Study No.79

ECONOMICS OF PULSES PRODUCTION AND IDENTIFICATION OF CONSTRAINTS IN RAISING THEIR PRODUCTION

(A Consolidated Report of AERC Studies)

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CONTENTS

CHAPTER	PARTICULARS	PAGE
CHAPTER I	**INTRODUCTION**	**1-12**
1.1.	Background	1
1.2	Scenario of Pulses	1
1.3	Availability of Pulses	3
1.4	Developmental Strategies Introduced During Different Plan Periods	3
1.5	Reasons for the Sluggish Growth of Pulses	6
1.6	Objectives of the Study	7
1.7	Coverage of the Study and Methodology	8
1.8	Data Collection	8
1.9	Reference Period	8
1.10	Cost Concept Used	8
CHAPTER II	**PULSES DEVELOPMENT IN INDIA AND STATES**	**13-30**
2.1	Performance of Pulses in India	14
2.2	Statewise Performance of Pulses in India	14
2.3	All India Growth Rates of Area, Production and Productivity of Gram, Arhar and Total Pulses in Different Periods	16
2.4	Instability in Area, Production and Yield of Gram, Arhar and Total Pulses in Different Periods	16
2.5	Demand and Supply Projections for Pulses	17
2.6	Trends in Area, Production and Productivity of Total Pulses in India and Other States	18
2.7	Growth Rates of Area, Production and Yield of Pulses in Different States	18
2.8	Technology Mission on Pulses Development Programme in Different States	23
2.9	Distribution of Targets and Achievements by Components	24
CHAPTER III	**PULSES DEVELOPMENT IN SELECTED DISTRICTS OF DIFFERENT STATES**	**31-60**
3.1	Characteristics of the Selected Districts	31
3.1.1	Andhra Pradesh (Gurtur, Anantapur and Khammam)	31
3.1.2	Assam (Jorhat and Nagaon)	32
3.1.3	Bihar (Bhagalpur and Godda)	32
3.1.4	Gujarat (Vadodara and Panchmahals)	32
3.1.5	Haryana (Bhiwani and Ambala)	32
3.1.6	Madhya Pradesh (Durg, Jhabua and Narsinghpur)	33

	3.1.7	Maharashtra (Nasik, Ahmednagar, Amravati and Yavatmal)	34
	3.1.8	Orissa (Ganjam, Cuttack and Kalahandi)	34
	3.1.9	Punjab (Ludhiana and Firozpur)	35
	3.1.10	Rajasthan (Nagaur and Hanumangarh)	35
	3.1.11	Tamil Nadu (Salem and Tuticorin)	36
	3.1.12	Uttar Pradesh (Udham Singh Nagar, Aligarh, Baharaich and Lalitpur)	37
	3.1.13	West Bengal (Purulia, Malda and Cooch Behar)	37
3.2		Pulses Development in Selected Districts of the States	43
	3.2.1	Andhra Pradesh (Gurtur, Anantapur and Khammam)	43
	3.2.2	Assam (Jorhat and Nagaon)	43
	3.2.3	Bihar (Bhagalpur and Godda)	44
	3.2.4	Gujarat (Vadodara and Panchmahals)	44
	3.2.5	Haryana (Bhiwani and Ambala)	45
	3.2.6	Madhya Pradesh (Durg, Narsinghpur and Jhabua)	45
	3.2.7	Maharashtra (Nasik, Ahmednagar, Amravati and Yavatmal)	46
	3.2.8	Orissa (Ganjam, Cuttack and Kalahandi)	47
	3.2.9	Punjab (Ludhiana and Firozpur)	47
	3.2.10	Rajasthan (Nagaur and Hanumangarh)	48
	3.2.11	Tamil Nadu (Salem and Tuticorin)	48
	3.2.12	Uttar Pradesh (Udham Singh Nagar, Aligarh, Bahraich and Lalitpur)	49
	3.2.13	West Bengal (Purulia, Malda and Cooch Behar)	49
3.3		Technology Mission on Pulses Development Programme in Selected Districts	50
	3.3.1	Andhra Pradesh (Gurtur, Anantapur and Khammam)	50
	3.3.2	Assam	50
	3.3.3	Bihar	50
	3.3.4	Gujarat	53
	3.3.5	Haryana	53
	3.3.6	Madhya Pradesh	53
	3.3.7	Maharashtra	54
	3.3.8	Orissa	54
	3.3.9	Punjab	54
	3.3.10	Rajasthan	55
	3.3.11	Tamil Nadu	55
	3.3.12	Uttar Pradesh	55
	3.3.13	West Bengal	55
CHAPTER IV		**RESULTS AND DISCUSSION**	**61- 122**
4.1		Characteristics of Sample Farmers	61
	4.1.1	Structure of Family	61
	4.1.2	Characteristics of Land Holdings and Irrigated Area	63
	4.1.3	Cropping Pattern	67
4.2		Pulse Crops Growth on the Sample Farms	73

4.3	Input Used (Cost per Hectare)	82
4.4	Profit per hectare and Input Output Ratio (Costs and Returns)	86
4.5	Disposal of Pulses on Sample Farms	101
4.6	Marketing, Prices and Processing of Pulses	106
4.7	Constraints in Raising Pulses Production	111
4.8	Strategy Suggested for Increasing Pulses Production for Different States	115
CHAPTER V	**SUMMARY AND CONCLUSIONS**	**123- 148**
	APPENDICES	**149- 177**

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GRAPHS

		Between pages
1	Per capita Net Availability of Cereals,Pulses and Total Food-grains in India : 1950-51 to 1996-97	2 - 3
2	Statewise area and production of total pulses (Major Pulse growing states) for the year 1995-96	14 - 15
3	The demand and supply projections for 2001 A.D.	16 –17
4	Area, Production and Productivity of Total Pulses in India (1982-83 to 1994-95)	17 – 18

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LIST OF TABLES

TABLE NO.	PARTICULARS	PAGE
CHAPTER I	**INTRODUCTION**	**1 - 12**
1.1	Area, production & productivity of pulses in major producing countries, 1995	2
1.2	Per capita net availability of cereals and pulses in India	3
1.3	Major strategies/programmes introduced for pulses development during different plan periods	4-5
1.4	Details of the Agro-climatic Regions and Districts selected by the AER Centres	9-12
CHAPTER II	**PULSES DEVELOPMENT IN INDIA AND STATES**	**13 - 30**
2.1	Yield of pulses in some countries, 1995	13
2.2	Trends in area, production and yield of pulses in India	14
2.3	Statewise area, production and productivity of total pulses during 1995-96	15
2.4	All India compound growth rates in area, production and yield of pulses	16
2.5	All India instability in area, production and yield of pulses	17
2.6	Demand and supply projections for pulses for 2001 AD	17
2.7	Trends in area, production and productivity of total pulses in India	20
2.8	Growth rates of area, production and yield of pules in different states	21
2.9	Financial allocations and amount spent during 1996-97, Andhra Pradesh	25
2.10	Financial allocation and amount spent during 1996-97, Bihar	26
2.11	Financial allocation, Gujarat, 1996-97	27
2.12	Financial allocations and amount spent during 1996-97, Haryana	27
2.13	Financial allocation during 1996-97, Madhya Pradesh	28
2.14	Financial allocations and amount spent during 1996-97, Orissa	28
2.15	Financial allocations and amount spent upto January 1997, Rajasthan	29
2.16	Financial allocations and amount spent during 1996-97, Tamil Nadu	29

2.17	Cropwise distribution of certified seeds of pulses alongwith subsidies under NPDP during 1996-97 in the selected districts of Uttar Pradesh	30
2.18	Amount spent on components of NPDP, 1995-96, West Bengal	30
CHAPTER III	**PULSES DEVELOPMENT IN SELECTED DISTRICTS OF DIFFERENT STATES**	**31 - 60**
3.1	Main features of the selected districts	38 - 42
3.2	Growth rates of area, production and yield of pulse crops in selected districts of the selected States.	51 – 52
3.3	Componentwise physical and financial targets and achievements of National Pulses Development Project in selected districts of the selected States.	56 – 60
CHAPTER IV	**RESULTS AND DISCUSSION**	**61– 122**
4.1	Structure of family of the selected farmers	62
4.2	Land holdings and irrigated area of the sample farms	64
4.3	Cropping pattern of the selected farms	69-71
4.4	Pulse crops grown on the sample farms, 1996-97	75- 80
4.5	Input used per hectare (cost per hectare) on sample farms	83-85
4.6	Per hectare output values, input cost, net profit and input output ratio	88- 99
4.7	Disposal of produce, sample farms	102-105
4.8	Constraints in raising the pulses production	112-113

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FOREWORD

This study is a common study which has been conducted by 10 Agro-Economic Research Centres in 13 States of the country at the instance of the Directorate of Economics & Statistics, Ministry of Agriculture, Government of India, New Delhi. As a Coordinator, this consolidated study was assigned to this Centre by Ministry of Agriculture.

Pulses play an important role as they are rich sources of vegetable protein. Pulses being leguminous crop add nitrogen to the soils. India is the largest producer of pulses in the world, both in quantity and types / varieties. The major pulses growing States of the country are Madhya Pradesh, Uttar Pradesh, Rajasthan, Maharashtra, Orissa, Bihar, Andhra Pradesh, Haryana, Karnataka, Gujarat, Tamil Nadu and West Bengal. The remaining States have only small area under pulses.

The main objectives, among others, of the study are to calculate the economics of production of pulses vis-à-vis competing crops and to identify the constraints in the production including adoption of improved technology of pulses.

With a view to assess the economics of pulses production and identification of constraints in raising their production, the study was conducted in selected States by selecting sample pulse growers of five size groups scattered in different agro-climatic zones. The input-output analysis was carried out with the help of primary data and trend and growth rates were studied from the secondary data. The marketing and milling of pulses were also studied with the help of data collected from the selected dal mills of the selected States.

The major constraints in increasing productivity of pulses are : lack of information about improved technology, lower adoption of rhizobium culture, scant availability of high yielding, disease resistant and drought resistant improved varieties seeds suitable for different climatic conditions, lower profits in production of pulses vis-à-vis competing crops and high variability in yields. Further, the farmers do not get full advantage of the enhanced market prices of pulses due to lack of direct access to processing and marketing facilities.

The present study was conducted by Dr. S.K. Gupta, Research Officer of this centre, who planned the study design and drafted the report. A good deal of useful information and data have been generated on problems of pulses production by the project-leaders of the selected Centres of the country. The scientists deserve appreciation for their work. The report will prove to be useful to the scientists and planners for planning future research on pulses.

Dated : 19/2/2001

(M.C. Athavale)
Professor & Head

PREFACE

The present study on "Economics of Pulses Production and Identification of Constraints in raising their Production" is a common study which has been conducted by ten A.E.R. Centres in different States at the instance of the Directorate of Economics and Statistics, Ministry of Agriculture, Government of India, New Delhi. Agro-Economic Research Centre, Jabalpur is the Coordinator of this Study. Thirteen States under the 10 A.E.R. Centres of the country were included in this study. Agro-Economic Research Centre, Jabalpur prepared this consolidated report of all the State reports.

Production of pulses is important both from nutritional and agronomical points of view. Pulses are the primary and cheapest sources of vegetable proteins for the poor and vegetarians who constitute significant proportion of Indian population. Pulse crops also increase the soil fertility through the nitrogen fixation in the root nodules.

Although India is the largest producer of pulses in the world, owing to stagnant production and productivity and increasing population, the net per capita availability of pulses has been declining continuously. Considering the importance of pulses production, many promotional strategies have been introduced to increase the production of pulses since the third five year plan. However, unlike other foodgrain crops like rice and wheat, the strategies introduced so far could not bring any breakthrough in the production of pulses. Since most of the existing studies conducted relating to pulse crops are based on secondary data either at the State level or regional level, an effort was made in this study to bring out the constraints in the cultivation of pulses and economics of pulses production using the field level (primary) data collected from the pulses growers of 13 States of the country.

On the basis of consolidated report, it is revealed that pulses are still relegated to the status of an inferior crop. Despite prices having risen, area under pulses is found to be nearly stagnated. Most of the pulses have been grown under rainfed conditions on the marginal and sub-marginal lands. The fluctuations in yield levels are high, pest attack is still a major menace.

Disease resistant and drought resistant varieties of seeds suitable for different climates, input subsidy, price support, improvement in the harvest and post harvest technology, modern storage facilities are the main requirements to boost the production. A package of all these measures in an integrated manner will be more effective to increase the production of pulses.

I wish to express my deep sense of gratitude to the Directorate of Economics and statistics, Department of Agriculture and Cooperation, Ministry of Agriculture, Govt. of India, New Delhi, for entrusting this study to this centre. I am thankful to Prof. M.C. Athavale, Professor and Head, Agro-Economic Research Centre for M.P., J.N. Krishi Vishwa Vidyalaya, Jabalpur (M.P.) for giving his valuable suggestions in finalising the report.

I express my sincere thanks to all Directors and project-in-charge of the selected Centres. I am also thankful to Director, Deputy Directors and other officials of the Department of Agriculture of the selected States.

I owe a deep sense of gratitute to Hon. Vice-Chancellor and other authorities of J.N. Krishi Vishwa Vidyalaya, Jabalpur. I express my heartfelt thanks to all the faculty members including the non technical staff of the Centre, who extended their sincere assistance and cooperation in completion of the project. I would also offer my thanks to Mr. Sikandar Khan, who took painstaking job of doing the typing of the report.

I am also thankful to all the sample farmers for providing necessary information and cooperation.

Gupta

Date : 19/2/2001

(S.K. Gupta)
Project Leader

CHAPTER - I

INTRODUCTION

1.1 Background

The present study "Economics of Pulses Production and Identification of Constraints in Raising their Production" was undertaken at the instance of the Directorate of Economics & Statistics, Ministry of Agriculture, Government of India. It was assigned to 10 Agro-Economic Research Centres of the country. Agro-Economic Research Centre, Jabalpur was asked to make a consolidated report of all the state reports.

The New Agricultural Technology (NAT) introduced during the mid-sixties did not make uniform impact on all the crops. Production of rice & wheat increased substantially, while it was almost stagnant in pulses. In fact, the production and productivity of pulses were stagnant over the last four decades. As a result of stagnant production and continuous growth of population, the per capita availability of pulses fell drastically. Despite many promotional schemes for increasing pulses production during the different plan periods, the production of 1990's was almost the same as it was in the early 1960's. Non-availability of good high yielding varieties was one of the reasons for slow growth in pulses production.

1.2 Scenario of Pulses

India is the largest producer of pulses in the world, both in quantity and quality. India produces 75 varieties of pulses. It produces 40 to 80 per cent of the global production of pulses like gram, arhar (tur), lentil, pea, cowpea, moong and urad. The area under pulses in India in 1995 was 24 million hectares or 35.45 per cent of the world area. The production of pulses was 14.8 million tonnes or 26.46 per cent of the world production. The yield was 595 kg. per hectare as against world average of 796 kg. per hectare. Thus India's yield of pulses lagged far behind that of world average (Table 1.1).

The share of pulses production in the overall foodgrains basket has declined from 16.5 per cent in 1950-51 to 7.1 per cent in 1995-96 (G.O.I., 1997). The cereal : pulses production ratio has been consistently against pulses from 8.2:1 to 11.5:1 during the period.

Once a net exporter, India is presently one of the largest importers of pulses. Pulses are imported on a more or less regular basis, because our domestic production is chronically short of domestic demand. The crisis of pulses is gradually firing up its grip on increase in demand, due to growth in population and introduction of protein based food industries. There is a need to check pulses import which drained much needed foreign exchange. To bridge the gap between demand and supply of pulses, India needs manifold increase in pulse production.

Table 1.1 Area, production & productivity of pulses in major producing countries, 1995

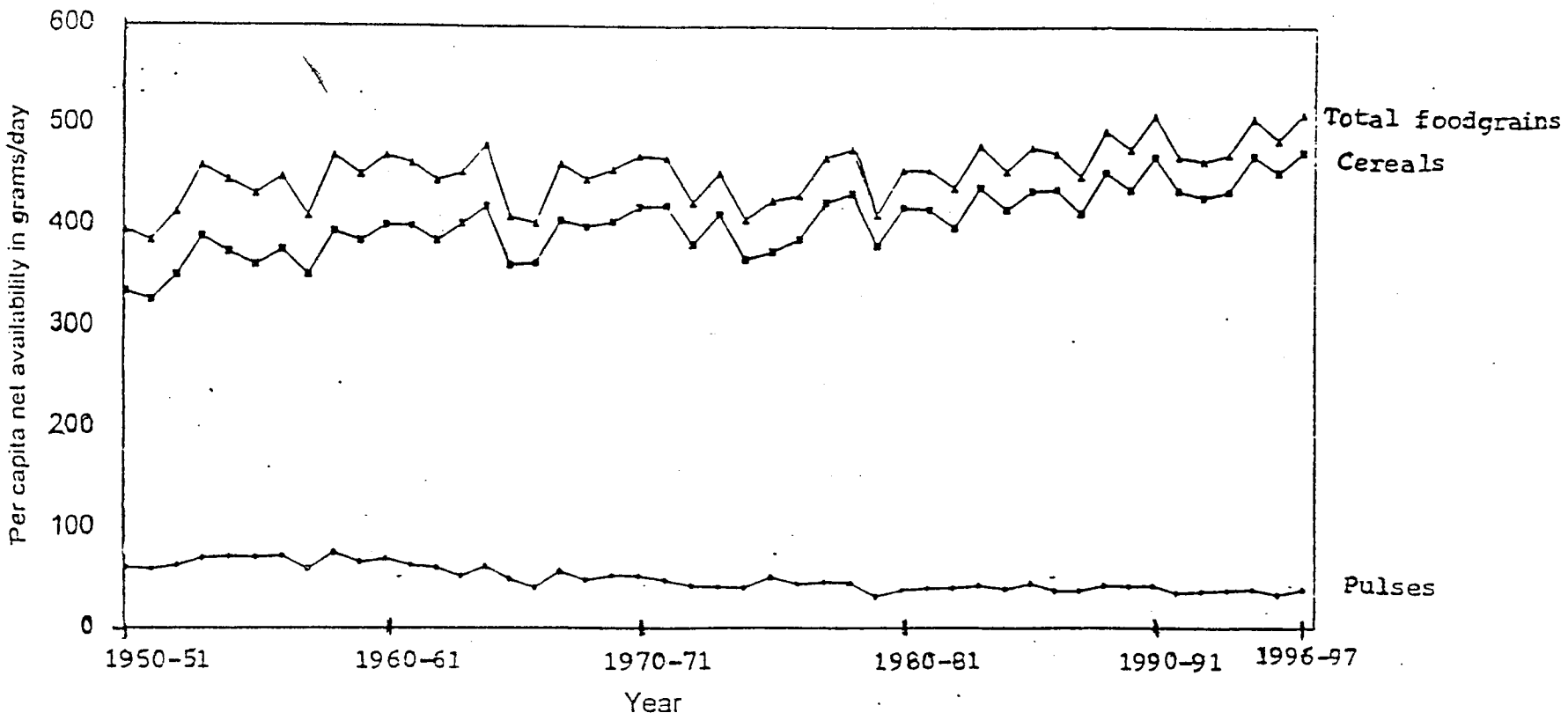
S.No.	Country	Area ('000 hectares)		Production ('000 tonnes)		Yield (kg./hectare)
1.	World	70,317	(100.00)	55,997	(100.00)	796
2.	India	24,925	(35.45)	14,820	(26.46)	595
3.	China	4,553	(6.47)	5,511	(9.84)	1,211
4.	Brazil	5,060	(7.19)	2,941	(5.25)	581
5.	France	700	(0.99)	3,502	(6.25)	5,003
6.	Australia	2,045	(2.91)	2,381	(4.25)	1,164
7.	Nigeria	2,220	(3.16)	1,850	(3.30)	833
8.	Canada	1,248	(1.77)	2,090	(3.73)	1,674
9.	Turkey	1,887	(2.68)	1,824	(3.26)	967
10.	U.S.A.	885	(1.26)	1,530	(2.73)	1,729
11.	Ukraine	1,075	(1.53)	1,518	(2.71)	1,412
12.	Russian Fed.	1,727	(2.45)	1,435	(2.56)	831
13.	Maxico	2,151	(3.06)	1,428	(2.55)	664
14.	Pakistan	1,524	(2.17)	781	(1.39)	513
15.	Egypt	179	(0.25)	380	(0.68)	2,122
16.	Argentina	207	(0.29)	277	(0.49)	1,340
17.	Bangladesh	714	(1.01)	517	(0.92)	724
18.	Indonesia	397	(0.56)	504	(0.90)	1,269
19.	Iran	1,010	(1.44)	730	(1.30)	723
20.	Japan	72	(0.10)	113	(0.20)	1,579
21.	Thailand	527	(0.75)	441	(0.79)	836
22.	Spain	309	(0.44)	211	(0.37)	683
23.	Italy	106	(0.15)	184	(0.33)	1,735

Note : *1. Total may not tally as many countries are not included.*
2. Figures in brackets denote percentages to total

Source: *FAO Production Yearbook, 1995, FAO, Rome*

Pulse crops are important both from nutritional and agronomical points of view. Pulses are the primary and cheapest sources of vegetable protein for the poor and vegetarians who constitute significant proportion of Indian population. Protein content of different pulses varies from 20 to 40 per cent. It is also a good source of minerals like calcium, phosphorus, iron, copper and molybdenum and also rich in vitamins such as thiamine, riboflavin, nicotinic acid, ascorbic acid and carotene etc. From the agronomic point of view, pulse crops increase the soil fertility through the nitrogen fixing bacteria present in the root nodules. Further, due to deep root system pulses can utilize the limited available moisture very efficiently than many other crops.

