is within the house.

Policy Suggestions:

1. Pre-harvest losses can be minimised only when the pests and disease can be identified quite early. Even after identification remedial action can be initiated only with right recommendations. Proper advice from Agricultural extension officers becomes crucial at this stage. Most of the time farmers are depending on the advice of pesticide dealers whose motive could be different at times. Hence, easy and timely access to scientific advice to deal with pests and diseases must be ensured to the farmers.

   Periodic training classes can be conducted to expose the farmers to advanced scientific knowledge.

2. Curtailing post-harvest losses is relatively easier than prevention of pre-harvest loss. Though these losses decreased over the years with increased awareness of harvest process, availability of labour in the crucial time of harvest poses a huge problem for the farmers. As the standing crop loses moisture the grains fall off easily and wasted while harvesting.

3. There is need for more mechanization that is cost effective. Subsidies on Farm Mechanization could be increased by the government. Training must be imparted to enthusiastic young farmers. In transportation, use of Jute Gunny bags may be discouraged and plastic or similar material bags may be made available to the farmers at reasonable price. Farmers may be trained in proper handling to reduce leakages in transportation.

4. Farmers had to sell the produce immediately after harvest at low prices as storage had become a daunting task for them. Construction and maintenance of independent storage had become a big problem for them. It would be a great help for the farmers if community storage space is built at the village level. More stress can be laid in training of farmers in the methods of secure and scientific storage.

   Attention: Department of Agriculture, Andhra Pradesh.

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ACTION TAKEN REPORT

Comments on the report **"Estimation of Pre and Post Harvest Losses in Paddy and Red Gram Crops- Andhra Pradesh"** submitted by AERC, Andhra University, Visakhapatnam

1. **Title of the draft report examined:**

   Estimation of Pre and Post Harvest Losses in Paddy and Red Gram Crops- Andhra Pradesh

2. **Date of receipt of the Draft report:** July 2015

3. **Date of dispatch of the comments:** 21 September 2015

4. **Comments on the Objectives of the study:**

   All the objectives of the study have been addressed

5. **Comments on the methodology**

   Common methodology proposed for the collection of field data and tabulation of results has been followed. However, some changes are to be made in a few tables.

6. **Comments on analysis, organization, presentation etc.**

(i) In Table 1.1, please specify the period for which decadal growth rate has been calculated

(ii) Table 2.2 presents the per cent share of different districts in area and production. Unit of data provided under area and production may be removed to avoid confusion. Calculation should be rechecked as there appears to be discrepancy. For instance, share of paddy area in Guntur in 2001-02 as compared to other periods. Table 2.5 should also be rechecked.

(iii) Blank rows under summer and perennial crops in Table 3.4 to Table 3.7R may be removed.

(iv) In Table 5.1 (Chapter 5), for manually and mechanically harvested, work out the percentages across stages of harvest by each type of harvesting methods. That is, 100 should add up to manual harvesting separately. So is the case for the mechanical harvesting.

(v) The report mainly describes the data presented in the tables. Results need to be explained with field observations.

(vi) Proper formatting of tables in the chapters is required. Blank cells may be marked with hyphen (

7. **Overall view on acceptability of report**

   Authors are requested to incorporate all the comments and submit the final report.

Action taken:

All the comments given by the coordinator are taken in to consideration and modifications carried out.

*****

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