Figure 1.1
Per capita Net Availability of Cereals, Pulses and Total Foodgrains in India: 1950-51 to 1996-97.



1.3 Availability of Pulses

Normally an average person needs 47 gms. of pulses per day. According to FAO and WHO estimates, 1 gm. of protein per capita per day for each kilogram body weight is required for proper growth of the body. However, in India the per capita availability of pulses is declining from year to year due to increasing population and nearly stagnant production. The per capita net availability of foodgrains increased from468.7 gm./day in 1961 to 510.1 gm./day in 1991. However, the availability of pulses declined from 69 gm./day in 1961 to 41.6 gm./day in 1991 and further to 34.8 gm./day in 1996 (Table 1.2and Figure 1.1)

Table 1.2 Per capita net availability of cereals and pulses in India

(Figures- grams/day)

Year	Cereals	Pulses	Total
1951	334.2	60.7	394.9
1961	399.7	69.0	468.7
1971	417.6	51.2	468.8
1981	417.3	37.5	454.8
1990	435.3	41.1	476.4
1991	468.5	41.6	510.1
1992	434.5	34.3	468.8
1993	427.9	36.2	464.1
1994	434.0	37.2	471.2
1995	468.5	38.1	506.6
1996	465.0	34.8	498.0

Source : Government of India, 1997

It is evident from the table that the net per capita availability of pulses in India never reached the recommended intake of FAO and WHO (80 gm./capita /day) in the last 50 years. The highest per capita availability so far reached was 71.8 gm/day in 1956-57 and thereafter it fell continuously. Even if we take into account the recommendation of Indian Council of Medical Research (ICMR) (i.e. 43 gm./capita/day) the results are not encouraging.

1.4 Developmental Strategies Introduced During Different Plan Periods

To meet the growing needs of the country, the pulse production programmes were initiated with different developmental strategies during various plan periods.

Unlike other foodgrain crops, there were no specific programmes of pulses development till the second five year plan. After noting the continuous decline in the output of pulses per hectare, an All-India Coordinated Pulse Research Project (AICPRP) was initiated in 1965 (third plan) to undertake a nation wide research effort on pulses with the headquarters at the Indian Agricultural Research Institute (IARI) with regional centres and four sub centres.

Table 1.3 Major strategies/programmes introduced for pulses development during different plan periods

Third Plan (1961-62 to 1965-66)	Fourth Plan (1969-70 to 1973-74)
1. All India (Coordinated Pulse Research Project) established. 2. All India coordinated varietal trials have been made. 3. Breeding of suitable varieties for fitting into multiple cropping. 4. Breeding of uniformly ripening varieties. 5. Breeding of suitable varieties of urad for mixed cropping in north India. 6. Breeding of diseases resistant varieties.	1. "Intensive Pulses District Programme" (IPDP) was initiated. 2. Adoption of package of practices involving use of improved seeds, phosphatic fertilisers, rhizobial culture and plant protection campaigns. 3. Outside the area of IPDP, minikit programme for major pulse crops introduced. 4. Extension of pulses area by catch cropping, inter-cropping and mixed cropping with cereals, millets, cotton. groundnut and sugarcane etc.

Fifth Plan (1974-75 to 1978-79)	Sixth Plan (1980-81 to 1984-85)
1. IPDP continued and further intensified. 2. Research programme on pulses stepped up by All India Coordinated Research Programme. 3. Breeding of varieties suitable as catch crops to replace monsoon fallows. 4. Standardization of techniques for fertilisers application. 5. Development of pest control schedules and suitable bacterial culture. 6. Development of more effective agronomic practices. 7. Special importance on processing of pulses and modernisation of dal milling industry.	1. Introduction of pulse crops in irrigated farming 2. Bringing additional area under short duration varieties of urad, moong etc., in rice fallows by utilising the residual moisture in rabi season and in summer season with irrigation after oilseeds, sugarcane, potato and wheat. 3. Multiplication and use of improved pulse seeds. 4. Use of Phosphatic fertilisers and rhizobial culture. 5. Improved post harvest technology. 6. Organisation of "pulse crop village" in various blocks both in irrigated and rainfed areas.

Seventh Plan (1985-86 to 1989-90)	Eighth Plan (1992-93 to 1996-97)
1. Introduction of pulses in irrigated farming. 2. Bringing additional area under short-duration varieties of moong and urad in rice fallows in the rabi season and as a summer crop where irrigation facilities are available. 3. Inter-cropping of arhar, moong and urad with other crops. 4. Multiplication and use of improved seeds. 5. Adoption of plant protection measures. 6. Use of fertilisers and rhizobial culture. 7. Remunerative prices relative to competing crops. 8. Centrally sponsored National Pulses Development Programme (NPDP).	1. Many programmes introduced in the seventh plan were allowed to continue in the eighth plan. 2. Pulse crops brought under Technology Mission in 1990-91. 3. Pulses production was intensified by taking up NPDP and the special food grain production programme on pulses.

Source : Various Five Year Plan Documents, Planning Commission, Government of India, New Delhi.

The proposed strategy for increasing production and productivity of pulses under National Pulse Development Programme (1996-97) is given below :

1. (a) Bringing additional area under non conventional cropping systems like introduction of short duration arhar varieties into irrigated cropping system in northern and central India in sequence with wheat. Introduction of summer pulses (urad, moong, cowpea) in irrigated areas after the harvest of rabi crops, substitution of upland crops like rice, jowar, maize, bajra and diverting these areas under short duration pulses in eastern and southern States. Introduction of rabi pulses in rice fallow areas, inter-cropping of arhar, moong and urad with jowar, bajra, maize, cotton, groundnut and soybean etc. Introduction of rabi arhar in Bihar, W.Bengal, Orissa, Eastern U.P., Gujarat & A.P. Introduction of rabi rajma in U.P., Bihar, M.P., Orissa, Maharashtra & W.Bengal.

   (b) Summer Pulse Campaign.

2. Adoption of improved production technology.

   (a) The full recommended package of practices should be popularised and adopted on a much larger area for each pulse crop.

   (b) Adopt inter cropping practices for increasing pulses production.

3. Breeding of suitable and uniformly ripening varieties including disease resistant varieties, adoption of plant protection measures, organisation of 'pulses crop village' in various blocks, use of fertilisers and rhizobial culture, remunerative prices relative to competing crops, etc. were taken up since Fourth Five Year Plan (1969-70 to 1973-74) period. But these measures could not make any significant impact on the production of pulses.

   Since pulse crops are important in terms of protein content as well as low cost nutritious diet for the poor people, much attention has been given to study the factors which hinder the growth of area and productivity of pulses or in other words identification of constraints.

1.5 Reasons for the Sluggish Growth of Pulses

Several studies have been conducted on pulses in the past. These have offered many reasons for the stagnant area and production of pulse crops. The main reasons are as follows.

Pulses are predominantly grown in rainfed areas where moisture stress is enormous and hence the production and productivity are lower. Some studies showed that since these are grown mainly in the rainfed areas, farmers are reluctant to use quality inputs such as fertilisers, pesticides etc. Some argue that because of non availability of good high yielding varieties as in the case of wheat and rice, farmers are reluctant to grow pulse crops in fertile areas. Farmers mainly use seeds from previous year's produce, untreated and of worn out varieties. These have poor response to yield increasing inputs. Though the absolute price of pulses is relatively higher than many competing crops, the total profit is less owing to low productivity.

Development of groundwater irrigation has also induced farmers to cultivate remunerative crops instead of pulses as groundwater is costly input. Farmers generally allot poor lands in terms of soil quality and irrigation facilities for growing pulse crops. Adoption of recommended practices such as weeding, application of rhizobium culture, application of pesticides etc. are not taken seriously for pulses cultivation. Generally pulses are susceptible to pests, diseases and weather fluctuations and involve a lot of risk.

Unlike in rice and wheat, importance is not given to study the problems and constraints relating to pulses production by using field level data. Most of the studies relating to pulses have been carried out by using macro level data either state level or regional level. Macro level data can be useful to understand the trends in area and production, but one can not understand the reasons for less adoption of yield increasing inputs and the problems in cultivating pulse crops. Lower productivity and lower use of inputs are field level problems and these can be studied only by field level information.

1.6 Objectives of the Study

The main objectives of the study are :

1. To find out the socio-economic characteristics of the farmers who cultivate pulse crops.
2. To analyse the input use pattern of pulse crops.
3. To analyse the relationship between the use of inputs and output.
4. To find out the factors which affect the growth of pulses area and productivity.
5. To find out the economics of production of different pulse crops grown under irrigated and rainfed conditions as compared to other predominant crops of the area in different seasons.
6. To identify factors responsible for diversion of area from pulses to other crops and the extent of diversion and its result.
7. To study possibilities and extent of diversification and expansion of area under pulses by way of multiple cropping, intercropping, etc. both under rainfed and irrigated systems.
8. To identify reasons for non/partial adoption of improved production technology and sub-optimal use of inputs like improved seeds, phosphatic and sulphur rich fertilisers and other micro-nutrients, plant protection chemicals and other inputs.
9. To suggest various measures (financial and non financial) for increasing production and productivity of pulses.
10. Factors responsible for large gap between purchase price from farmers (very low)and sale price to consumers (very high) of pulses.
11. To explore the possibility of contract cultivation of pulses within the country and suggest most suitable areas to undertake this for different pulse crops.

Some A.E.R. Centres also analysed the trends in area, production and productivity of major pulses in the respective states.

Due to non-availability of data on some of the above objectives no observations could be made/conclusions drawn.

1.7 Coverage of the Study and Methodology

Thirteen states under the 10 Agro-Economic Research Centres of the country were covered in this study (Table 1.4). It was proposed that in the state sample districts/blocks should be so selected so as to cover all the agro-climatic zones/regions. The district selected for field work among the districts of respective zones was representing the highest area under pulse crop. From each of the selected districts 5 blocks were selected and from each block one village was selected. A sample of 10 pulse growers from each village was randomly selected by adjusting the available size classes. In this way, 50 farmers from each of the districts, were selected for the study. The farmers have been divided into five size groups according to the size of land holdings viz., marginal (upto 1.00 ha.), small (1.01 to 2.00 ha.), semi-medium (2.01 to 4.00 ha.), medium (4.01 to 10.00 ha.) and large (above 10.00 ha.).

1.8 Data Collection

This study was based on both primary as well as secondary data. Primary data was collected from sample farmers and secondary data was collected from various Agricultural Statistics, published by Ministry of Agriculture, Government of India and Directorate of Agriculture of various State Governments.

Published and unpublished literature was also consulted. Besides these, the data from dal mill owners for the year 1996 (January to December) were collected to understand the factors responsible for large gap between purchase price from farmers and sale price to consumers of pulses.

1.9 Reference Period

The reference year of the study was agricultural year 1996-97, viz. crop season rabi 1996, summer 1997 and kharif 1997. The field work was started after the harvest of kharif crop 1997.

1.10 Cost Concept Used

In this study cost means cost A_2. Cost was calculated with the help of standard cost concept method as is used by the Directorate of Economics & Statistics, Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India.

The items included in cost A_2 are :

Cost A_1 + rent paid for leased in land.

Table 1.4 Details of the Agro-climatic Regions and Districts selected by the AER Centres

S. No.	AER Centre/State	Agro-climatic Regions under state	Districts selected from each agro-climatic region	Selected pulse crops	No.of farmers selected from each district	Total number of farmers selected	Selected blocks from selected districts	Year of publication
1.	Allahabad (Uttar Pradesh)	Zone No. 1. Western Himalayan Zone 4. Middle Gangetic Plain Region 5. Upper Gangetic Plain Region 8. Central Plateau & Hills Region	Udham SinghNagar Baharaich Aligarh Lalitpur	Kharif Arhar Moong Urad Rabi Pea, Lentil Gram Summer Urad, Moong	50	200	Not mentioned	1998
2.	Bhagalpur (Bihar)	4. Middle Gangetic Plain Region 7. Eastern Plateau & Hills Region.	Bhagalpur Godda	Kharif Arhar (Tur) Rabi Gram	50	100	Bhagalpur- Sultanganj, Sahkund, Sabour, Pirpainti, Kahalgaon Godda- Pathargama, Poraiyahat, Boarijore, Sunder Pahari, Godda.	March 1998
3.	Chennai (Tamil Nadu)	10. Southern Plateau & Hills Region 11. East Coast Plains & Hills Region 12. West Coast Plains & Ghat Region Zone No.12 was not taken in to consideration because in Nilgiri & Kanya Kumari districts pulses were not grown.	Salem Tirunelveli (Tuticorin) ----	No kharif pulses in salem district and no rabi pulses in Tuticorin district. No summer pulses Black gram (urad) Red gram (tur) Horse gram (fodder gram) Green gram (moong) Bengal gram (gram) are important pulses.	50	100	Salem- Tharamangalam, Veerapandi, Pethanaickenpalayam, Valapadi. Ayodhya pattinam. Tuticorin- Koyathar, Kavilpatti, Tuticorin, Vilathikulam, Thenthiruperai.	1997-98 Received on (22.4.99)
4.	Delhi (Haryana)	6. Trans- Gangetic Plains Region	Ambala Bhiwani	Massar (Lentil) Gram Minor Pulses Arhar, urad, moong	50	100	Not mentioned	August 99 Received on 30.3.2000

S. No.	AER Centre/State	Agro-climatic Regions under state	Districts selected from each agro-climatic region	Selected pulse crops	No.of farmers selected from each district	Total number of farmers selected	Selected blocks from selected districts	Year of publication
5.	Delhi (Punjab)	6. Trans-Gangetic Plains Region	Firozpur Ludhiana	Moong, gram Miner pulses urad, lentil, arhar	50	100	Not mentioned	March 2000
6.	Jabalpur (Madhya Pradesh)	7. Eastern Plateau & Hill Region 8. Central Plateau & Hill Region 9. Western Plateau & Hills Region	Durg Narsinghpur Jhabua	Kharif Arhar, urad, moong Rabi Gram, teora, pea, kulthi Summer Moong	50	150	Durg- Bemetera, Saja, Nawagarh, Berala, Dondilohara. Narsinghpur- Chawarpatha Chichali, Gotegaon, Kareli, Narsinghpur. Jhabua- Alirajpur, Udaigarh, Jobat, Petlawad, Bhabara.	May, 1999
7.	Jorhat (Assam)	2. Eastern Himalayan Region	Jorhat Nagaon	Kharif Blackgram (urad) Rabi Pea	50	100	Jorhat- Salmara, Kamalabari, Ahatguri, Baligaon, Parbatia Nagaon- Juria, Pub-Tharia, Batadrawa, Dhing, Ali-tangoni.	1998
8.	Pune (Maharashtra)	7. Eastern Plateau & Hills Region 9. Western Plateau & Hills Region 12. West Coast Plains and Ghat Regions Note - Pulses (Tur & Gram) are negligible in zone-7 and Zone-12, Therefore, excluded the districts of these two zones.	Sub-zone of zone-9 9 (I) - Nasik 9 (II) - Ahmednagar 9 (III)- Amravati 9 (IV)- Yavatmal	Kharif Tur Rabi Gram	25	100	Nasik- Yeola Ahmednagar- Kopargaon Amravati- Chandur Rly Yavatmal Yavatmal	July 1998

S. No.	AER Centre/State	Agro-climatic Region under state	Districts selected from each agro-climatic region	Selected pulse crops	No.of farmers selected from each district	Total number of farmers selected	Selected blocks from selected districts	Year of publication
9.	Santiniketan (West Bengal)	2. Eastern Himalayan Region 3. Lower Gangetic Plains Region 7. Eastern Plateau & Hill Region	Cooch Behar Malda Purulia	Kharif Mash kalai (urad) Rabi Mash Kalai (urad) Summer Moong	50	150	Not mentioned	1998
10.	Vallabh Vidyanagar (Rajasthan)	6. Trans-Gangetic Plains Region. 8. Central Plateau & Hill Region. 9. Western Plateau & Hill Region. 14. Western Dry Region Note- % share of kharif pulses was highest in Zone-14 and share of Rabi pulses was maximum in Zone-6. Area and Production of pulses in Zone-8 and 9 was very low. Therefore, Zone 8 and 9 are omitted for the study purpose.	Hanumangarh -- -- Nagaur	Kharif Moong Rabi Gram	50	100	Hanumangarh- Nohar, Bhadra, Rawatsar. Nagaur- Nagaur, Nawa, Jayal, Degana	1999
11.	Vallabh Vidyanagar (Gujarat)	13. Gujarat Plains & Hill Region.	Vadodara Panchmahal	Kharif Tur Rabi Gram	50	100	Vadodara- Kurai, Hadod, Nada, Thuvavi, Simmri, Panchmahal- Segri, Taravdiya, Bathevada, Isharoda, Hadana muvada.	1999

12.	Visakha-patnam (Andhra Prdesh)	10. Southern Plateau & Hill Region. 11. East Coast Plains & Hill Region. A.P. State has 5 Agro-Climatic zones. 1. North Coastal Andhra 2. South Coastal Andhra 3. Rayalaseema 4. South Telangana 5. North Talangana Zone(1) and (5) are problematic area so these zones are eliminated from investigation.	Zone-2 Guntur Zone-3 Anantapur Zone-4 Khammam	Kharif Blackgram (As mixed crop) Red gram Green gram (As mixed crop) Rabi Black gram (As pure crop) Green gram (As pure crop) No Summer Crop	50	150	Not mentioned	December, 1997
13.	Visakha-patnam (Orissa)	7. Eastern Plateau & Hill Region. 11. East Coast Plains & Hill Region. State have 5 zones 1. Northern Plateau & Hills 2. Inland Region 3. Eastern Ghats 4. Coastal Plains 5. Ganjam Note- (1) and (2) Zones are omitted for purpose of study.	--- --- Kalahandi Cuttack Ganjam	Kharif Red gram (tur) Rabi Black gram (urad) Green gram (moong)	50	150	Not mentioned	May,1998

CHAPTER II

PULSES DEVELOPMENT IN INDIA AND STATES

The production of foodgrains like paddy & wheat has increased significantly especially after the introduction of New Agricultural Technology (NAT), which was introduced in the mid-sixties in Indian agriculture. However increase in production of pulses is almost negligible. Although there is no significant increase in area, production and productivity of various pulse crops at national level, this may not be true across different states. This is because the conditions in states vary in terms of availability of irrigation water, rainfall, climate and ecological conditions. Therefore, in the present chapter we try to review the scenario of pulse crops in terms of area, production and productivity at national as well as at different states' level.

India is the largest grower and producer of pulses in the world as it ranks first in both area and production under pulses. In 1995 India accounted for 35 per cent of the area and 26 per cent of production in the world. Despite being the largest producer, the pulses productivity is one of the lowest (595 kg./ha) in the world. France ranks first in the case of productivity of pulses in the world (5,003 kg./ha) followed by Netherland (4,041 kg.), Switzerland (4,000 kg.), England (3,162 kg.), U.S.A. (1,729 kg.), Canada (1,674 kg.) and China (1,211 kg.), whereas, the world average is 796 kg. per hectare. India's yield (595 kg/ha.) lags far behind the global average (Table 2.1).

Table 2.1 Yield of pulses in some countries, 1995

S.No.	Country	Yield (Kg./ha)
1	France	5,003
2	Netherland	4,041
3	Switzerland	4,000
4	England	3,162
5	Germany	2,859
6	Egypt	2,122
7	Italy	1.735
8	U.S.A.	1,729
9	Canada	1,674
10	Japan	1,579
11	Argentina	1,340
12	China	1,211
	World	796

Source : FAO - Production Year Book, 1995

India grows a variety of pulse crops. No other country in the world grows such a large number of varieties.

2.1 Performance of Pulses in India

In 1951-52, 96,960 thousand hectares were under foodgrains. By 1992-93 the area increased to 1,23,000 thousand hectares, and has since remained fairly stable. The area under pulses increased from 18,780 thousand hectares to 22,360 thousand hectares during the corresponding period. During 1995-96, pulses were grown on 23,920 thousand hectares. In relative terms, area under pulses has been hovering around 19 per cent of the total area under foodgrains.

The highest area and production of pulses were recorded during 1990-91, whereas, the highest yield was 610 kg./ha during 1994-95 (Table 2.2).

Table 2.2 Trends in area, production and yield of pulses in India

Year	Area under pulses ('000 hect.)	Area under foodgrains ('000 hect.)	% of pulse area to total foodgrains area	Pulse Production ('000 tonnes)	Yield (Kg./ha)
1951-52	18,780	96,960	19.37	8,420	448
1956-57	23,320	1,11,155	20.98	11,550	495
1961-62	24,240	1,17,215	20.68	11,760	485
1966-67	22,120	1,15,328	19.18	8,350	377
1967-68	22,650	1,21,448	18.65	12,100	534
1968-69	21,260	1,20,453	17.65	10,420	490
1969-70	22,020	1,23,569	17.82	11,690	531
1974-75	22,030	1,21,111	18.19	10,020	455
1977-78	23,500	1,27,509	18.43	11,970	510
1980-81	22,460	1,26,680	17.73	10,630	473
1985-86	24,420	1,27,987	19.08	13,360	547
1990-91	24,662	1,,27,850	19.29	14,265	578
1991-92	22,542	1,21,850	18.50	12,014	533
1992-93	22,360	1,23,000	18.16	12,815	573
1993-94	22,250	1,22,725	18.13	13,305	598
1994-95	23,030	1,23,684	18.62	14,040	610
1995-96	23,920	1,23,426	19.38	13,190	552

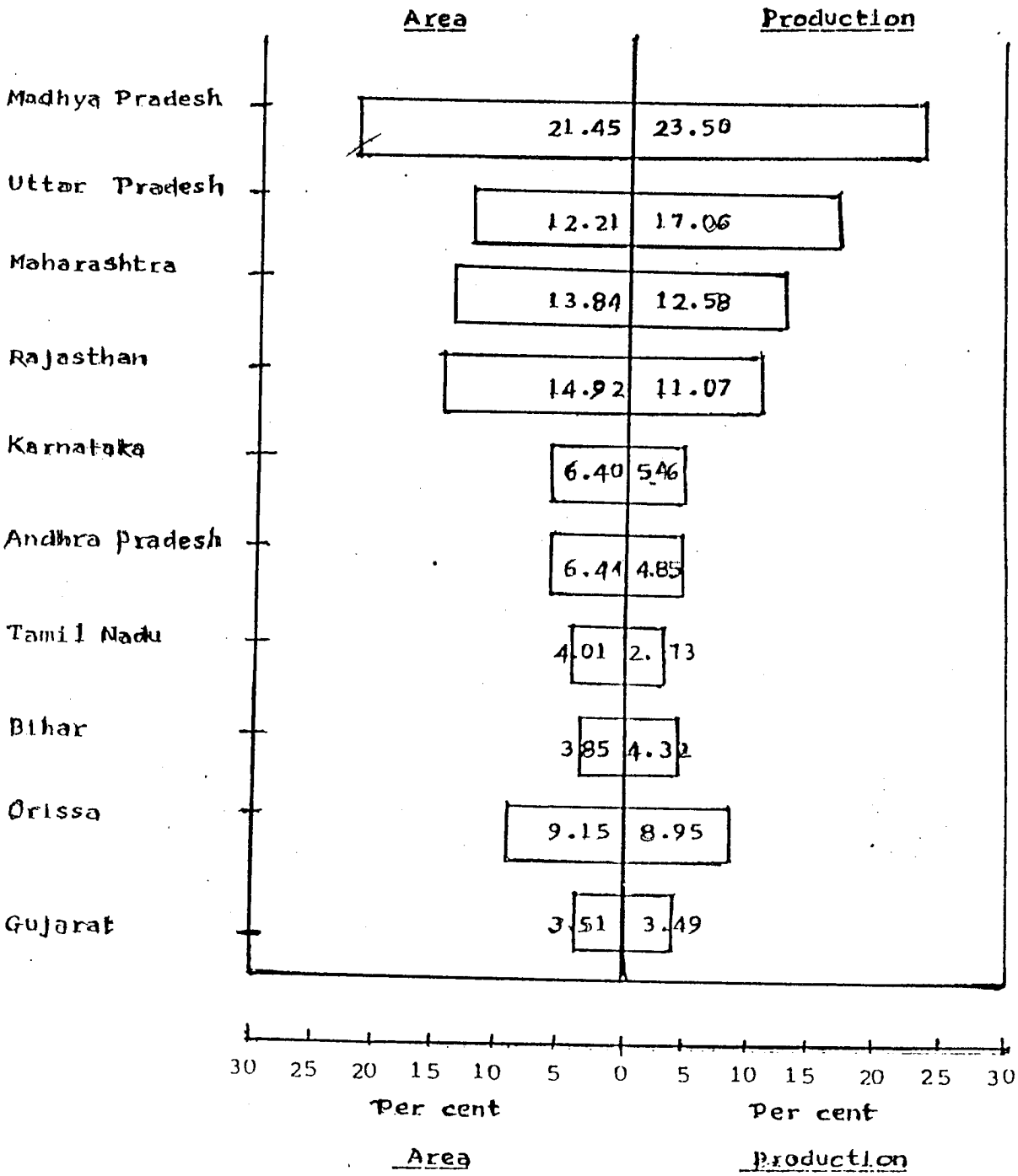
Source : Government of India, 1997

2.2 Statewise Performance of Pulses in India

So far as the pulses production scenario in the different states of the country is concerned, Madhya Pradesh is the largest producer of pulses. During 1995-96 the total area under pulses in the country was 23,920.0 thousand hectares. Madhya Pradesh accounted for 5,130 thousand hectares or 21.45 per cent and its share in total production was 3,100 thousand tonnes or 23.50 per cent of the country's production. The average productivity level was also

Figure. 2.1

Statewise area and production of total pulses
(Major pulse growing states)
(For the year 1995-96)



Percentage figures denotes the share of each state to all India total.

higher (604 kg./ha) in Madhya Pradesh as compared to the national average of 552 kg./ha. The other major pulse growing states were Rajasthan (3,570.0 thousand hectares), Maharashtra (3,310.0 thousand hectares), Uttar Pradesh (2,920.0 thousand hectares), Orissa (2,190.0 thousand hectares), Karnataka (1,530.0 thousand hectares) and Andhra Pradesh (1,540 thousand hectares). These contributed more than 1,000 thousand hectares each. Other states with considerable area were Tamil Nadu, Bihar, Gujarat, Haryana and West Bengal. Madhya Pradesh (3,100 thousand tonnes), Uttar Pradesh (2,250 thousand tonnes), Maharashtra (1,660 thousand tonnes), Rajasthan (1,460 thousand tonnes) and Orissa (1,180 thousand tonnes) are the major pulse producing States, accounting for about 72 per cent of pulses area in the country and 73 per cent of the total production. Unfortunately, the productivity of pulses in these major states is much below the national average with the exception of Uttar Pradesh and Madhya Pradesh. The highest productivity of pulses is in Haryana (972 kg/ha) followed by Uttar Pradesh (770 kg./ha), West Bengal (641 kg/ha), Bihar (620 kg/ha), Madhya Pradesh (604 kg/ha). Gujarat (543 kg/ha), Orissa (537 kg/ha), Maharashtra (503 Kg./ha) and Karnataka (474 kg/ha).

The coverage of pulse area under irrigation was highest in Haryana (28.0 per cent) followed by Uttar Pradesh (26.2 per cent), Madhya Pradesh (15.7 per cent), Rajasthan (9.1 per cent) and Gujarat (8.9 per cent). At the national level this figure was 11.2 per cent for 1993-94 (Table 2.3) and (Figure 2.1).

Table 2.3 Statewise area, production and productivity of total pulses during 1995-96

State	Area ('000 ha)	Share in national area	Production ('000 tonnes)	Share in national production	Productivity (kg/ha)	Percentage area under irrigation (1993-94)
Madhya Pradesh	5,130	21.45	3,100	23.50	604	15.7
Uttar Pradesh	2,920	12.21	2,250	17.06	770	26.2
Maharashtra	3,310	13.84	1,660	12.58	503	6.3
Rajasthan	3,570	14.92	1,460	11.07	409	9.1
Orissa	2,190	9.15	1,180	8.95	537	6.8
Bihar	920	3.85	570	4.32	620	1.7
Andhra Pradesh	1,540	6.44	640	4.85	416	0.7
Haryana	430	1.80	420	3.18	972	28.0
Karnataka	1,530	6.40	720	5.46	474	3.9
Gujarat	840	3.51	460	3.49	543	8.9
Tamil Nadu	960	4.01	360	2.73	374	5.7
West Bengal	200	0.84	130	0.98	641	1.7
Others	380	1.60	240	1.82	---	---
All India	23,920	100.00	13,190	100.00	552	11.2

Source : Government of India, 1997

2.3 All India Growth Rates of Area, Production and Productivity of Gram, Arhar and Total Pulses in Different Periods

There have been significant temporal variations in the growth rates in area, production and yield of pulses in India. There was decline in the acreage during the pre green revolution period (1960-61 to 1966-67). The period of rapid growth was from 1977-78 to 1984-85 and period of slow growth was from 1984-85 to 1994-95. Increase in pulses acreage was experienced during the initial green revolution period (1966-67 to 1977-78). Positive growth rates in yield were observed during the post green-revolution period, with the highest 1.74 during the period of rapid growth (1977-78 to 1984-85). The production growth rates were also positive during the post green revolution period, indicating that the growth in output during this period was a contribution of growth in yield. In fact, the negative growth in acreage during the period from 1977-78 to 1994-95 could not pull down the output level due to growth rates in yield.

The growth rates in the area of gram, the major rabi pulse have been negative in the period of rapid growth, while a negative growth in output was experienced in arhar, the major kharif pulse in the period of slow growth (Table 2.4).

Table 2.4 All India compound growth rates in area, production and yield of pulses

(% per annum)

Period	Total pulses			gram			arhar		
	A	P	Y	A	P	Y	A	P	Y
Pre-green revolution (1960-61 to 1966-67)	-1.49	-6.96	-5.56	-3.67	-9.78	-6.35	1.12	6.25	7.29
Initial green revolution (1966-67 to 1977-78)	0.64	0.95	0.31	0.04	1.16	1.12	0.09	2.15	2.06
Post-green revolution period (1977-78 to 1984-85)	-0.14	1.60	1.74	-1.21	0.84	0.37	3.08	4.99	1.86
Period of slow growth (1984-85 to 1994-95)	-0.01	1.01	1.02	-0.14	1.14	1.28	1.05	-0.60	-1.63

2.4 Instability in Area, Production and Yield of Gram, Arhar and Total Pulses in Different Periods

While the yield of gram has been improving over the years, the yield of arhar is exhibiting negative growth rates which shall be a matter of concern from the food security point of view because arhar is the major pulse consumed in India. On the other hand, the amplitude of fluctuations in the production as well as yield of pulses in the country has been declining. This has been true for both gram and arhar. This augurs well from the angle of food security because for maintaining supply, stability is one of the major components of national food security (Table 2.5).

Figure 2.2 The demand and supply projections for 2001 A.D.

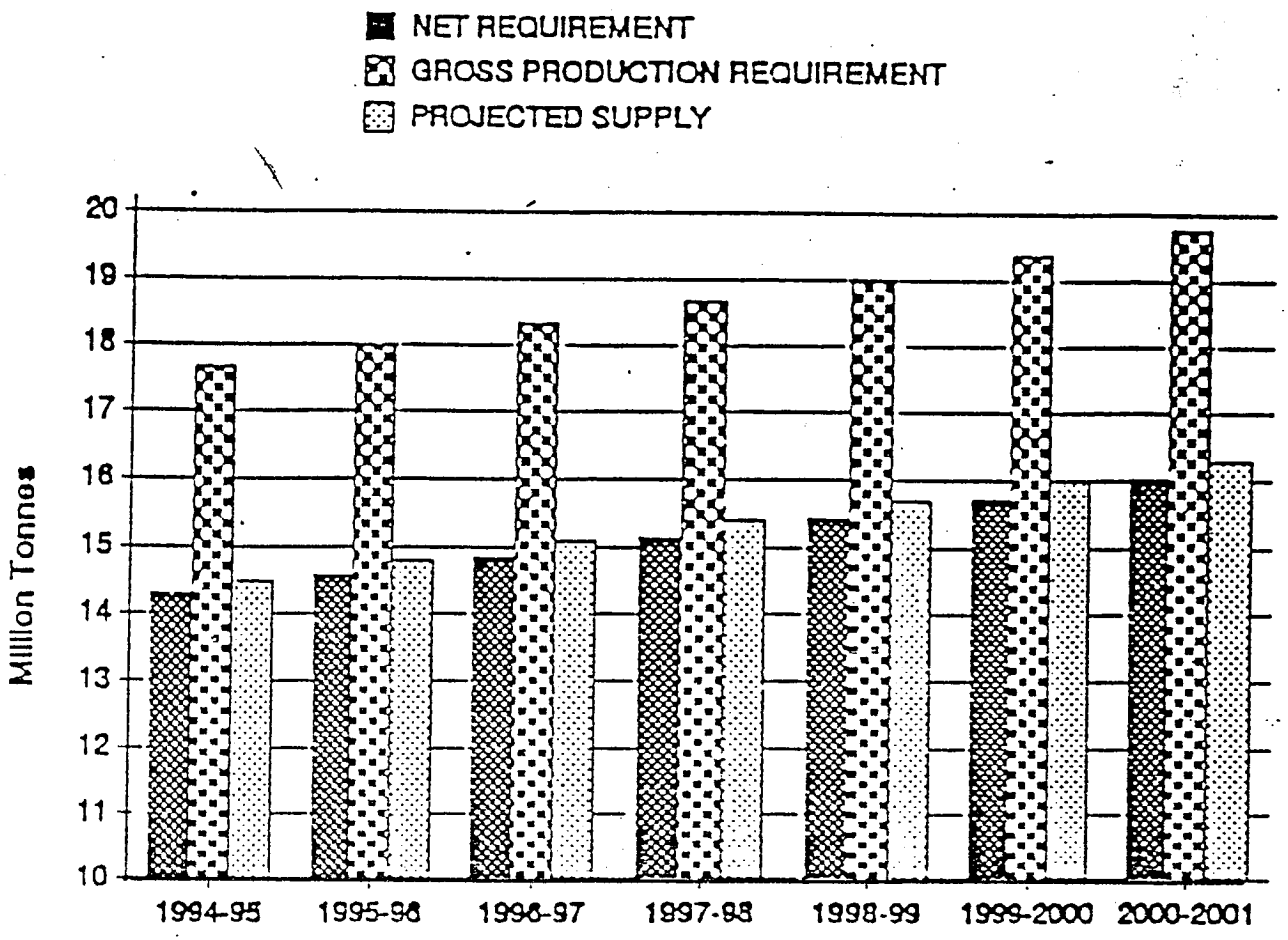


Table 2.5 All India instability in area, production and yield of pulses

(C V %)

Period	Total pulses			gram			arhar		
	A	P	Y	A	P	Y	A	P	Y
Pre-green revolution (1960-61 to 1966-67)	3.39	13.66	11.31	6.90	18.12	12.86	2.46	19.05	19.41
Initial green revolution (1966-67 to 1977-78)	4.19	12.68	12.58	5.65	15.18	12.38	3.96	14.07	14.04
Period of rapid growth (1977-78 to 1984-85)	2.44	10.82	9.48	6.39	14.60	11.77	7.27	13.96	7.59
Period of slow growth (1984-85 to 1994-95)	3.96	7.56	5.88	9.74	15.27	8.74	5.25	8.53	9.32

2.5 Demand and supply projections for pulses

Some of the studies have projected demand and supply conditions upto the year 2000-2001 and others have estimated upto the year 2006-2007. The projected results also varied due to difference in methodology followed by different authors. Bhushan and Sobti (1992) have projected the demand and supply for pulses for the period from 1994-95 to 2000-2001. It may be seen from table 2.6 and the figure 2.2 that the requirement for pulses for 1994-95 as per physiological norms set by ICMR (Normatic Demand Model) works out to 14.32 million tonnes for which production requirement is estimated at 17.66 million tonnes, but the projected supply comes to only 14.50 million tonnes indicating a gap of 3.16 million tonnes between demand and supply. By the turn of the century (2000-2001) production of 19.77 million tonnes would be required to meet the consumption requirement of 16.04 million tonnes, but the projected supply of pulses comes to only 16.30 million tonnes indicating a gap of 3.47 million tonnes between demand & supply (Table 2.6 and fig. 2.2)

Table 2.6 Demand and supply projections for pulses for 2001 AD

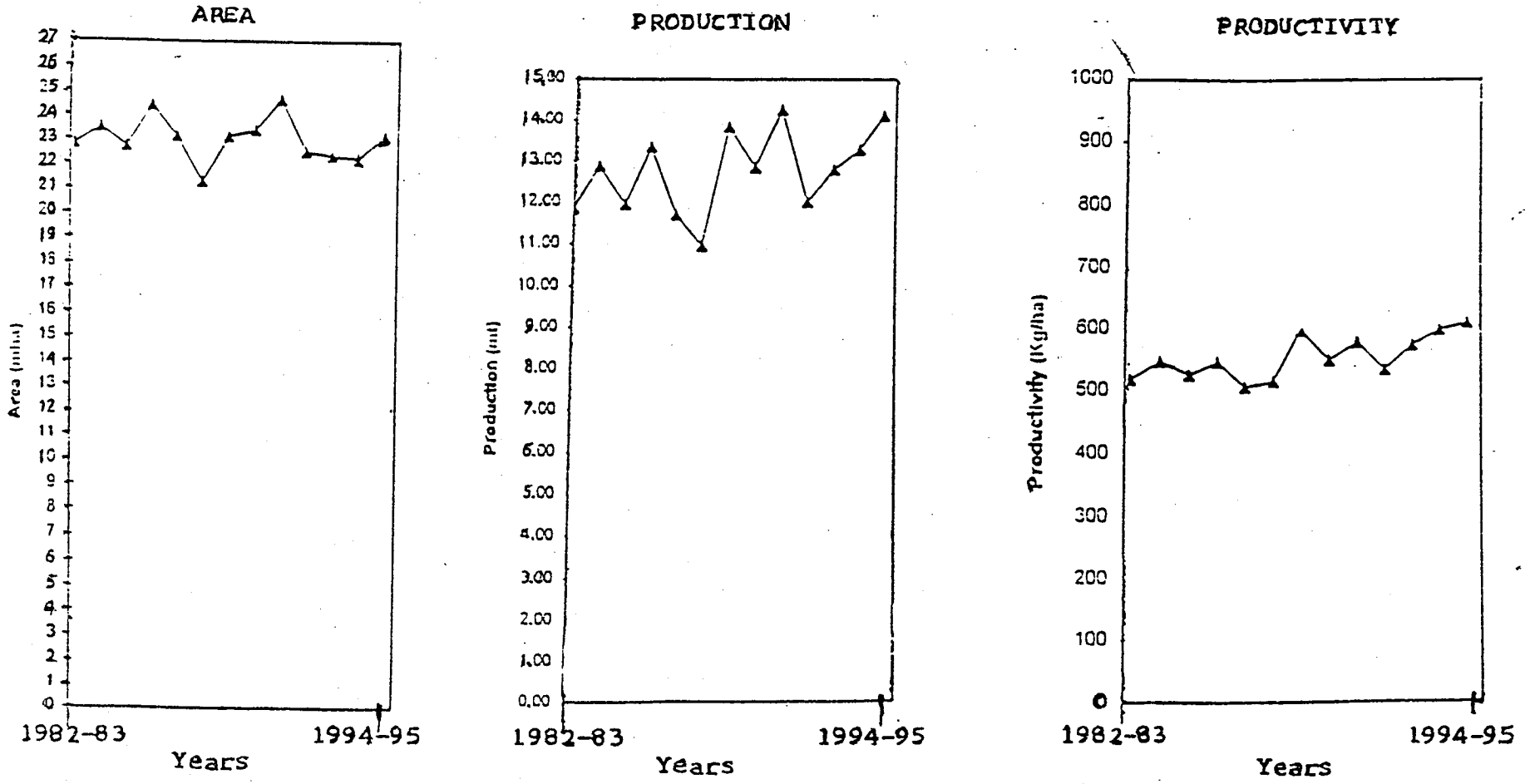
(Figures Million Tonnes)

Year	Normatic Demand Model		Projected supply	Gap
	Net requirement	Gross production requirement		
1	2	3	4	(3-4)
1994-95	14.32	17.66	14.50	3.16
1995-96	14.60	17.99	14.80	3.19
1996-97	14.87	18.33	15.10	3.23
1997-98	15.16	18.68	15.40	3.28
1998-99	15.40	19.03	15.70	3.33
1999-2000	15.74	19.40	16.00	3.40
2000-2001	16.04	19.77	16.30	3.47

Note : Normatic demand model is based on physiological need @ 43 grams/day/person and 12.5 per cent retail level and production level wastage etc.

Source : Bhushan B. and Sobti, R. (1992) "Pulses- present status and prospects". Yojana, (36) 3, July, pp. 18-22

Fig. 2.3 AREA, PRODUCTION AND PRODUCTIVITY OF TOTAL PULSES IN INDIA (1982-83 to 1994-95)



2.6 Trends in Area, Production and Productivity of Total Pulses in India and Other States

The area under pulses in India was 22,456.9 thousand hectares in 1980-81. It was 24,662.2 thousand hectares in 1990-91. Thereafter, the area fluctuated between 22,542.5 thousand hectares to 23,165.8 thousand hectares till 1994-95. The production of pulses was 10,626.8 thousand tonnes in 1980-81. In 1990-91, it was 14,265.3 thousand tonnes. Thereafter the production increased from 12014.7 thousand tonnes in 1991-92 to 14,116.7 thousand tonnes in 1994-95. The productivity of pulses was 473 kg/ha in 1980-81. It increased to 578 kg/ha in 1990-91 and 609 kg/ha in 1994-95 with fluctuations. Thus the increase in production of pulses was mainly due to increase in the yield of pulses.

Among different States, Madhya Pradesh has earned an important place as it ranked first both in terms of area and production of pulses. The area under pulses in 1980-81 was 4,576.3 thousand hectares. It increased to 5,012.6 thousand hectares in 1990- 91 but decreased to 4,528.4 thousand hectares in 1991-92. Thereafter, it increased from year to year and was 5,005.7 thousand hectares in 1994-95. The production of pulses in M.P. in 1980-81 was 2,020.8 thousand tonnes. It was 3,103.9 thousand tonnes in 1990-91. However, it decreased to 2,792.4 thousand tonnes in 1991-92. Thereafter, it increased from year to year and was 3,572.0 thousand tonnes in 1994-95.The yield of pulses per hectare was 439 kg. in 1980-81 and 619 kg. in 1990-91. It was highest in 1994-95 (714 kg/ha). In Madhya Pradesh, the increase in production of pulses was mainly due to significant increase in the yield of pulses.

The other important pulse growing states of the country in respect of area are Rajasthan, Maharashtra, Uttar Pradesh, Andhra Pradesh, Bihar, Orissa, Gujarat and Tamil Nadu. The trends for production were different in these states. The production of pulses was second highest in Uttar Pradesh followed by Rajasthan, Maharashtra, Bihar, Andhra Pradesh, Orissa, Gujarat and Haryana. The highest yield was observed in Haryana in 1994-95 (1,064 kg/ha) followed by Punjab (878 kg/ha), Uttar Pradesh (858 kg/ha), Bihar (833 kg./ha), Madhya Pradesh (714 kg/ha), West Bengal (630 kg/ha), Orissa (576 kg/ha) and Gujarat (575 kg/ha). The high productivity of pulses in Haryana, Punjab, Uttar Pradesh and Madhya Pradesh was mainly due to higher percentage of area under irrigation in these states. (Table 2.7 and fig.2.3).

2.7 Growth Rates of Area, Production and Yield of Pulses in Different States

In India the growth rates of area (4.09 per cent) and production (5.92 per cent) of pea were observed to be highest and highly significant among all pulse crops, whereas, in the case of yield it was highest (4.03 per cent) in teora. Lentil was another important pulse crop which showed positive and highly significant growth in area, production and yield.

In Andhra Pradesh the growth rates of pulses were estimated for the period 1974-75 to 1994-95. Arhar, urad and moong were the main pulse crops of the state. The growth rates of area, production & productivity of total pulses were 0.8689, 4.0507 and 3.1818 respectively.

Regarding the individual pulse crops; urad reported significant and positive growth rates in area (6.3993 per cent), production (8.8478 per cent) and yield (2.4484 per cent). The production and yield of arhar showed neither acceleration nor deceleration. This means that production of arhar is more or less stagnant. The non-significance of growth of area under moong indicates that growth is stagnant during the period of two decades. (Table 2.8)

In the state of Assam the total pulse area had a negative growth rate of 2.71 per cent. As in the area, the production also showed downward slope with a growth rate of (-) 2.50 per cent. The yield of total pulses is irregular and unstable. The yield had an annual growth of 1.39 per cent. The trend of both area and production is non linear in the case of urad. The area under urad was almost static and the growth rate was 0.05 per cent (very insignificant). The growth rate of production was 4.73 per cent per annum. The yield of urad has been fluctuating around the average yield of 446 kg/hectare and it has maintained an annual growth of 4.61 per cent. The area under pea has decreased since 1992-93 at an annual rate of 2.98 per cent. The production of pea has increased with an annual growth rate of 3.22 per cent. The yield has increased with a better growth rate of 6.14 per cent per annum. At the state level the area of pea has decreased year after year but the production and productivity have increased at a comparatively better growth rate (Table 2.8).

In Bihar the growth rate of major pulse crops with regard to area, production and productivity during the period 1985-86 to 1995-96 has been examined by the exponential growth rate analysis. In the case of gram, area and production showed negative growth of 4.49 and 1.91 per cent per annum respectively, while the productivity showed a positive rate of growth of 2.58 per cent. In the case of arhar, declining trends in area, production and productivity were observed being 0.21, 2.69 and 2.05 per cent per annum respectively. In the case of teora, the area and production showed negative growth of 6.16 and 3.98 per cent per annum respectively, which was statistically significant, whereas, the productivity had a positive growth rate of 2.18 per cent. The area, production and productivity of pea registered declining trends by 1.99, 2.84 and 0.84 per cent per annum respectively. The area and production of lentil registered increasing compound growth rates, i.e., 1.02 per cent and 0.64 per cent per annum respectively, whereas its productivity registered a negative growth rate of 0.38 per cent. In the case of area all selected pulse crops (except lentil) witnessed negative growth rates. The reduction in area might be due to shifting of cropping pattern.

A.E.R.C. Vallabh Vidyanagar has not calculated the growth rates of pulses for Gujarat.

The area and production of pulses in Haryana during (1967-1996) have declined continuously. Among pulses, the highest decline was observed in the case of gram. Recently, "other" pulses occupied an important place in the production scenario of pulses by contributing 58 thousand tonnes to the total pulse production of the state. In the case of total pulses, area and production showed negative growth of 3.1 and 0.7 per cent per annum respectively, while the productivity showed a positive rate of growth, (2.5 per cent).

Table 2.7 Trends in area, production and productivity of total pulses in India

Area - '000 hectares
Production - '000 tonnes
Yield - Kg.per Hectare

year	All India			Andhra Pradesh			Assam			Bihar			Gujarat			Haryana			Madhya Pradesh		
	A	P	Y	A	P	Y	A	P	Y	A	P	Y	A	P	Y	A	P	Y	A	P	Y
1980-81	22456.9	10626.8	473	1445.7	414.5	287	113.2	47.1	416	1367.8	833.0	609	553.6	266.6	481	803.8	504.7	628	4576.3	2020.8	439
1990-91	24662.2	14265.3	578	1631.9	695.5	426	113.4	48.5	428	1175.7	915.8	779	931.6	626.6	673	736.5	540.2	733	5012.6	3103.9	619
1991-92	22542.5	12014.7	533	1645.2	791.8	481	116.8	53.3	456	1083.0	850.4	785	838.8	393.7	469	384.0	270.2	704	4528.4	2792.4	617
1992-93	22359.8	12814.5	573	1588.4	739.0	465	109.2	51.1	468	979.6	693.3	708	974.0	648.1	665	468.1	330.2	705	4745.4	2898.2	611
1993-94	22250.1	13304.8	598	1559.3	677.0	434	109.2	57.0	522	995.3	735.5	789	888.7	538.1	605	476.9	469.6	985	4871.4	3264.6	670
1994-95	23165.8	14116.7	609	1583.3	636.5	402	108.7	59.4	546	973.0	810.5	833	901.1	518.5	575	463.8	493.6	1064	5005.7	3572.0	714

year	Maharashtra			Orissa			Punjab			Rajasthan			Tamil Nadu			Uttar Pradesh			West Bengal		
	A	P	Y	A	P	Y	A	P	Y	A	P	Y	A	P	Y	A	P	Y	A	P	Y
1980-81	2804.4	831.2	296	1725.5	886.1	514	337.5	199.9	592	3147.2	1169.7	372	532.2	146.7	275	2862.3	2523.6	882	523.8	237.8	454
1990-91	3257.3	1443.9	443	1957.9	1085.8	555	146.4	108.4	740	3682.8	1718.8	467	863.4	348.2	403	3040.2	2771.9	912	313.6	193.1	616
1991-92	3008.4	932.6	310	2142.9	1132.9	529	102.1	79.6	780	2830.7	916.9	324	795.5	331.2	416	2875.5	2522.1	877	269.4	174.7	648
1992-93	3350.4	1829.1	546	849.3	362.4	427	102.2	74.6	730	3440.7	1457.9	424	739.0	342.7	464	2922.0	2526.9	865	275.3	198.6	721
1993-94	3432.8	2205.3	642	972.8	498.6	513	101.4	80.7	796	3328.0	1071.1	322	689.9	276.4	401	2874.6	2516.0	875	268.5	170.6	635
1994-95	3595.4	1698.3	472	978.0	563.6	576	103.1	90.5	878	3602.6	1965.6	546	992.9	396.0	399	2817.6	2418.7	858	244.4	153.9	630

Source : Area and production of principle crops in India, Ministry of Agricultural, Government of India, 1994-95

Table 2.8 **Growth rates of area, production and yield of pulses in different States**

Pulse crops	All India (1982-83 - 1994-95)			Andhra Pradesh (1974-75 - 1994-95)			Assam (1986-87 - 1995-96)			Bihar (1985-86 - 1995-96)			Madhya Pradesh (1982-83 - 1996-97)		
	A	P	Y	A	P	Y	A	P	Y	A	P	Y	A	P	Y
Gram (Bengal gram)	-0.94	0.29	1.24*	–	–	–	–	–	–	-4.49***	-1.91	2.58	1.22**	3.44***	2.18***
Arhar (Tur) (Red Gram)	1.39***	0.15	-1.23	3.1285***	5.4383***	2.3098	–	–	–	-0.21***	-2.69**	-2.05	-2.21***	-2.18*	0.03
Teora (Lakh) Lathyrus	-2.37**	1.57	4.03***	–	–	–	–	–	–	-6.16***	-3.98***	2.18***	0.12	5.36***	4.28***
Urad (Black Gram)	0.83*	2.54*	1.94**	6.3993***	8.8478***	2.4484**	0.05	4.73	4.61	–	–	–	-3.43***	-100*	2.45**
Moong (Green Gram)	0.57*	1.44*	0.86	-0.0280	2.1183**	2.1470**	–	–	–	–	–	–	-4.04***	-3.49***	0.56
Kulthi	-5.11***	-3.60***	1.35**	–	–	–	–	–	–	–	–	–	-2.35***	-1.01*	1.37*
Pea	4.09***	5.92***	1.74**	–	–	–	-2.98	3.22	6.14	-1.99***	-2.84***	-0.84	2.86**	4.96***	1.83**
Lentil (Masor)	1.81***	4.08***	2.22***	–	–	–	–	–	–	1.02***	0.64	-0.38	3.90***	5.32	1.34**
Moth	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Cow pea	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Total pulses	-0.15	0.95*	1.09**	0.8689***	4.0507***	3.1818***	-2.71	-2.50	+1.39	NA	NA	NA	0.074	2.47***	2.39***

Pulse crops	Maharashtra (1980-81- 1992-93)			Orissa (1983-84 - 1995-96)			Rajasthan (1981-82 - 1995-96)			West Bengal (1982-83 - 1991-92)		
	A	P	Y	A	P	Y	A	P	Y	A	P	Y
Gram (Bengal gram)	2.95***	7.92***	4.84***	–	–	–	-1.798	-1.804	-1.004	-7.81	-8.46	-0.60
Arhar (Tur) (Red Gram)	3.94***	3.53***	-0.40	-1.5526	0.9619	2.5145*	-1.685	-0.092	1.508	-10.88	-14.27	-3.06
Teora (Lakh) Lathyrus	–	–	–	–	–	–	–	–	–	–	–	–
Urad (Black Gram)	–	–	–	1.3358***	1.3508**	0.0149	-0.038	0.463	0.510	+1.26	+3.27	+1.98
Moong (Green Gram)	–	–	–	1.8139**	1.2457	-0.5682	5.534***	11.014	5.230	-7.56	-8.85	-0.81
Kulthi	–	–	–	–	–	–	–	–	–	–	–	–
Pea	–	–	–	–	–	–	-0.706	4.258***	11.259**	–	–	–
Lentil (Masor)	–	–	–	–	–	–	-2.519	-1.124	1.409*	-0.51	+1.84	+2.38
Moth	–	–	–	–	–	–	0.389	5.391	5.008	–	–	–
Cow pea	–	–	–	–	–	–	-3.354**	6.115	9.901*	–	–	–
Total pulses	1.88***	5.22***	3.30***	1.2421**	1.4384**	0.1964	- negative	- negative	+ negative	-2.08	-1.43	+0.65

*** = Significant at 1% level ** = Significant at 5% level * = Significant at 10% level

In Madhya Pradesh, the growth rate of area was highest in the case of lentil (3.90 per cent) followed by pea (2.86 per cent), gram (1.22 per cent) and teora (0.12 per cent). Moong-moth, urad, kulthi and arhar registered negative growth rates in area during 1982-83 to 1996-97. In the case of production, very high growth rate (5.36 per cent) was observed in teora followed by lentil (5.32 per cent), pea (4.96 per cent) and gram (3.44 per cent). It was negative in the case of moong-moth, arhar, kulthi and urad. In the case of yield, all the pulse crops registered positive growth rates. It was highest in the case of teora (4.28 per cent) followed by urad (2.45 per cent), gram (2.18 per cent), pea (1.83 per cent), kulthi (1.37 per cent), lentil (1.34 per cent), moong moth (0.56 per cent) and arhar (0.03 per cent). The growth rates of production and yield of total pulses in Madhya Pradesh were positive and highly significant, whereas, it was very low and insignificant in the case of area (Table 2.8).

Gram and arhar were the most important pulse crops of the Maharashtra. The rate of growth of area, production and productivity of gram for the period 1980-81 to 1992-93 was 2.95, 7.92 and 4.84 per cent respectively. Arhar occupied the first place among the pulse crops in the state and it accounted for about 31 per cent of the total pulses area. The growth rates of area and production of arhar were 3.94 and 3.53 per cent respectively, It was significant. But in the case of yield, the growth rate was negative. The growth rate for total pulses was 1.88, 5.22 and 3.30 per cent per annum for area, production and productivity respectively, which was also highly significant.

In Orissa, the growth rates of area and production of total pulses were 1.2421 and 1.4384 per cent per annum respectively during 1983-84 to 1995-96. The growth rate was statistically significant. But this effect is not reflected in the case of yield. It was very low (0.1964 per cent) and non-significant. In the case of moong, area and production showed positive growth rates but there was negative growth in the case of yield. In the case of urad, the growth rates of area and production were positive and significant. But this effect was not reflected in the case of yield (non-significant). No acceleration or deceleration was found in the case of area, production and productivity of urad. The area and production of arhar showed neither acceleration nor deceleration. But the yield has a growth rate which is significant. (Table 2.8)

Eight major pulse crops are grown in Rajasthan. However, moong, moth in kharif and gram in rabi are most important pulses followed by urad and chawla in kharif and lentil and pea in rabi. Moong, moth and gram accounted for about 91 per cent of the total area and production of the state during 1993-96. Among kharif pulses, moong showed positive and significant growth (5.534 per cent) in respect of area and it has also significant and positive growth rate (11.014 per cent) of production. In the case of cowpea, it showed a negative growth rate of area but it has positive and significant growth rate in respect of yield (9.901 per cent). In the case of moong, it was the area which was responsible for increased production, whereas for cowpea the yield was responsible for increased production. Out of the three rabi pulses (gram, lentil and pea), only pea showed negative growth rate in the case of area but it has positive and significant increase in growth rate of production. In the case of lentil, the growth rate of area and production both

declined but in the case of yield, it showed positive and significant increase. All the pulses taken together, showed negative growth rates in the case of area and production. In respect of yield, it was positive, but insignificant.

The growth rates of area, production and yield of major pulses in Uttar Pradesh and Tamil Nadu were not estimated by the respective AER Centres. The growth rate of pulses production in Tamil Nadu was 4.10 per cent between the period 1984-85 to 1996-97.

In West Bengal, the production of pulses declined at the rate of 1.43 per cent per annum during the decade 1982-83 to 1991-92. Decline in production was due to decline in area by 2.08 per cent per annum. Yield rate of pulses grew at a meagre rate of 0.65 per cent per annum. Gram, arhar, and moong showed negative growth rates in area, production and yield, whereas, urad showed positive growth rate in area, production and yield. Lentil showed positive growth rate in production and yield and negative growth rate in area (Table 2.8).

2.8 Technology Mission on Pulses Development Programme in Different States

In order to increase the area and production of pulses, a centrally sponsored National Pulses Development Programme (NPDP) was launched in different states in mid eighties with the financial aid of the Government of India. The programme was designed to supplement the efforts of the State Governments for increasing the production and productivity of various pulse crops. The programme includes enhancing production and productivity of six major pulse crops i.e., gram, arhar, moong, urad, pea and lentil.

Primarily, the National Pulse Development Programme is considered a district oriented Mission Programme and is expected to achieve the increased level of productivity and production within a time schedule. The main objective of NPDP is to increase the production by adopting location-specific technology.

Under NPDP emphasis is laid on all components which will help in increasing the production and yield of pulses. Some of the major components of the programme are as below.

1. Seed Village Component - The concept of seed village is to produce the certified seeds of the appropriate variety of various crops locally.

2. Distribution of Certified Seed - The pulse growers were supplied with certified seeds of pulse crops by the department at a subsidised rate.

3. Purchase of Breeder seed and Production of Foundation Seed - State seed farms could not produce sufficient quantities of foundation seeds. Hence progressive farmers were selected for the production of foundation seeds under this scheme.

4. Distribution of Seed Minikits - Under this scheme, the latest released pulse varieties are supplied to the farmers at subsidised rates.

5. Block Demonstrations - These are organised in each of the selected districts / blocks in the farm size of atleast 10 hectares with the help of technical experts.

6. Pheromone Traps Demonstration

7. Integrated Pest Management (IPM) Demonstrations - The main objective is to control the insects by reducing the use of insecticides through IPM demonstrations in farmers' fields.

8. Distribution of Farm Implements - Improved farm implements are distributed among the pulse growers to improve the level of efficiency.

9. Dal Processors - Under this scheme, dal processors are distributed to the farmers at subsidised rate.

10. Storage Bins - Under this component, storage bins are distributed to the pulse growers at subsidised rate.

11. Rhizobium Culture - It is a cheap input and is being distributed at 50 per cent financial assistance.

12. Micro-nutrients - It was proposed to supply micro nutrients to the pulse farmers at Rs. 100/- per hectare.

13. Distribution of Sprinkler Sets - Adequate and timely supply of water for irrigation to pulse crops contributed a lot in raising production in view of the importance of judicious use of irrigation water.

14. Training - It is an essential part of the whole programme. Training provides an opportunity to the extension workers and farmers to have detailed knowledge about the latest technical know how.

"According to the Union Agriculture Ministry, in 1995-96, Rs.34 crore were spent on NPDP. The NPDP is being implemented in 25 states including Union Territory of Andaman and Nicobar Islands. A Technology Mission on Oilseeds and Pulses for the formulation of the policy is duly funded by UNDP and having the technical support of FAO has also been attempting to deal in areas like credit, extension work, marketing, processing, storage etc. without much gains.

The share of the subsidy between the Central Government and State Governments is in the ratio of 75: 25 for all the items of the programme.

2.9 Distribution of Targets and Achievements by Components

It was attempted to compare targets and achievements for different components of NPDP for different states. However, this could not be attempted as in different states either physical targets and achievements or financial targets and achievement were given. Physical

targets and achievements could not be used for inter state comparison as the importance of various components varied considerably from state to state. Therefore, only financial targets and achievements were attempted. Even these were not available for some states. In the following paragraphs targets and achievements of financial outlays and expenses are described.

In Andhra Pradesh, the particulars of financial allocations and the amount actually spent for the various components showed that the expenditure was 89.70 per cent of the total allocation. Under seed programme the achievement was remarkable. The percentage of expenditure to allocation was highest in the case of sprinklers (172.76 per cent) followed by minikit programme (110.40 per cent), training (101.20 per cent), seed village programme (100 per cent), foundation seed programme (100 per cent), certified seed programme (91.00 per cent) and rhizobium culture (90.20 per cent). It was lowest in micro-nutrients (14.60 per cent) (Table 2.9).

Table 2.9 Financial allocations and amount spent during 1996-97, Andhra Pradesh

S.No.	Components	Allocation (Rs.in lakhs)	Expenditure (Rs.in lakhs)	Percentage of Expenditure in allocation
1.	Seed Village Programme	12.00	12.000	100.00
2.	Certified Seed Programme	18.00	16.380	91.00
3.	Foundation Seed Programme	4.00	4.000	100.00
4.	Minikit Programme	12.00	13.248	110.40
5.	Rhizobium Culture	5.00	4.510	90.20
6.	Block Demonstrations	25.00	16.752	67.01
7.	I.P.M. Demonstrations	8.00	3.189	39.86
8.	Pheromones Trap Demonstrations	3.00	--	--
9.	Micro Nutrients	1.00	0.146	14.60
10.	Opening of retail outlets/Stores	1.00	--	--
11.	Agricultural Implements	20.00	11.550	57.75
12.	Dal Processors	4.00	--	--
13.	Storage bins	2.00	--	--
14.	Sprinklers	30.00	51.828	172.76
15.	Trainings			
	a) Andhra Pradesh Agricultural University b) Deputy Directors of Agriculture	1.33	1.346	101.20
16.	Staff & Contingencies	7.00	2.592	37.03
	Total	153.33	137.541	89.70

Source : Commissioner & Director of Agriculture, Hyderabad

In Assam, the financial allocation and amount spent in 1996-97 was nil.

The financial allocation (target) and amount spent on various components of NPDP in Bihar in 1996-97 showed that the total achievement was 54 per cent of the target. The percentage of achievement was highest in the case of sprinkler sets (151 per cent) and the lowest in certified seeds (20 per cent). The amount spent was 100 per cent in the case of minikits and metal bins. In other components expenditure was less than the financial allocation (Table 2.10).

Table 2.10 Financial allocations and amount spent during 1996-97, Bihar

S.No.	Components	Allocation (Rs.in lakhs)	Expenditure (Rs.in lakhs)	Percentage of Expenditure in allocation
1.	Minikits	18.00	18.00	100.00
2.	Training	2.00	1.20	60.00
3.	Block Demonstration	34.00	8.20	24.00
4.	Seed Village	15.00	--	--
5.	Foundation Seeds	4.00	--	--
6.	Certified Seeds	16.00	3.15	20,00
7.	I.P.M. Demonstration	9.66	--	--
8.	Pheromone Trap	3.00	--	--
9.	Agricultural Implements	20.00	8.65	43.00
10.	Dal Processor	6.00	--	---
11.	Sprinkler Sets	30.00	45.20	151.00
12.	Rhizobium Culture	4.00	3.25	81.00
13.	Metallic Bins	4.00	4.00	100.00
14.	Establishment	7.00	3.50	50.00
	Total	174.66	95.15	54.00

Source : Director of Agriculture, Government of Bihar, Patna

For Gujarat state, only financial target was available for the year 1996-97. It was highest in the case of sprinkler sets and block demonstrations and lowest in the case of dal-processors and storage bins and micro-nutrients (Table 2.11).

Table 2.11 Financial allocation, Gujarat, 1996-97 (Rs. In lakhs)

S.No.	Components	Financial Allocation	Percentage
1.	Organisation of Seed Village	16.00	13.28
2.	Production of Foundation Seeds	5.00	4.15
3.	Distribution of Certified Seeds	5.00	4.15
4.	Distribution of Seeds Minikits	14.47	12.01
5.	Block Demonstration	30.00	24.90
6.	Farm Implements	10.00	8.30
7.	Sprinklers Sets	30.00	24.90
8.	Rhizobium Culture	3.00	2.49
9.	I.P.M. Demonstation	3.00	2.49
10.	Pheromone Traps	2.00	1.67
11.	Dal Processors and Storage Bins	1.00	0.83
12.	Micro Nutrients	1.00	0.83
	Total	120.47	100.00

The percentage of financial achievements to allocation in Haryana for the year 1996-97 for various components of NPDP showed that it was highest in the case of plant protection measures (114.8) followed by block demonstrations and IPM demonstrations (108.3) and minikits (107) and lowest in staff and contingency (6.5) (Table 2.12).

Table 2.12 Financial allocations and amount spent during 1996-97, Haryana

S.No.	Components	Financianl (Rs. In lakhs)		
		Allocation	Expenditure	Percentage
1.	Breeder and Foundation Seed	2.00	1.05	52.50
2.	Certified Seed	9.22	4.11	51.10
3.	Seed Village	7.00	4.00	57.10
4.	Minikits	20.00	21.39	107.00
5.	Block Demonstration	15.50	16.78	108.30
6.	I.P.M. Demonstration	2.00	0.96	48.30
7.	Pheromone Traps	1.00	0.26	26.00
8.	Storage Bins & Dal Processors	3.00	--	--
9.	Sprinkler Sets	50.00	42.40	84.80
10.	Plant Protection Equipments	4.00	4.59	114.80
11.	Rhizobium Culture	1.00	0.99	99.00
12.	Training	1.50	0.63	42.00
13.	Staff and Contingencies	2.00	0.13	6.50
	Total	119.22	97.89	82.10

In Madhya Pradesh the component wise financial allocation of NPDP in 1996-97 was highest in block demonstrations followed by breeder's seed and foundation seed, seed village, distribution of farm implements and distribution of certified seeds. It was lowest in the case of micro-nutrients and opening of retail outlets (Table 2.13).

Table 2.13 Financial allocations during 1996-97, Madhya Pradesh (Rs. In lakhs)

S.No.	Components	Financial allocation	Percentage
1.	Seed Village	68.00	9.27
2.	Distribution of Certified Seed	55.00	7.50
3.	Purchase of Breeders Seeds & Production of Foundation Seed	74.00	10.09
4.	Distribution of Seed Mini kits	74.00	10.09
5.	Organisation of Block Demonstration	190.00	25.91
6.	Pheromone Traps Demonstrations	5.00	0.68
7.	I.P.M. Demonstrations	20.00	2.73
8.	Distribution of farm implements	57.00	7.77
9.	Dal Processors	6.00	0.82
10.	Storage Bins	6.00	0.82
11.	Rhizobium Culture/PSB	6.33	0.86
12.	Micro nutrients	1.00	0.14
13.	Opening of retail outlets	1.00	0.14
14.	Sprinkler sets	170.00	23.18
	Total	733.33	100.00

Financial allocations and amount spent during 1996-97 for various components of NPDP in Orissa state showed that except staff and contingencies (76.20 per cent), the achievement was 100 per cent in all the components (Table 2.14).

Table 2.14 Financial allocations and amount spent during 1996-97, Orissa

S.No.	Components	Allocation (Rs.-lakhs)	Expenditure (Rs.- lakhs)	Percentage of Expenditure in allocation
1.	Seed Village Programme	10.00	10.00	100.00
2.	Certified Seed Programme	9.99	9.99	100.00
3.	Foundation Seed Programme	5.00	5.00	100.00
4.	Minikit Programme	15.00	15.00	100.00
5.	Rhizobium Culture	4.00	4.00	100.00
6.	Block Demonstrations	41.94	41.94	100.00
7.	I.P.M. Demonstrations	4.32	4.32	100.00
8.	Pheromones Trap Demonstrations	2.00	2.00	100.00
9.	Micro Nutrients	1.00	1.00	100.00
10.	Opening of retail outlets/Stores	1.00	1.00	100.00
11.	Agricultural Implements	19.99	19.99	100.00
12.	Dal Processors	1.00	1.00	100.00
13.	Storage bins	2.00	2.00	100.00
14.	Sprinklers	50.00	50.00	100.00
15.	Plant Protection Equipments	5.00	5.00	100.00
16.	Trainings	1.00	1.00	100.00
17.	Staff & Contingencies	3.11	2.37	76.20
	Total	176.36	175.62	99.58

Source : Commissioner & Director of Agriculture, Orissa

The percentage of expenditure to financial allocation in Rajasthan state was below 50 per cent in all the components. It was highest in the case of minikit programme (48.57 per cent) followed by block demonstrations and staff and contingencies and lowest in micro nutrients (8.00 per cent) (Table 2.15).

Table 2.15 Financial allocations and amount spent upto January 1997, Rajasthan

S.No.	Components	Allocation (Rs.-lakhs)	Expenditure (Rs.-lakhs)	Percentage of Expenditure in allocation
1.	Seed Village Programme	80.65	--	--
2.	Distribution of Certified Seeds	64.50	11.76	18.23
3.	Foundation Seed Programme	38.85	--	--
4.	Minikit Programme	210.00	102.00	48.57
5.	Total Seed Component	396.00	114.76	28.99
6.	Plant Protection	36.00	7.56	21.00
7.	Block Demonstration	310.00	135.00	43.55
8.	Distribution of Rhizobium Culture	16.00	2.57	16.06
9.	Dal Processor/Storage Bins	42.00	6.81	16.21
10.	Micro Nutrients	2.00	0.16	8.00
11.	Farmers training	4.00	0.46	11.50
12.	Staff contingencies	14.00	5.50	39.28

The total achievement under NPDP in Tamil Nadu during 1996-97 was 97.05 per cent. Under various components of NPDP, it was highest in the case of dal processors (155.25 per cent) followed by storage bins and P.P. equipments (147.00 per cent) and seed village (142.44 per cent). It was lowest (59.57 per cent) in staff and contingencies. In majority of components, the percentage of amount spent to the allocation was 100 per cent (Table 2.16).

Table 2.16 Financial allocations and amount spent during 1996-97, Tamil Nadu

S.No.	Components	Allocation (Rs.-lakhs)	Expenditure (Rs.- lakhs)	Percentage of Expenditure in allocation
1.	Seed Village Programme	16.00	22.79	142.44
2.	Certified Seed Programme	30.00	28.78	95.93
3.	Foundation Seed Programme	13.00	7.38	56.77
4.	Minikit Programme	36.50	35.23	96.52
5.	Block Demonstrations	50.00	49.36	98.72
6.	Pheromones Traps Demonstration	3.00	2.99	99.67
7.	I.P.M. Demonstration	8.00	7.35	91.87
8.	Farm Implements	13.00	13.00	100.00
9.	Dal Processors	4.00	6.21	155.25
10.	Rhizobium Culture	5.59	6.21	111.09
11.	Micro Nutrients	3.47	2.77	79.83
12.	Training	3.10	3.07	99.03
13.	Storage bins and Plant Protection Equipments	4.00	5.88	147.00
14.	Sprinklers	30.50	29.73	97.47
15.	Staff & Contingencies	7.00	4.17	59.57
Total		227.16	220.47	97.05

In Uttar Pradesh the subsidy on certified seeds of pulses under under NPDP during 1996-97 in the selected districts was maximum in Lalitpur district and minimum in Udham singh Nagar (Nainital) (Table 2.17)

Table 2.17 Cropwise distribution of certified seeds of pulses alongwith subsidies under NPDP during 1996-97 in the selected districts of Uttar Pradesh

(Seed s in Qtls., Subsidy in Rs.)

S.No.	Pulses & Subsidy	Udhamsingh Nagar	Aligarh	Bahraich	Lalitpur	Total Uttar Pradesh
1.	Arhar	1	270	130	10	5,370
2.	Total Kharif	1	270	130	10	5,370
3.	Gram	30	420	280	1,420	18,500
4.	Pea	5	410	120	230	14,000
5.	Lentil	5	30	30	80	2,000
6.	Razma	--	--	15	--	130
7.	Total Rabi	40	860	445	1,730	34,630
8.	Grand Total	41	1,130	575	1,740	40,000
Subsidy on Certified Seeds in '000 Rs.		12.3	339.0	172.5	522.0	12,000

The performance of National Pulses Development Project in West Bengal showed that the amount spent in the case of minikits distribution was highest and lowest in rhizobium culture (Table 2.18).

Table 2.18 Amount spent on components of NPDP, 1995-96, West Bengal

S.No.	Components	Amount Spent (Rs. In lakhs)
1.	Minikits Distributed	50.43
2.	Block Demonstrations Organised	16.98
3.	Certified Seed Distributed	6.36
4.	Rhizobium Culture	1.97

Source : Directorate of Agriculture, Government of West Bengal.

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CHAPTER III

PULSES DEVELOPMENT IN SELECTED DISTRICTS OF DIFFERENT STATES

In this chapter it is proposed to give a brief account of the salient features of the selected districts and pulses development therein.

3.1 Characteristics of the Selected Districts

3.1.1 Andhra Pradesh (Guntur, Anantapur and Khammam)

Guntur, Anantapur and Khammam districts were selected from the state of Andhra Pradesh. The normal rainfall for these three districts was 890 mm., 521 mm. and 1,045 mm. respectively. As regards irrigation status, canals accounted for a major proportion (79.89) of the net area irrigated followed by tubewells (5.92 per cent) in Guntur district. Tubewells and wells together contributed 67.56 per cent followed by canals in Anantapur district. In Khammam district, canals are the major sources followed by tanks and wells. The irrigation intensity was higher in Anantapur (120.03 per cent) as compared to Khammam (109.22 per cent) and Guntur (106.56 per cent).

Food crops accounted for 78 per cent of the total cropped area in Khammam, 66 per cent in Guntur and only 21 per cent in Anantapur. Among the food crops, area under pulses accounted for nearly 37 per cent, 25.68 per cent and 26.18 per cent in Guntur, Anantapur and Khammam district respectively. Again, among the pulses, urad accounted for 81 per cent of the total area under pulses in Guntur, arhar occupied 46 per cent in Anantapur and moong accounted for 61 per cent in Khammam. The cropping intensity was highest in Guntur (133 per cent) followed by Khammam (96.0 per cent) and Anantapur (85 per cent).

The average size of land holding was highest in Anantapur (2.75 ha.) followed by Khammam (1.79 ha.) and Guntur (1.12 ha). The percentage of small farmers was more in Guntur district (85.54) as compared to other two districts. (Table 3.1)

The three selected districts were predominantly rural in character with more than 70 per cent of work force engaged in agriculture. Among the three districts, the perentage of cultivators was high in Anantapur district as compared to other two districts. The percentage of agricultural labourers was highest in Guntur district.

As regard consumption of fertilisers, the use of all the nutrients (N, P and K) was higher in Guntur district as compared to other two districts.

3.1.2 Assam (Jorhat and Nagaon)

Jorhat and Nagaon districts were selected from Assam. Pea was the leading pulse crop of these two districts followed by urad. There was no evidence of significant development of pulse crops in both the districts (Table 3.1)

3.1.3 Bihar (Bhagalpur and Godda)

Bhagalpur and Godda districts were selected from Bihar State. Bhagalpur district was characterised as diara and plain lands. Gram was most suitable pulse crop of this district in rabi season. Godda district was characterised by undulating topography. Arhar was main pulse crop of this district in kharif season.

The population growth rates of Bhagalpur and Godda districts were 2.01 and 1.87 per cent per annum respectively. The population density of Bhagalpur district (573 persons per sq.km.) was much higher as compared to Godda district (408 persons per sq.km.). The percentage of urbanisation was much higher in Bhagalpur (12.12) than Godda district (2.74). Literacy percentage of Bhagalpur and Godda districts was 38.89 and 34.02 respectively.

The proportion of people engaged in agriculture and allied activities was slightly higher in Godda district (88.40 per cent) as compared to Bhagalpur district (83.36 per cent). Net sown area as percentage of reported area in Bhagalpur district was higher (46.44) as compared to Godda district (41.66). The gross irrigated area as percentage of gross cropped area in Bhagalpur district (46.40) was much higher as compared to Godda district (14.21). So far as the average size of operational holding is concerned, Godda district ranked higher with 1.92 hectares in comparison to Bhagalpur district (0.82 hectare). The consumption of fertiliser per hectare was very high in Bhagalpur district (85 kg.) as compared to Godda district (10 kg.). With regard to geographical area Bhagalpur district was much bigger than Godda district (Table 3.1).

3.1.4 Gujarat (Vadodara and Panchmahals)

The two most important pulse crops of these districts were gram and tur. Gram was the most dominant pulse crop in Panchmahals district and tur in Vadodara district (Table 3.1).

3.1.5 Haryana (Bhiwani and Ambala)

Bhiwani district consisted five tehsils- Bhiwani,Charkhi Dadri, Bavani khera, Loharu and Siwani. The average annual rainfall in Bhiwani district was 350 mm. The percentage of gross irrigated area was 42.52. The canals were the main sources of irrigation. The dry crops like bajra, gram, mustard and cotton dominated the cropping pattern. Wheat was grown in irrigated areas.

Ambala district consisted five tehsils- Ambala, Barara, Naraingarh, Panchkula and Kalka. The average rainfall was 1,200 mm. The main sources of irrigation were tubewells which were supplemented by canals. The important crops of the district were wheat, paddy, maize, sugarcane and pulses (Table 3.1).

3.1.6 Madhya Pradesh (Durg, Jhabua and Narsinghpur)

Durg district was located in the north-eastern part of the state and was a part of Chhattisgarh region. It occupied an area of 8,702 sq.km. and had a forest area of 11.45 per cent of the total geographical area. The density of population per sq.km. was 281. The total population included 51 per cent males and 49 per cent females. Again 65 per cent population was rural and 35 per cent, urban. It had 12.80 per cent scheduled castes and 12.43 per cent scheduled tribes population. The literacy percentage was 48. The district population had 42.37 per cent main workers. Among workers 43.25 per cent were cultivators and 25.03 per cent, agricultural labourers. Agriculture was mainly dependent on rainfall. A topo-sequence of four broad groups of soils viz. bhata (tikara), matasi, dorsa and kanhar occured in the district. The consumptions of fertilisers was 32.25 kg./ha. The cropping intensity and irrigation intensity was 144.43 and 109.86 per cent respectively. Only 28.7 per cent of the gross cropped area was irrigated. Cereals dominated the cropping pattern occupying 57.23 per cent followed by pulses, oilseeds and fruits and vegetables (Table 3.1).

Jhabua district lay in the extreme western part of the state. Its boundaries met the borders of Gujarat, Maharashtra and Rajasthan States. It was a tribal district. The fields were undulating, slopy, light and stoney in most parts. Soils were poor and water retention capacity of soil was very low. Early withdrawal of monsoon and soil and water run-off were the important constraints. The main source of income was agriculture. Ninety per cent of the area was sown during kharif and 10 per cent in rabi. Small and marginal farmers moved out for wage earning in the surrounding villages after sowing kharif crops and came back only to harvest the crops. A cooperative system of group work known as 'Halma' was popular among the farmers. Crop raising was very difficult in the hilly areas. More than 50 per ent of the total geographical area was under cultivation. The area under forest was 19.13 per cent. Of the total population 85.67 per cent belonged to scheduled tribes. The district was rural in character as 91.32 per cent of the population resided in villages. The literacy percentage was 14.54. As high as 84.11 per cent of the total workers were cultivators. The climate was arid to sub arid with an annual average rainfall of 800 mm. The fertiliser consumption was very low (19 kg./hectare). The cropping intensity was 127.50 per cent and irrigation intensity was 102.07 per cent. Of the cropped area only 19.17 per cent was irrigated. Maize was the single important crop occupying 22.81 per cent followed by urad (18.37 per cent), gram (9.74 per cent) and kulthi (4.79 per cent) of the gross cropped area. Soybean, groundnut, cotton and fodder were also grown. Cereals dominated the cropping pattern followed by pulses and oilseeds (Table 3.1).

Narsinghpur district lay almost in the central part of the state. It had an area of 5,136 sq.km. and forest area of 26.53 per cent of the total geographical area. The density of population was 153 per sq.km. Of the total population, the percentage of rural and urban population was

85.13 and 14.87 respectively. The percentage of scheduled castes and scheduled tribes population was 16.59 and 12.90 respectively. The proportion of main workers was 36.08. The literacy percentage was 45.33. The literacy percentage among females was far lower (41.59) than the males (68.44). The average rainfall was 1,300.8 m.m. The consumption of fertilisers was 33.73 kg./ha. Nearly 58 per cent area of the district was under cultivation. The intensity of cropping and irrigation was 135.44 and 102.15 per cent respectively. Of the gross cropped area 36.09 per cent was irrigated. Pulses dominated the cropping pattern occupying 44.94 per cent of the gross cropped area. Oilseeds (29.90 per cent) and cereals (21.48 per cent) occupied second and third positions. Among cereals wheat occupied 16.46 per cent, among pulses gram was the major crop occupying 30.30 per cent. Other important pulses were lentil, pea and arhar. Soybean was most important oilseed occupying 28.16 per cent. Sugarcane occupied 2.06 per cent area.

3.1.7 Maharashtra (Nasik, Ahmednagar, Amravati and Yavatmal)

Nasik and Ahmednagar were selected for gram and Amravati and Yavatmal were selected for tur.

The percentage of area under gram in Nasik and Ahmednagar districts to total Maharashtra in T.E. 1992-93 was 7.93 and 4.92 respectively. Similarly in the case of tur, the percentage of area in Amravati and Yavatmal districts to total Maharashtra was 8.26 and 9.20 respectively (Table 3.1).

3.1 8 Orissa (Ganjam, Cuttack and Kalahandi)

The normal rainfall for the three districts was 1,296, 1,501 and 1,378 mm respectively. During the year 1995-96, gross irrigated area in the three districts was 260.47 ha., 432.46 ha. and 132.92 ha. respectively. The percentage of irrigated area in total potential area was highest in Kalahandi district (92 per cent) followed by Ganjam (78 per cent) and Cuttack (68 per cent).

Among the food crops, area under pulses accounted for 35 to 45 per cent in the selected districts. Again, among the pulses, moong accounted for 53 per cent in Ganjam, urad accounted for 42 per cent in Cuttack and arhar accounted for only 10 per cent in Kalahandi. The cropping intensity was highest (187 per cent) in Ganjam followed by Cuttack (181 per cent) and Kalahandi (160 per cent). The average size of land holding in Ganjam was 1.04 ha. It was 1.94 ha and 0.94 ha in Kalahandi and Cuttack respectively. The percentage of small farmers was more in Cuttack district (89.23 per cent) as compared to the other two selected districts. The percentage of medium farmers was highest (32.72 per cent) in Kalahandi district. The three selected districts were predominantly rural with more than 75 per cent of work force engaged in agriculture. Among the three districts, the percentage of cultivators was highest in the Cuttack (57.84) followed by Ganjam (54.18) and Kalahandi (51.08). The percentage of agricultural labourers in agricultural workers was highest in Kalahandi (48.92 per cent) followed by Ganjam and Cuttack. The consumption of fertilizers was highest in Cuttack district (35.06 kg./ha) followed by Ganjam (28.87 kg./ha) and Kalahandi (10.07 kg./ha) (Table 3.1).

3.1.9 Punjab (Ludhiana and Firozpur)

Ludhiana is one of the central districts of Punjab. The Sutlej river forms its northern boundary, separating it from Jalandhar district. The district experiences extremes of climate i.e. intensely hot and cold. Rains are generally received during June to September, in summer and during December to February in winter. Ludhiana district consisted five tehsils, namely, Jagraon, Khanna, Ludhiana East, Ludhiana West and Samrala. The proportion of rural population to total population was 48.78 per cent. High proportion of urban population accounted for higher incidence of literacy (67.34 per cent) in the district. Agricultural workers formed 36.21 per cent of the total workers. Agricultural sector was well developed. The cultivated area was wholly irrigated. Tubewells were the main sources of irrigation. Wheat and paddy were the major crops.

Firozpur district occupied the south-west corner of the State. It experienced extreme weather condition i.e. very hot in summer and severe cold in winter. It received 159.4 mm. of rainfall. The district consisted five tehsils, namely, Firozpur, Fazilka, Abohar, Zira and Jalalabad. The proportion of rural population to total population was 76.05 per cent. The literacy percentage was 48.03. The workers constituted 30.30 per cent to the total population. The agricultural workers formed 68.29 per cent of the total workers. The economy of the district was mostly agriculture based. The cultivated area was fully irrigated. Canals and tubewells were the major sources of irrigation. Wheat, paddy, cotton, sugarcane and gram were the main crops. (Table 3.1).

3.1.10. Rajasthan (Nagaur and Hanumangarh)

Nagaur district is situated in the Western dry agro-climatic zone in Rajasthan. The geographical area of the district was 1,764.2 thousand hectares accounting for 5.2 per cent area of the state. As per 1991 Cencus, 77.6 per cent of the total workers were engaged in agriculture either as cultivators or as agricultural labourers. The climate is dry and healthy and extreme cold and heat prevailed during winter and summer. The normal rainfall is 388.6 mm. The density of population was 121 persons per sq. km. Literacy percentage was 31.80. The net sown area in 1993-94 was 1,265.8 thousand hectares accounting for 71.7 per cent of the total geographical area. The area under forest constituted only 0.7 per cent. The net irrigated area was 183.0 thousand hectares, which accounted for 14.5 per cent of the net sown area. Wells and tubewells were the main sources of irrigation. The cropping intensity and irrigation intensity of the district was 107.51 and 134.17 per cent respectively. In 1995-96, food crops accounted for 66.4 per cent of the gross cropped area. Bajra is the main crop which covered 34.1 per cent of the GCA. Among food crops, kharif pulses (moong, moth and cowpea) constituted 31 per cent area, but production and productivity were low. Rabi pulses like gram had only 2.5 per cent of the gross cropped area in the district. Among non-food crops, oilseed crops occupied 20 per cent (Table 3.1).

Hanumangarh is newly formed district situated in northern part of the state and comes under Trans- gangetic plain region. As per 1991 census, 83.6 per cent of the total population

consisted of rural population. The climate is extremely cold in winter and very warm during summer. Normal rainfall was 273.5 mm. The net sown area was 795.9 thousand hectares accounting for 82.0 per cent of the geographical area. The net irrigated area was 301.3 thousand hectares, which accounted for 37.9 per cent of the net sown area during 1993-94. The gross irrigated area was 462.3 thousand hectares, accounting for 48.1 per cent of gross cropped area. The cropping intensity and irrigation intensity was 120.8 per cent and 153.4 per cent respectively. Food crops constituted 60 per cent of the gross cropped area during 1995-96. Gram was the main pulse crop and occupied 32.5 per cent of the gross cropped area. Among non food crops cotton had 20 per cent of the gross cropped area followed by guar and oilseeds. Moth was popular among kharif pulses (Table 3.1)

3.1.11 Tamil Nadu (Salem and Tuticorin)

These two districts accounted for 14 per cent of the area under pulses and 19 per cent of the production of total pulses in the state in 1996-97.

Salem is an inland district with an area of 8,649 sq. km. which was 6.65 per cent of total area of the state. The population was 38,96,382 comprising 20,11,917 males and 18,84,465 females. The normal rainfall was 841.5 mm. The prominent soils were red loam, black and saline. The total geographical area of the district was 8,63,469 hectares. Area under forests was 20.50 per cent. Net area sown was 53.69 per cent. The cropping intensity and irrigation intensity of the district was 142.46 per cent and 123.59 per cent respectively. The area under food crops was 58.26 per cent of the total cropped area. Paddy and cholam were important food crops. The percentage of area under pulses was also significant. Groundnut was the most important non-food crop occupying 22.52 per cent of the gross cropped area. The area under pulses was 48,449 hectares in 1981-82 and increased steadily over the years and reached 90,000 hectares in 1995-96. The production of pulses increased from 20,000 tonnes to 59,000 tonnes during the same period.

Tuticorin is a coastal district of Tamil Nadu with an area of 4,621 sq. km. which was 3.55 per cent of the total area of the State. The total population was 14,55,920 comprising 7,08,760 males and 7,46,160 females. The normal rainfall of the district was 622.20 mm. The prominent soils of the district were red loam, black, alluvial and saline. Forests constituted only 2.40 per cent. Net area sown was 45.32 per cent of the total geographical area. The percentage of net irrigated area to the net cropped area was 23.5. The irrigation intensity was 122 per cent. Food crops constituted 59.93 per cent of the total cropped area. Among cereals, paddy, chombu and cholam were the main crops sharing 14.21, 7.60 and 2.81 per cent respectively. Urad was the most important pulse sharing 10.24 per cent of the total cropped area. The area under non food crops was 40.07 per cent. Area under cotton was 17.95 per cent of the total cropped area. Urad and moong were the pulses largely cultivated in this district (Table 3.1).

3.1.12 Uttar Pradesh (Udham singh nagar, Aligarh, Baharaich and Lalitpur)

3.1.13 West Bengal (Purulia, Malda and Cooch Behar)

Purulia is the western most district of the State. Malda is the southern most district of the northern Bengal. The district of Cooch Behar is bounded by the district of Jalpaiguri of West Bengal on the northern and most part of the western side. The district of Malda is more densely populated district. There are 717 persons per sq.km. (1991 census) in Malda district as against 641 and 355 in Cooch Behar and Purulia districts respectively. The tendency towards urbanisation was observed to be more in Malda as compared to other two districts. Among three districts, the geographical area of Purulia was highest (614.04 thousand hectares) followed by Malda (371.05 thousand hectares) and Cooch Behar (341.50 thousand hectares) in the year 1994-95. The area under forest was highest (85.83 th.hectares) in Purulia followed by Cooch Behar (8.78 th. hect.) and Malda (1.68 th. hectare). In Purulia, the total culturable waste land comprised 2.04 per cent in 1994-95 which was 15.83 per cent in 1982-83. Net cropped area constituted 53.58 per cent in 1994-95. On the contrary, the net sown area in the districts of Malda and Cooch Behar contributed 77.12 and 72.89 per cent respectively.

Irrigation in the district of Purulia was mainly done by tanks from accumulation of run-off water. Area Irrigated by tanks constituted 37.90 per cent. Irrigation from tubewells covered only a fraction of the land (0.06 per cent of the total area irrigated). The percentage of net irrigated area constituted 3.52 per cent which pointed to the very poor condition of the existing irrigation facilities in the district. In Malda district, the extent of irrigation facility constituted 22.32 per cent of net sown area of which lion's share was occupied by tubewells (71.83 per cent). In Cooch Behar district, irrigated area constituted 8.07 per cent of net sown area. The major sources of irrigation were wells (61.61 per cent) and tubewells (31.22 per cent) (Table 3.1).

The average rainfall in the district of Purulia was 1.361.4 mm. as againsts 1,593.8 mm. in Malda and 3,243.2 mm. in Cooch Behar.

In Purulia 86 per cent of the gross cropped area was under rice. The next important crop group was pulses which occupied 5.61 per cent of the gross cropped area. The crops grown in Malda were rice, wheat, pulses, rape and mustard, til, jute, sugarcane, potato and chilly. The principal crop was rice (60 per cent) followed by pulses (13.00 per cent) and wheat (12.18 per cent). The principal crops of Cooch Behar were rice, jute, wheat, pulses, potato, rape and mustard and chilly. Rice predominated in the cropping pattern accounting for 71.39 per cent of gross cropped area. The next important crop was jute followed by wheat and pulses. The cropping intensity worked out to 102.13 per cent in Purulia, 169.35 per cent in Malda and 185.32 per cent in Cooch Behar. Consumption of fertilizers per hectare of gross cropped area was 84.88 kg. in Purulia, 98.92 kg. in Malda and 75.39 kg. in Cooch Behar in 1993-94. As regards the progress of mechanisation, the district of Purulia lagged behind other selected districts. In Purulia district, the average size of holding was 1.05 ha. (1990-91), whereas, it was 0.87 and 0.97 ha in Malda and Cooch Behar districts respectively (Table 3.1).

Table 3.1 Main features of the selected districts

S.No	States	Andhra Pradesh (1994-95)			Assam (1995-96)		Bihar	
	Items / Districts	Guntur	Anantapur	Khammam	Jorhat	Nagaon	Bhagalpur	Godda
1.	Location	South Coastal Andhra	Rayala-seema	South Telangana	--	--	Middle Gangetic Plain Region	Eastern Plateau & Hills Region
2.	Geographical Area (Sq.Km.)	--	--	--	--	--	5,589	2,110
3.	Forest (% to geographical area)	--	--	--	--	--	--	--
4.	Density of Population (No./Sq.Km)	--	--	--	--	--	573	408
5.	Population (% to total population)							
	Male	--	--	--	--	--	--	--
	Female	--	--	--	--	--	--	--
	Rural	71.11	76.50	79.77	--	--	--	--
	Urban	--	--	--	--	--	12.12	2.74
	Schedule castes	--	--	--	--	--	--	--
	Schedule Tribes	--	--	--	--	--	--	--
	Main workers	--	--	--	--	--	--	--
	(Percentage to total Main workers)							
	Cultivators	28.44	47.89	36.01	--	--	--	--
	Agril. Labourers	71.56	52.11	63.99	--	--	--	--
6.	Literacy Percentage- Male	--	--	--	--	--	--	--
	Female	--	--	--	--	--	--	--
	Rural	--	--	--	--	--	--	--
	Urban	--	--	--	--	--	--	--
7.	Fertilizer Consumption (Kg./ha)	165	44	128	--	--	85	10
8.	Cropping Pattern (Main Crop)							
	Cereals (Ha.)	--	--	--	--	--	--	--
	Pulses (Ha.)	--	--	--	2,974	11,342	--	--
	Total food grains (Ha.)	--	--	--	--	--	--	--
	Oilseeds (Ha.)	--	--	--	--	--	--	--
	Fruits & Vegetables (Ha.)	--	--	--	--	--	--	--
9.	Average Size of Land Holding (Ha.)	1.12	2.75	1.79	--	--	--	--
10.	Average Rainfall (m.m.)	890	521	1,045	--	--	--	--
11.	Gross Cropped Area (Ha.)	8,59,951	9,94,649	4,91,516	--	--	--	--
12.	Gross Irrigated Area (Ha.)	3,56,060	1,62,187	1,90,247	--	--	--	--
13.	Percentage of irrigated area to gross cropped area	41.40	16.30	38.70	--	--	46.40	14.21
14.	Cropping Intensity (%)	133.00	85.00	96.00	--	--	129.00	110.00
15.	Irrigation Intensity (%)	106.56	120.03	109.22	--	--	--	--

Continued.....

Table continued.....

S.No	States	Gujarat		Haryana		Madhya Pradesh (1995-96)		
	Items / Districts	Vadodara	Panch-mahal	Bhiwani	Ambala	Durg	Jhabua	Narsinghpur
1.	Location	--	--	Surrounded by Rohtak, Hissar and Mahendra-garh.	Surrounded by Yamuna-nagar, Patiala, & Chandigarh	Latitude 20°23'to 21°23N Longitude 80°46'to 81°58'E	Latitude 22°0'to 23°3'N Longitude 73°0'to 75°0'E	Latitude 24°45' to 23°15' N Longitude 78°38' to 79°38' E
2.	Geographical Area (Sq.Km.)	--	--	--	--	8,702	6,757	5,136
3.	Forest (% to geographical area)	-	--	--	--	11.45	19.13	26.53
4.	Density of Population (No./Sq.Km)	--	--	--	--	281	167	153
5.	Population (% to total population)							
	Male	--	--	--	--	51	51	52
	Female	--	--	--	--	49	49	48
	Rural	--	--	--	--	65	91.32	85.13
	Urban	--	--	--	--	35	8.68	14.87
	Schedule castes	--	--	--	--	12.80	3.06	16.59
	Schedule Tribes	--	--	--	--	12.43	85.67	12.90
	Main workers	--	--	--	--	42.37	39.30	36.08
	(Percentage to total Main workers)							
	Cultivators	--	--	--	--	43.25	84.10	39.81
	Agril. Labourers	--	--	--	--	25.03	5.90	38.88
6.	Literacy Percentage-	--	--	--	--	47.89	14.54	45.33
	Male	--	--	--	--	74.06	20.15	68.44
	Female	--	--	--	--	42.78	8.79	41.59
	Rural	--	--	--	--	50.37	10.42	51.37
	Urban	--	--	--	--	75.53	57.82	79.30
7.	Fertilizer Consumption (Kg./ha)	--	--	--	--	32.25	19.24	33.73
8.	Cropping Pattern (Main Crop)							
	Cereals (Ha.)	--	--	--	--	4,60,000	2,20,400	86,400
	Pulses (Ha.)	1,39,200	1,00,100	--	--	2,74,500	1,58,800	1,80,800
	Total food grains (Ha.)	--	--	--	--	7,34,500	3,79,200	2,67,200
	Oilseeds (Ha.)	--	--	--	--	51,300	46,100	1,20,300
	Fruits & Vegetables (Ha.)	--	--	--	--	15,000	1,300	2,700
9.	Average Size of Land Holding (Ha.)	--	--	--	--	--	--	--
10.	Average Rainfall (m.m.)	--	--	350	1,200	1,286	800	1,300
11.	Gross Cropped Area (Ha.)	--	--	--	--	8,17,500	4,38,900	3,94,500
12.	Gross Irrigated Area (Ha.)	--	--	--	--	2,34,900	60,600	1,41,900
13.	Percentage of irrigated area to gross cropped area	--	--	42.52	--	28.73	13.81	35.97
14.	Cropping Intensity (%)	--	--	--	--	144.43	127.50	135.44
15.	Irrigation Intensity (%)	--	--	--	--	109.86	102.07	102.15

Continued....

Table continued....

S.No	States	Maharashtra (19992-93)				Orissa (1995-96)		
	Items / Districts	Nasik	Ahmednagar	Amravati	Yavatmal	Ganjam	Cuttack	Kalahandi
1.	Location	Western Hills and Plains	Scarcity Region	Central Plateau	Central Vidharba	Ganjam	Coastal Plains	Eastern Ghats
2.	Geographical Area (Sq.Km.)	--	--	--	--	--	--	--
3.	Forest (% to geographical area)	--	--	--	--	--	--	--
4.	Density of Population (No./Sq.Km)	--	--	--	--	--	--	--
5.	Population (% to total population) Male	--	--	--	--	--	--	--
	Female	--	--	--	--	--	--	--
	Rural	--	--	--	--	84.32	75.37	93.10
	Urban	--	--	--	--	15.68	24.63	6.90
	Schedule castes	--	--	--	--	--	--	--
	Schedule Tribes	--	--	--	--	--	--	--
	Main workers	--	--	--	--	--	--	--
	(Percentage to total Main workers) Cultivators	--	--	--	--	54.15	57.84	51.08
	Agril. Labourers	--	--	--	--	45.85	42.16	48.92
6.	Literacy Percentage-	--	--	--	--	--	--	--
	Male	--	--	--	--	--	--	--
	Female	--	--	--	--	--	--	--
	Rural	--	--	--	--	--	--	--
	Urban	--	--	--	--	--	--	--
7.	Fertilizer Consumption (Kg./ha)	--	--	--	--	28.87	35.06	10.07
8.	Cropping Pattern (Main Crop)	--	--	--	--	--	--	--
	Cereals (Ha.)	--	--	--	--	4,20,373	5,69,566	3,68,163
	Pulses (Ha.)	--	--	--	--	2,76,727	3,06,277	3,01,490
	Total food grains (Ha.)	--	--	--	--	6,97,100	8,75,843	6,69,653
	Oilseeds (Ha.)	--	--	--	--	--	--	--
	Fruits & Vegetables (Ha.)	--	--	--	--	--	--	--
9.	Average Size of Land Holding (Ha.)	--	--	--	--	1.04	0.94	1.94
10.	Average Rainfall (m.m.)	--	--	--	--	1,296	1,501	1,378
11.	Gross Cropped Area (Ha.)	9,74,850	13,32,525	8,91,475	9,24,975	8,93,280	12,15,073	8,58,287
12.	Gross Irrigated Area (Ha.)	--	--	--	--	2,60,470	4,32,460	1,32,920
13.	Percentage of irrigated area to gross cropped area	--	--	--	--	29.16	35.59	15.48
14.	Cropping Intensity (%)	--	--	--	--	187.00	181.00	160.00
15.	Irrigation Intensity (%)	--	--	--	--	--	--	--

Continued....

Table continued.....

S.No	States	Punjab		Rajasthan (1995-96)		Tamil Nadu (1995-96)	
	Items / Districts	Ludhiana	Firozpur	Nagaur	Hanumangarh	Salem	Tuticorin
1.	Location	Central district of Punjab	South West corner of Punjab	Latitutde 24°37' and 26°00'N Longitude 63°51' and 75°21'E	Trans-gangetic plain region	Inland district	Coastal district
2.	Geographical Area (Sq.Km.)	3,762	5,853	17,642	9,703	8,649	4,621
3.	Forest (% to geographical area)	–	–	0.70	0.80	20.50	2.40
4.	Density of Population (No./Sq.Km)	645	274	121	–	–	–
5.	Population (% to total population)	–	–	–	Total	38,96,382	14,55,920
	Male					51.63	48.70
	Female	–	–	–	–	48.37	51.30
	Rural	48.78	76.05	84.00	83.60	–	–
	Urban	51.22	23.95	16.00	16.40	–	–
	Schedule castes	–	–	–	–	–	–
	Schedule Tribes	–	–	–	–	–	–
	Main workers	31.25	30.30	–	–	–	–
	(Percentage to total Main workers)						
	Cultivators	63.79	31.71	–	–	–	–
	Agril. Labourers	36.21	68.29	–	–	–	–
6.	Literacy Percentage-	67.34	48.03	31.80	–	–	–
	Male	72.00	56.89	–	–	–	–
	Female	61.25	38.13	–	–	–	–
	Rural	–	–	–	–	–	–
	Urban	–	–	–	–	–	–
7.	Fertilizer Consumption (Kg./ha)	–	–	–	–	–	–
8.	Cropping Pattern (Main Crop)	Wheat,	Wheat,				
	Cereals (Ha.)	paddy,	paddy,	5,53,300	2,51,500	–	–
	Pulses (Ha.)	maize,	cotton,	3,02,400	3,65,000	91,000	30,857
	Total food grains (Ha.)	moong &	mustard, gram,	8,55,700	6,16,500	–	–
	Oilseeds (Ha.)	tur are	moong and	2,54,700	87,200	–	–
	Fruits & Vegetables (Ha.)	imp. crops	sugarcane	–	–	–	–
9.	Average Size of Land Holding (Ha.)	–	–	10.95	7.14	1.02	1.40
10.	Average Rainfall (m.m.)	476	159.4	388.6	273.5	841.5	622.20
11.	Gross Cropped Area (Ha.)	–	–	12,88,500	9,61,800	6,60,446	2,22,471
12.	Gross Irrigated Area (Ha.)	–	–	2,19,000	4,62,300	–	–
13.	Percentage of irrigated area to gross cropped area	100.00	88.55	16.99	48.10	51.10	26.80
14.	Cropping Intensity (%)	–	–	107.51	120.84	142.46	106.93
15.	Irrigation Intensity (%)	–	–	134.17	153.43	123.59	122.00

Continued....

Table continued....

S.No	States	Uttar Pradesh (1994-95)				West Bengal (1994-95)		
	Items / Districts	Udhamsingh Nagar	Aligarh	Bahraich	Lalitpur	Purulia	Malda	Cooch Behar
1.	Location	Western Himalayan zone	Upper Gangetic Plain	Middle Gangetic Plain	Central Plateau zone	Eastern Plateau & Hills Region	Lower Gangetic Plains Region	Eastern Himalayan Region
2.	Geographical Area (Sq.Km.)	–	–	–	–	6,140	3,710	3,415
3.	Forest (% to geographical area)	–	–	–	–	13.98	0.45	2.57
4.	Density of Population (No./Sq.Km)	–	–	–	–	355	717	641
5.	Population (% to total population) Male	–	–	–	–	–	–	–
	Female	–	–	–	–	–	–	–
	Rural	–	–	–	–	90.56	92.93	92.19
	Urban	–	–	–	–	9.44	7.07	7.81
	Schedule castes	–	–	–	–	–	–	–
	Schedule Tribes	–	–	–	–	–	–	–
	Main workers	–	–	–	–	–	–	–
	(Percentage to total Main workers) Cultivators	–	–	–	–	–	–	–
	Agril. Labourers	–	–	–	–	–	–	–
6.	Literacy Percentage-	–	–	–	–	–	–	–
	Male	–	–	–	–	–	–	–
	Female	–	–	–	–	–	–	–
	Rural	–	–	–	–	–	–	–
	Urban	–	–	–	–	–	–	–
7.	Fertilizer Consumption (Kg./ha)	–	–	–	–	84.88	98.92	75.39
8.	Cropping Pattern (Main Crop)	–	–	–	–	–	–	–
	Cereals (Ha.)	–	–	–	–	–	–	–
	Pulses (Ha.)	7,330	61,280	98,160	1,11,310	19,200	52,500	11,800
	Total food grains (Ha.)	–	–	–	–	3,31,500	3,56,300	3,37,800
	Oilseeds (Ha.)	–	–	–	–	8,200	20,200	13,600
	Fruits & Vegetables (Ha.)	–	–	–	–	2,500	3,100	13,700
9.	Average Size of Land Holding (Ha.)	–	–	–	–	1.05	0.87	0.97
10.	Average Rainfall (m.m.)	–	–	–	–	1,361.4	1,593.8	3,243.2
11.	Gross Cropped Area (Ha.)	–	–	–	–	–	–	–
12.	Gross Irrigated Area (Ha.)	–	–	–	–	–	–	–
13.	Percentage of irrigated area to gross cropped area	–	–	–	–	3.52	22.32	8.07
14.	Cropping Intensity (%)					102.13	169.35	185.32
15.	Irrigation Intensity (%)	–	–	–	–	–	–	–

3.2 Pulses Development in Selected Districts of the States

3.2.1 Andhra Pradesh (Guntur, Anantapur and Khammam)

The area and production of total pulses in Guntur and Khammam districts showed an increasing trend. In Anantapur district it was decreasing. But the per hectare yield of Anantapur showed a significant increase while the remaining two districts reported more or less a stagnant yield.

The triennial variations of selected pulses in the selected districts showed that the area and production of the selected pulses in the respective districts showed an increasing trend but the yields have not improved much. This was due to non-adoption of improved cultural practices.

The growth rates over a period of two decades (i.e. from 1974-75 to 1994-95) in area, production and productivity of selected pulses showed that urad in Guntur showed positive growth rates in area and production. Tur in Anantapur and green gram in Khammam district showed significant positive growth in area and production. But these two crops in the respective districts have exhibited neither acceleration nor deceleration of growth. This indicated that these two crops of tur and green gram are more or less stagnant in terms of area, production and yield. (Table 3.2)

3.2.2 Assam (Jorhat and Nagaon)

The trends in area, production and yield of pulses in Jorhat and Nagaon districts were based on the period of 7 years from 1989-90 to 1995-96. It was observed that the area and production of total pulses diminished in both the districts. The decrease of both area and production of total pulses was faster in Jorhat than that in Nagaon district. The yield pattern of total pulses displayed irregularity in both districts. Comparatively the growth of yield level was faster in Jorhat.

In both Jorhat and Nagaon districts area and production of blackgram were found to increase. The area and production of green gram increased in Nagaon, while it did not change much in Jorhat. The area and production of Bengal gram and other unspecified pulses increased in Jorhat but the area and production of gram decreased in Nagaon. Not much change was observed in area and production of other pulses in Nagaon district. The area and production of tur, pea and lentil decreased in both the districts during the period.

In Jorhat district, the area and production of total pulses decreased at an annual rate of 7.02 and 4.28 per cent respectively. The yield had a growth rate of 2.94 per cent per annum. Similarly, in Nagaon district, the area and production of total pulses decreased at an annual rate of 4.50 and 2.28 per cent respectively. In other words productivity of total pulses increased nominally inspite of shrinkage in area under total pulses in both Jorhat and Nagaon districts.

In Jorhat district the growth rate of area and production of pea decreased at an annual rate of 11.83 and 9.51 per cent respectively. The yield had an annual growth of 3.41 per cent. The growth rate of area and production of pea in Nagaon district also decreased at an annual rate of 5.25 and 4.51 per cent. The yield of pea had an insignificant growth of 0.69 per cent.

In the case of blackgram the growth rates of area and production in Jorhat district showed a positive rate of 9.57 and 7.73 per cent per annum, whereas, the yield showed a negative growth rate of 1.68 per cent. In Nagaon district, the area, production and yield of blackgram showed positive growth rate of 4.28, 7.64 and 3.44 per cent per annum respectively (Table 3.2).

3.2.3 Bihar (Bhagalpur and Godda)

In Bhagalpur district, gram was the major pulse crop. The analysis of change in respect of area, production and productivity of pulses indicated a positive change in area under lentil, arhar, teora and gram by 149.19, 110.99, 20.45 and 18.50 per cent respectively during the triennium ending 1986 to 1996. But in the case of pea, the area declined by 69.53 per cent. Similar trend was observed in the case of production of all the selected pulse crops. As far as the productivity of selected pulses is concerned it declined by 0.17, 41.86 and 13.32 per cent in the case of lentil, arhar and teora repectively. However, in the case of pea and gram, the productivity increased by 13.55 and 41.34 per cent respectively. The increase in the production of lentil, arhar, teora and gram was mainly due to increase in area under these crops. Further, in the case of gram, the increase in production was mainly due to an increase in the yield during the period. (Table 3.2)

In Godda district, negative changes in area were observed in the case of lentil, arhar, teora and gram. Similarly, the production of lentil, arhar, teora and gram declined by 10.96, 39.28, 41.26 and 59.75 per cent respectively during the same period. The decrease in productivity per hectare of arhar, teora and gram was 30.15, 19.52 and 4.78 per ent respectively. Despite 25.98 per cent increase in the productivity of lentil, production of the crop decreased.

3.2.4 Gujarat (Vadodara and Panchmahals)

The selected districts claimed 63.4 per cent of the area devoted to all pulses in the state. As in area in the case of production also five districts contributed 65.96 per cent of the State's pulses production. The share of five districts in the total production of the state are 17.86, 16.36, 14.81, 13.18 and 3.75 per cent respectively. Among pulses, the area under tur was highest in Vadodara and the area under gram was highest in Panchmahals. The yield per hectare of Panchmahals, Kheda, Surat, Jamnagar and Vadodara was higher than 575 kg. per hectare for the state (Table 3.2).

3.2.5 Haryana (Bhiwani and Ambala)

In Bhiwani district, 33.10 per cent of gross cropped area was under pulses in 1985-86. Irrigation facilities were available for 30.59 per cent of the pulse area. Gram occupied 32.37 per cent of gross cropped area. Among other crops, the area under bajra, wheat and mustard was significant. Wheat, rice and cotton were fully irrigated. After a decade (1995-96), the area under pulses declined and slipped down to 25.81 per cent of the gross cropped area. Irrigated area also declined. Production of pulses increased from 146 thousand tonnes in 1985-86 to 159 thousand tonnes in 1995-96. This increase in pulses production was mainly contributed by gram. The production of moong, lentil, mash, and other pulses declined in this period. In the case of productivity, performance of pulses indicated a mixed trend. The productivity of gram jumped from 699 kg./ha to 1,051 kg/ha during the same period. But, the yield rates of mash and other pulses went down.

In Ambala district, 7.67 per cent of gross cropped area was under pulses in 1985-86. Only 3.37 per cent of area under pulses was irrigated. Lentil and gram were the main pulse crops of the district. Among other crops the area under wheat, rice, maize and sugarcane was significant. The area under pulses came down to 2.27 per cent of gross cropped area in 1995-96. Gram suffered the most. Lentil, mash, moong and other pulses too suffered in terms of acreage. The production of pulses was 3.6 thousand tonnes during 1995-96. Lentil followed by gram contributed the largest share to the pulse production. The yield of total pulses in Ambala was 857 kg./ha in 1995-96, which was below the state level of 1002 kg./ha. The productivity of gram was found almost equal to the state level (Table 3.2).

3.2.6 Madhya Pradesh_ (Durg, Narsinghpur and Jhabua)

Teora (lathyrus) was the major pulse crop of Durg district followed by gram, urad, lentil and arhar. Teora showed the highest absolute increase in area, production and yield between two trienniums ending 1988-89 and 1995-96. Arhar showed decrease in aea, production and yield in both absolute and relative terms. Urad showed 42.86 and 12.50 per cent decrease in area & production respectively. But an increase of 53.15 per cent was observed in yield, which was highest in pulses in Durg district. Lentil showed positive change in area, production and yield.

In Jhabua district, urad was the major pulse crop followed by kulthi, gram and arhar. Total pulses showed increasing trend in area, production and yield. Gram and urad showed increase in area, production and yield, whereas, arhar showed decrease in area, production and yield during two trienniums. In the case of kulthi the area decreased by 17.49 per cent, whereas, the production and yield increased by 15.15 per cent and 39.45 per cent respectively. The area under total pulses registered an increase of 57.64, 117.26 and 37.86 per cent respectively between two trienniums.

Narsinghpur is the major pulse growing district of Madhya Pradesh. Among different pulses gram ranked first followed by pea, arhar, lentil and moong-moth. Gram registered an increase of 12.28, 28.32 and 14.39 per cent respectively in area, production and yield between two trienniums. Pea, arhar, and moong-moth showed decrease in area, production and yield. Except gram, the yield of all the pulses showed negative change. The highest relative increase in area (110.34 per cent) and production (85.18 per cent) was observed in the case of lentil, whereas, the yield showed decrease by 11.83 per cent (Table 3.2).

In Durg district, teora registered highest growth rates in area (7.72 per cent) and production (11.67 per cent) per annum. Urad showed highest rate of growth in yield (5.98 per cent), whereas, area and production registered negative growth rates. The area, production and yield of total pulses increased with annual compound growth rates of 4.56, 6.07 and 1.44 per cent respectively.

In Jhabua district the highest growth rate was observed in area (18.34 per cent) and production (21.43 per cent) of gram and yield (6.14 per cent) of urad. Arhar registered negative growth rates in area, production and yield. In the case of kulthi, the growth rate of area (2.95 per cent) was negative but it was positive in the case of production (2.04 per cent) and yield (5.31 per cent).

In Narsinghpur district, arhar, moong and pea registered negative growth rates in area, production and yield. Only gram registered positive growth rate in area (1.64 per cent), production (2.78 per cent) and yield (1.13 per cent). Lentil showed positive growth rates in area and production but negative rate in yield (Table 3.2).

Overall picture showed that gram and total pulses registered positive growth rates in area, production and yield in all the three selected districts, whereas, arhar registered negative growth rates in all the three districts.

3.2.7 Maharashtra (Nasik, Ahmednagar, Amravati and Yavatmal)

The percentage of area under gram to total Maharashtra in Nasik and Ahmednagar districts (T.E.1992-93) was 7.93 and 4.92 respectively. Similarly, in the case of tur, the percentage of area in Amravati and Yavatmal was 8.26 and 9.20 respectively.

In Nasik district, gram occupied 42.45 per cent area of the total area under pulses in T.E.1992-93. In Ahmednagar, gram occupied 28.67 per cent area of the total pulses area. In the case of tur, it occupied 47.13 per cent area of the total pulse area of Amravati district. In Yavatmal district, tur occupied 51.07 per cent of the total pulse area in that district.

The growth rate of area, production and productivity of gram for the period 1980-81 to 1992-93 was 6.38, 8.48 and 1.97 per cent per annum respectively in Nasik district. For Ahmednagar district, the figures were 2.18, 5.94 and 3.69 per cent respectively. For the state as a whole, the growth rate of area, production and yield of gram was 2.95, 7.92 and 4.84 respectively. In Amravati district, the growth rate of area, production and yield of tur was 5.82, 6.77 and 0.62 per cent per annum respectively. The same for Yavatmal district was 5.95, 5.51 and (-) 0.41 per cent per annum. For Maharashtra State, it was 3.94, 3.53 and (-) 0.40 per cent respectively for area, production and yield (Table 3.2).

3.2.8 Orissa (Ganjam, Cuttack and Kalahandi)

The area and production of total pulses in three selected districts showed an increasing trend. But the yield in Kalahandi showed a significant increase while the remaining two districts hovered around 500 kg per hectare.

Though the area and production of the selected pulses in the selected districts showed an increase, the yields have not improved. This was mainly due to non-adoption of improved seed and cultural practices. Moong in Ganjam district showed non-significant positive growth rate in area and production. Yield showed negative growth rate (Table 3.2).

Urad in Cuttack showed negative and significant growth rates in area, production and yield. Arhar crop in Kalahandi showed positive growth rates in area and production. But the yield showed negative growth rate.

3.2.9 Punjab (Ludhiana and Firozpur)

In Ludhiana district, 3.73 per cent of gross cropped area was under pulses in 1986-87. Irrigation facilities were available for 100 per cent of the cultivated area. Moong (1.90 per cent of GCA) and arhar with 1.76 per cent of GCA were the major pulse crops. After a decade, area under pulses declined and slipped down to 2.03 per cent of gross cropped area. Irrigated area remained the same. Paddy gained substantially in terms of cultivated area.

In Firozpur district, 3.44 per cent of GCA was under pulse crops in 1986-87. Fifty five per cent of cultivated area under pulses was irrigated. Gram and moong were the main pulse crops of the district. Among other crops, wheat, rice, cotton and mustard were significant. The cultivated area under rice, sugarcane, cotton and jowar was totally irrigated. The area under pulses came down slightly to 3.23 per cent of GCA in 1996-97. In the process of declining area, gram suffered marginally while moong maintained its position. Minor pulses such as urad, arhar and lentil too suffered in terms of acreage.

In Ludhiana, production of pulses declined from 17.00 thousand tonnes in 1986-87 to 8.70 thousand tonnes in 1996-97. The decrease in production of pulses is mainly attributed to arhar. The overall performance of yields of pulses was found highly disappointing.

The production of pulses in Firozpur increased from 16 thousand tonnes (1986-87) to 22.60 thousand tonnes (1996-97). Gram has contibuted major share to this spurt in production. The yield of pulses jumped from 535 kg./ha in 1986-87 to 957 kg./ha in 1996-97. The productivity of gram indicated a significant increase.

3.2.10 Rajasthan (Nagaur and Hanumangarh)

In Nagaur district, kharif pulses (moong, moth and cowpea) are the predominant crops. These constituted 31 per cent area, but production and productivity were low. The area and production of moong and cowpea showed an increase in the district. The per hectare yield of these pulses rose significantly during 1991-94, while it declined during 1993-96. In the case of gram, the area and production declined during 1991-94. However, the per hectare yield remarkably increased during 1993-96 over the period 1981-84.

Gram is an important pulse crop of Hanumangarh district. It occupied 54 per cent of the total area under food crops in the district. Gram being mostly unirrigated and risky crop, the productivity depended on rains and was also affected by non-availability of improved seeds. In the case of kharif pulses, moth is popular and production and productivity increased during 1995-96 as compared to 1994-95.

3.2.11 Tamil Nadu (Salem and Tuticorin)

The pulses grown in Salem district were tur, urad, moong, gram and cowpea. The area under total pulses increased from 48,449 hectares (1981-82) to 95,000 hectares (1996-97). The production of total pulses increased from 20,000 tonnes to 59,000 tonnes during the same period. The area, production and yield of red gram was 14,821 hectares, 10,790 tonnes and 756 kg/ha respectively in 1981-82 in Salem district. The area of redgram increased to 26,619 hectares in 1988-89 and in 1996-97 it decreased to 19,000 hectares. There was a wide fluctuation in the production [8,000 tonnes (1995-96) to 32,210 tonnes (1986-87)] of redgram due to fluctuations in yield (487 kg/ha in 1982-83 to 1,435 kg./ha in 1986-87). The area under blackgram was 7,031 hectares in 1981-82 and reached to 24,000 hectares in 1996-97. Fluctuations in the yield were due to vagaries of monsoon. Area under moong increased from 2,310 hectares in 1981-82 to 17,000 hectares in 1995-96. Production also increased from 1,220 tonnes to 14,000 tonnes. There was improvement in the yield but the fluctuations were wide. Gram was cultivated only on a minor scale. The yield per hectare was around 400 kg.

The area under total pulses in Tuticorin district increased from 24,496 hectares in 1986-87 to 30,857 hectares in 1994-95. The production increased from 4,250 tonnes to 12,410 tonnes during the same period. Urd and moong were the major pulses of Tuticorin district. The area of urd increased from 19,325 hectares in 1986-87 to 23,818 hectares in 1994-95. Production and yield also showed an increasing trend. The area under moong was 3,224 hectares in 1986-87. It rose to 12,694 hectares in 1990-91 but again declined to 5,316 hectares in 1994-95. There was

a wide fluctuation in the yield of moong (119 kg. to 806 kg./ha.) and consequently the production (380 tonnes to 10,230 tonnes). The area under red gram and gram was insignificant in the district. Avarai, Mochai and cowpea were the other pulses in the district. Area under other pulses increased from 1,118 hectares in 1986-87 to 1,976 hectares in 1994-95. The yield per hectare was around 200 kgs.

3.2.12 Uttar Pradesh (Udhamsingh Nagar, Aligarh, Bahraich and Lalitpur)

Arhar, moong, urad, pea, lentil and gram were the important pulse crops in the State. The details of area, production and yield of these crops were not discussed by the Centre. In Udham singh Nagar district the coverage under total pulses decreased from 9.38 thousand hectares in 1985-86 to 7.33 thousand hectares in 1994-95. The total production of pulses showed a declining trend in the last one decade. In Baharaich district, the trend in production of total pulses was quite erratic during the last decade. In Aligarh district, the total area under pulses decreased from 105.36 thousand hectares in 1985-86 to 61.28 thousand hectares in 1994-95. The production of pulses declined from 89.62 thousand tonnes in 1985-86 to 59.52 thousand tonnes in 1994-95. In Lalitpur district, the area under pulses increased from 72.65 thousand hectares in 1985-86 to 111.31 thousand hectares in 1994-95. Production of pulses also increased from 50.42 thousand tonnes in 1985-86 to 89.20 thousand tonnes in 1994-95. In this district, the trends of area and production were increasing.

3.2.13 West Bengal (Purulia, Malda and Cooch Behar)

Rabi pulses constituted the important pulse crops in Malda and Cooch Behar districts while this is not so in Purulia district where kharif pulses dominated. In all the three districts, the relative share of rabi pulses declined during two periods i.e. 1982-83 and 1991-92. The declining share in rabi pulses was accompanied by the corresponding increase in the share of kharif pulses.

Analysis of growth rates revealed that the production of total pulses increased by 4.2147 per cent in Purulia, 1.0557 per cent in Malda and 2.5112 per cent in Cooch Behar. Positive growth rates in production observed in all the sample districts were associated with positive area growth rates. However yield growth rates were not uniform across the sample districts. Negative growth rates were observed in total pulses in Malda and Cooch Behar districts whereas it was positive in Purulia district.

The selected pulse crops in the sample districts are kharif mashkalai, rabi mashkalai and summer moong. In respect of kharif mashkalai, the district of Cooch Behar and Purulia experienced positive growth rates in area, production and productivity. The district of Malda recorded negative growth rate in production accompanied by significantly high negative growth rate in productivity and a positive growth in area. In respect of rabi mashkalai, Cooch Behar district attained a significantly high positive growth rate in production and area. Growth rate in productivity assumed positive magnitude but not so high. The district of Malda showed a positive

growth rate in area, production and productivity. The district of Purulia showed negative growth rate in production and area but positive growth in yield. Summer moong was negligible in Purulia district. Cooch Behar district witnessed positive growth rate in production of summer moong associated with the positive growth rate in area but negative (less than 1 per cent) growth in productivity. Malda experienced negative growth rates in area, production and productivity (Table 3.2).

3.3 Technology Mission on Pulses Development Programme in Selected Districts

3.3.1 Andhra Pradesh (Guntur, Anantapur and Khammam)

The actual budget released by the State Government under National Pulses Development Project by the end of 1996-97 was Rs.16.812 lakhs, Rs. 2.211 lakhs and Rs.8.137 lakhs for three selected districts respectively. The corresponding expenditure was Rs.16.357 lakhs, Rs. 2.049 lakhs and Rs.7.721 lakhs in three selected districts respectively. Out of the actual released budget, 97.29 per cent in Guntur, 92.67 per cent in Anantapur and 94.89 per cent in Khammam district was spent on various components. Among the components, the distribution of seed minikits, block demonstrations and certified seeds reported remarkable achievements. Despite the introduction of new varieties of seeds and other developmental programmes, the farmers still followed age old cultural practices and locally available seeds. The foundation seed was supplied to only progressive farmers who could invest more money. Villagers residing in remote corners of the districts were completely unaware of the newly introduced varieties of seeds and developmental programmes (Table 3.3).

3.3.2 Assam

Not mentioned in the report.

3.3.3 Bihar

In Bhagalpur district, the physical and financial target under the component "distribution of certified seeds for the year 1996-97 " was 138 quintals and Rs.0.414 lakhs respectively against which the achievements were 34.58 quintals and Rs.0.103 lakhs. Physical target fixed for the component "distribution of minikits under NPDP " was 850 in numbers against which achievement was 100 per cent during the year. Against the physical target of 3,000 packets of rhizobium culture, the achievement was only 1,000 packets. Regarding the target, achievement and distribution of seed minikits of pulses, it was 400 in the case of gram, 200 in the case of pea and 150 in the case of rajma.

So far as the distribution of different components of NPDP in Godda district, none of the respondent farmers reported to have been benefitted by any of the components of NPDP (Table 3.3).

Table 3.2 Growth rates of area, production and yield of pulse crops in selected districts of the selected States.

Pulse crops	Andhra Pradesh (1974-75 to 1994-95)									Assam (1989-90 to 1995-96)					
	Guntur			Anantapur			Khammam			Jorhat			Nagaon		
	A	P	Y	A	P	Y	A	P	Y	A	P	Y	A	P	Y
Gram (Bengal Gram)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pea	--	--	--	--	--	--	--	--	--	- 11.83	- 9.51	3.41	- 5.25	- 4.51	0.69
Lentil (Masoor)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arhar (Tur) (Red Gram)	--	--	--	1.7893	6.0350	4.2456	--	--	--	--	--	--	--	--	--
Moong (Green Gram)	--	--	--	--	--	--	1.4443	4.2011	2.7567	--	--	--	--	--	--
Moth (Kidney beans)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Urad (Black Gram) (Beri, Mash Kalai)	7.1823	9.2750	2.0926	--	--	--	--	--	--	9.57	7.73	- 1.68	4.28	7.64	3.44
Kulthi (Horse Gram)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Teora (Lathyrus) (Lakh)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Pulse crops	Madhya Pradesh (1986-87 to 1995-96)									Bihar (1985-86 to 1995-96)					
	Durg			Jhabua			Narsinghpur			Bhagalpur			Godda		
	A	P	Y	A	P	Y	A	P	Y	A	P	Y	A	P	Y
Gram (Bengal Gram)	0.93	1.86	0.92	18.34	21.43	2.59	1.64	2.78	1.13	1.50	5.57	4.06	- 11.96	- 12.58	- 0.62
Pea	--	--	--	--	--	--	-2.19	- 5.50	- 3.41	- 13.33	- 12.27	0.02	--	--	--
Lentil (Masoor)	5.06	7.96	2.75	--	--	--	11.03	8.35	- 2.44	9.24	9.02	0.73	- 4.91	- 1.23	3.67
Arhar (Tur) (Red Gram)	- 4.75	- 7.88	- 3.28	- 5.61	- 6.57	- 1.03	- 1.77	- 4.47	- 2.75	8.86	3.96	- 5.48	- 1.70	- 5.63	- 3.83
Moong (Green Gram)	--	--	--	--	--	--	- 8.27	- 9.26	- 1.09	--	--	--	--	--	--
Moth (Kidney beans)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Urad (Black Gram) (Beri, Mash Kalai)	- 6.88	- 1.34	5.98	7.00	13.60	6.14	--	--	--	--	--	--	--	--	--
Kulthi (Horse Gram)	--	--	--	- 2.95	2.04	5.31	--	--	--	--	--	--	--	--	--
Teora (Lathyrus) (Lakh)	7.72	11.67	3.65	--	--	--	--	--	--	2.29	1.44	- 0.65	- 3.50	- 7.72	- 4.14

Continued.....

Table 3.2 continued.....

Pulse crops	Maharashtra (1980-81 to 1992-93)												Gujarat, Haryana and Punjab					
	Nasik			Ahmed nagar			Amravati			Yavatmal			Districtwise growth rate not computed					
	A	P	Y	A	P	Y	A	P	Y	A	P	Y	A	P	Y	A	P	Y
Gram	6.38	8.48	1.97	2.18	5.94	3.69	9.63	17.38	7.07	7.63	15.12	6.97	--	--	--	--	--	--
Pea	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Lentil	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arhar	5.33	5.20	-0.15	6.04	4.04	- 1.77	5.82	6.77	0.62	5.95	5.51	- 0.41	--	--	--	--	--	-
Moong	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Moth	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Urad	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Kulthi	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Teora	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Pulse crops	Orissa (1983-84 to 1995-96)									West Bengal (1982-83 to 1991-92)								
	Ganjam			Cuttack			Kalahandi			Purulia			Malda			Cooch Behar		
	A	P	Y	A	P	Y	A	P	Y	A	P	Y	A	P	Y	A	P	Y
Gram	--	--	--	--	--	--	--	--	--	- 4.73	- 3.89	0.81	- 9.33	-11.30	- 1.80	--	--	--
Pea	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Lentil	--	--	--	--	--	--	--	--	--	--	--	--	4.41	5.90	1.42	- 7.68	- 6.16	1.49
Arhar	--	--	--	--	--	--	2.9523	2.6736	- 0.2786	- 5.78	0.86	- 4.92	-11.88	-11.97	- 0.09	--	--	--
Moong	1.6751	0.8583	- 0.8168	--	--	--	--	--	--	3.18	5.06	1.77	- 11.53	-14.40	- 1.66	3.65	3.43	- 0.30
Moth	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Urad	--	--	--	-0.1015	-0.3616	-0.2600	--	--	--	4.16	7.87	3.56	6.50	8.77	2.17	138.91	135.62	4.50
Kulthi	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Teora	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

For Rajasthan, Tamil Nadu and Uttar Pradesh - Districtwise growth rates not computed.

3.3.4 Gujarat

The Intensive Pulses Development Programme was initiated towards the end of fourth Five Year Plan in the selected districts which have potential for pulses production. The detailed break up of physical and financial targets on National Pulses Development Project for Vadodara and Panchmahals districts in 1996-97 are presented in table 3.3.

3.3.5 Haryana

The district of Bhiwani has great potential for pulses production and therefore, it has always been included under the pulses development programmes of Haryana. But Ambala, being part of the irrigated zone, has never been included under the output augmenting schemes of pulses. Hence, the analysis was restricted only to Bhiwani district.

Technology Mission has been implementing the centrally sponsored National Pulses Development Project in Bhiwani for the last few years. Under NPDP, emphasis is laid on all components, which help in increasing the production and productivity of pulses in the district. The performance of seed related components, viz., breeder and foundation seeds, certified seeds and seed villages was not impressive. In the case of breeder and foundation seed, only 35 per cent of the physical targets were achieved after spending 42.5 per cent of the allotted funds. Only 45 per cent of the physical targets were achieved in certified seed component. Seed village scheme has indicated better performance and 65 per cent of the target was achieved. The proposed target was fully achieved in the case of distribution of seed minikits and block demonstrations. Around 40 per cent of the target was achieved under IPM demonstrations and only 20 per cent of the targets were fulfilled in the case of pheromone traps. The targets of plant protection equipment were achieved to the level of 75 per cent. The achievement of rhizobium culture was not impressive because 55 per cent of the targets were fulfilled by spending 85 per cent of allotted funds. Training programmes indicated an achievement of 60 per cent (Table 3.3).

3.3.6 Madhya Pradesh

Information on component wise total physical targets and achievements of National Pulses Development Project during 5 years (1992-93 to 1996-97) was made available by the office of the Deputy Directors of Agriculture, Durg, Jhabua and Narsinghpur. In Durg district the percentage of achievement to target was highest in the case of PSB culture followed by farm implements, storage bins, rhizobium culture, plant protection implements and distribution of certified seeds. In the case of other components, the achievement was less than the target. It was lowest in block demonstrations (23.54 per cent).

In Jhabua district, the percentage of achievement was highest (418.66 per cent) to target in PSB culture followed by micro-nutrients (365.00 per cent), farm implements (231.05 per cent), distribution of certified seeds (150.11 per cent), sprinkler sets (118.57 per cent) and rhizobium culture (105.99 per cent). The achievement was equal to target (100.00 per cent) in the case of training. It was lowest in plant protection implements (11.54 per cent).

In Narsinghpur district the percentage of achievement to target was maximum (497.83 per cent) in the case of farm implements followed by PSB culture (318.84 per cent), distribution of certified seeds (212.31 per cent), rhizobium culture (139.09 per cent) and distribution of seed minikits (101.56 per cent). In the case of IPM demonstrations it was 100 per cent. It was lowest in the case of foundation seeds (11.16 per ent) (Table 3.3).

3.3.7 Maharashtra

Information on componentwise total physical targets and achievement of National Pulse Development Project in Maharashtra and selected district was not given in the report.

3.3.8 Orissa

The financial targets fixed by the State Government under National Pulses Development Project and the achievement by the end of 1996-97 for the selected three districts are described below.During 1996-97,out of the targetted amount 80.61 per cent in Ganjam, 83.28 per cent in Cuttack and 77.03 per cent in Kalahandi districts were spent towards various components. Among the various components, the distribution of certified seed, block demonstrations, seed minikits, IPM Demonstrations, plant protection equipments and rhizobium culture reported a remarkable achievement. Despite the introduction of new varieties of seeds and other developmental programmes, the farmers are still following the age old cultural practices and locally available seeds (Table 3.3).

3.3.9 Punjab

The districts of Ludhiana and Firozpur have great potential for pulses production and therefore, they have always been included under the pulses development programmes of Punjab. Technology Mission has been implementing the centrally sponsored National Pulses Development Project in Ludhiana and Firozpur for the last few years. Under NPDP, emphasis is laid on all components, which help in increasing the production and productivity of pulses in the districts (Table 3.3). The performance of seed related components, viz., breeder and foundation seeds, certified seeds and seed villages was not impressive in Ludhiana and Firozpur. The progress of breeder seed and foundation seed was nil in both the district. The certified seed component also did not do well because only 47 per cent of the physical target in Ludhiana was achieved after spending 60 per cent of the allotted funds. In Firozpur, the situation was almost identical. Seed village component has also indicated poor performance because only 43 per cent of the set target in Ludhiana and 20 per cent in Firozpur was achieved after spending 50 and 35 per cent of the allotted funds respectively. Only 60 per ent and 56 per cent of the physical targets were achieved in seed minikit programme in Ludhiana and Firozpur districts respectively after spending 100 per cent of the allotted funds. The coverage under block demonstrations was creditable and the target was fully achieved in Ludhiana and Firozpur. Around 100 per cent and 50 per cent of the target of IPM demonstrations was achieved in Ludhiana and Firozpur districts respectively. The targets of storage bins were achieved to the level of 80 per cent in Ludhiana and 90 per cent in Firozpur. The percentage of target achieved in the case of rhizobium culture was not impressive.

3.3.10 Rajasthan

The financial targets fixed by the State Government under NPDP and the achievement of the selected districts was not presented in the report.

3.3.11 Tamil Nadu

In this State National Pulses Development Project was implemented successfully from 1986-87 onwards. Component wise targets and achievements of NPDP of Salem district for 1996-97 showed that the achievement was 100 per cent of the target in the components of block demonstrations, pheromone traps, IPM demonstrations, rhizobium culture, training and sprinkler sets. In the case of seed village and certified seeds, the achievement was more than the target. The target was not fully achieved in the case of minikits, foundation seed and micro-nutrients. The achievement was nil in dal processors and storage bins.

In Tuticorin district, the achievement was more than the target in seed village component. The achievement was 100 per cent in the components like block demonstrations, pheromone traps, IPM demonstrations, dal processors, training and sprinkler sets. The achievement was less than the target in the case of minikits, certified seeds, foundation seed, rhizobium culture and micro-nutrients (Table 3.3).

3.3.12 Uttar Pradesh

The cropwise distribution of certified seeds of pulses alongwith subsidies under NPDP during 1997-98 in the selected districts of U.P. indicated that the total seeds distributed during 1997-98 was 44,000 quintals of which maximum i.e. 1,479 quintals were distributed in Lalitpur district. The next district was Aligarh where it was distributed to the extent of 958 quintals. In Udham Singh Nagar it was minimum i.e. only 128 quintals. During this year the quantity of seeds distributed was higher during rabi season as compared to that in kharif season. In rabi season, gram and pea were important crops, while in kharif season arhar was important crop in terms of seed distribution. During 1997-98, zaid pulses gained importance in all the selected districts except Udham Singh Nagar where seed distribution in both zaid and kharif seasons was found nil. The distribution of subsidies was also highest in Lalitpur and lowest in Udham Singh Nagar (Table 3.3).

3.3.13 West Bengal

In the selected districts, NPDP comprised distribution of minikits and organising block demonstrations. The performance of NPDP in the selected districts in the year 1995-96 showed that the selected districts distributed the targetted number of minikits, the exception being the district of Cooch Behar where the achievement figures did not touch even 10 per cent of the targetted figure. In respect of conducting block demonstrations, the district of Cooch Behar again showed the exception where the achievement fell short of the target (2.67 per cent). The achievement was 100 per cent in the remaining two districts (Table 3.3).

Table 3.3 Componentwise physical and financial targets and achievements of National Pulses Development Project in selected districts of the selected States.

S. No	Components	Units	Andhra Pradesh (1996-97) (Rupees in Lakhs)									Bihar (1996-97)			
			Guntur			Anantapur			Khammam			Bhagalpur			Godda
			Actual budget released	Expen-diture	Percen-tage of expendi ture in actual budget	Actual budget released	Expen-diture	Percen-tage of expendi ture in actual budget	Actual budget released	Expen-diture	Percen-tage of expen-diture in actual budget	Physical target	Achieve-ment	% of achieve ment to target	
1	Seed Minikits	No.	Not	0.774	Not	0.476	0.501	105.25	0.843	0.983	116.61	850	850	100.00	None of the respon-dent farmers reported to have been benefitted by any of the com-ponents of NPDP
2	Research Minikits	Hect.	mentioned	--	mentioned	--	--	--	--	--	--	--	--	--	
3	Block Demonstrations	Hect.	"	0.615	"	0.300	0.230	76.67	1.570	0.287	18.28	--	--	--	
4	Trainings	No.	"	0.046	"	--	0.800	--	0.257	0.047	18.29	--	--	--	
5	Seed Villages	Qtls.	"	--	"	0.382	--	--	0.792	--	--	--	--	--	
6	Foundation Seeds	Qtls	"	--	"	--	--	--	--	--	--	--	--	--	
7	Certified Seeds	Qtls	"	1.676	"	0.327	0.433	132.42	1.960	0.061	3.11	138	34.58	25.06	
8.	Plant Protection Implement	No.	"	--	"	--	--	--	--	--	--	--	--	--	
9	Plant Protection Management	Hect.	"	--	"	--	--	--	--	--	--	--	--	--	
10	Farm Implements	No.	"	1.553	"	0.430	--	--	1.510	1.159	76.75	--	--	--	
11	Sprinkler Sets	No.	"	10.158	"	--	--	--	--	5.088	--	--	--	--	
12	Pheromone traps	No.	"	--	"	0.041	--	--	0.185	--	--	--	--	--	
13	IPM Demonstration	Hect.	"	0.259	"	0.255	0.085	33.33	0.490	0.096	19.59	--	--	--	
14.	Dal Processors	No.	"	--	"	--	--	--	0.280	--	--	--	--	--	
15	Storage Bins	No.	"	--	"	--	--	--	--	--	--	--	--	--	
16	Rhizobium Culture	No./Hect.	"	--	"	--	--	--	--	--	--	3,000	1,000	33.33	
17	PSB Culture	No.	"	--	"	--	--	--	--	--	--	--	--	--	
18	Micro- nutrients	No.	"	1.276	"	--	--	--	0.250	--	--	--	--	--	
19	Retail Outlets	No.	"	--	"	--	--	--	--	--	--	--	--	--	
20	Contingencies	--	"	--	"	--	--	--	--	--	--	--	--	--	
Total			16.812	16.357	97.29	2.211	2.049	92.67	8.137	7.721	94.89	--	--	--	

Continued.....

Table 3.3 Continued.....

S.			Gujarat (1996-97)				Haryana (1996-97)		Madhya Pradesh (1992-93 to 1996-97) (Physical) Total								
No	Components	Units	Vadodara		Panchmahal		Bhiwani		Durg			Jhabua			Narsinghpur		
			Physical Target	Financial Target Rs.Lakhs	Physical Target	Financial Target Rs.Lakhs	Physical Target Achie-ved (%)	Financial Target Achie-ved (%)	Physical Target	Achieve-ment	% of achieve-ment to target	Physical Target	Achieve-ment	% of achieve-ment to target	Physical Target	Achieve-ment	% of achieve-ment to target
1	Seed Minikits	No.	200	0.23	850	1.04	100.0	100.0	5,477	4,220	77.05	4,416	4,340	98.28	8,086	8,212	101.56
2	Research Minikits	Hect.	--	--	--	--	--	--	--	--	--	--	--	--	2,305	1.879	81.52
3	Block Demonstrations	Hect.	450	4.05	400	4.08	100.0	100.0	960	226	23.54	1,036	735	70.94	1,968	891	45.27
4	Trainings	No.	--	--	--	--	60.0	80.0	--	--	--	5	5	100.00	--	--	--
5	Seed Villages	Qtls.	700	1.40	1,100	2.20	65.0	65.0	1,245	--	--	918	--	--	1,826	--	--
6	Foundation Seeds	Qtls	100	0.40	150	0.60	35.0	42.5	789	--	--	592	--	--	673	75.10	11.16
7	Certified Seeds	Qtls	175	0.50	200	0.60	45.0	50.0	2,045	2,751.04	134.52	1,802	2,705	150.11	2,536	5,384.11	212.31
8.	Plant Protection Implement	No.	--	--	--	--	75.0	76.0	210	549	261.43	52	6	11.54	442	421	95.25
9	Plant Protection Management	Hect.	--	--	--	--	--	--	406	--	--	150	54	36.00	3,178	756.10	23.79
10	Farm Implements	No.	100	1.15	50	0.58	--	--	444	3,154	710.36	483	1,116	231.05	600	2,987	497.83
11	Sprinkler Sets	No.	60	7.50	30	3.75	100.0	100.0	52	34	65.38	70	83	118.57	76	69	90.79
12	Pheromone traps	No.	80 Ha.	0.40	80 Ha.	0.40	20.0	25.0	74	25	33.78	73	32	43.83	64	52	81.25
13	IPM Demonstration	Hect.	40	0.60	45	0.67	38.0	40.0	120	--	--	59	20	33.89	74	74	100.00
14.	Dal Processors	No.	5	0.20	3	0.12	--	--	15	--	--	15	--	--	17	--	--
15	Storage Bins	No.					--	--	50	154	308.00	--	--	--	--	--	--
16	Rhizobium Culture	No./ Hect.	2,500 Ha.	0.62	1,800 Ha.	0.46	55.0	85.0	16,700 (No.)	47,589	284.96	58,340	61,838	105.99	47,850	66,554	139.09
17	PSB Culture	No.	--	--	--	--	--	--	300	27,479	9,159.7	6,000	25,120	418.66	10,000	31,884	318.84
18	Micro- nutrients	No.	150 Ha.	0.15	175 Ha.	0.18	--	--	150	--	--	40	146	365.00	--	--	--
19	Retail Outlets	No.	--	--	--	--	--	--	2	--	--	2	--	--	--	--	--
20	Contingencies	-	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total			--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Continued.....

Table 3.3 Continued.....

S. No	Components	Units	Orissa (1996-97) (Financial) (Rs. in lakhs)									Punjab (1996-97)			
			Ganjam			Cuttack			Kalahandi			Ludhiana		Firozpur	
			Target	Achieve-ment	% of achieve-ment to target	Target	Achieve-ment	% of achieve-ment to target	Target	Achieve-ment	% of achieve-ment to target	% of physical target achieved	% of financial target achieved	% of physical target achieved	% of financial target achieved
1	Seed Minikits	No.	2,28,151	2.01,769	88.94	1,03,470	1,03,354	99.89	79,000	79,000	100.00	60.00	100.00	56.00	100.00
2	Research Minikits	Hect.	--	--	--	--	--	--	--	--	--	--	--	--	-
3	Block Demonstrations	Hect.	8,35,728	8,06,338	96.48	1,81,436	1,80,633	99.55	4,86,847	4,54.034	93.26	100.00	100.00	100.00	100.00
4	Trainings	No.	5,000	5,000	100.00	10,000	10,000	100.00	--	--	--	80.00	80.00	100.00	100.00
5	Seed Villages	Qtls.	2,24,860	42,727	19.00	2,27,030	11,849	5.22	2,10,000	25,848	12.31	43.00	50.00	20.00	35.00
6	Foundation Seeds	Qtls	--	--	--	8,800	8,800	100.00	10,000	10,000	100.00	--	--	--	--
7	Certified Seeds	Qtls	11,100	11,100	100.00	2,472	4,991	197.86	1,74,000	1,74,000	100.00	47.00	60.00	45.00	55.00
8.	Plant Protection Implement	No.	15,000	14,562	97.00	14,400	14,400	100.00	14,400	14,400	100.00	--	--	--	--
9	Plant Protection Management	Hect.	--	--	---	--	--	--	--	--	--	--	--	--	--
10	Farm Implements	No.	2,68,500	1.97,183	73.44	66,750	1,12,347	168.31	1,90,568	1.30.968	68.73	--	--	--	--
11	Sprinkler Sets	No.	6,41,147	5,41,147	84.40	6,02,260	8,82,522	96.72	4.91,802	4,53.125	92.14	--	--	--	--
12	Pheromone traps	No.	11,020	--	--	6,000	7,500	125.00	16,772	8,344	49.75	--	--	--	--
13	IPM Demonstration	Hect.	29,487	23,676	88.29	12,000	13,770	114.75	43,150	43.150	100.00	100.00	100.00	50.00	60.00
14.	Dal Processors	No.	25,000	12,000	48.00	12,000	4,000	33.33	20,000	8,000	40.00	--	--	--	--
15	Storage Bins	No.	7,653	5,478	71.58	5,903	5,903	100.00	5.638	5.638	100.00	80.00	100.00	90.00	100.00
16	Rhizobium Culture	No./ Hect.	76,529	39,059	51.04	52,250	41,793	79.99	77,018	47,750	62.00	30.00	40.00	15.00	25.00
17	PSB Culture	No.	--	--	--	--	--	--	--	--	--	--	--	--	--
18	Micro- nutrients	No.	6,500	1,980	30.46	4,500	--	--	3,500	2.100	60.00	--	--	--	--
19	Retail Outlets	No.	--	--	--	--	--	--	--	--	--	--	--	--	--
20	Contingencies	--	1,36,967	1,30,932	95.59	13,925	14,815	106.39	23.914	23.914	100.00	--	--	--	--
Total			26,54,491	21,39,813	80.16	13,26,124	11,04.386	83.28	17.33,645	13.35.488	77.03	--	--	--	--

Continued.....

Table 3.3 Continued.....

S. No	Components	Units	Tamil Nadu (1996-97) (Physical and Financial)											
			Salem						Tuticorin					
			Physical target	Physical Achieve-ment	% of achieve-ment to target	Financial target	Financial Achieve-ment	% of achieve-ment to target	Physical target	Physical Achieve-ment	% of achieve-ment to target	Financial target	Financial achieve-ment	% of achieve-ment to target
1	Seed Minikits	No.	3,500	2,000	57.14	2.80	1.60	57.14	1,375	1,250	90.90	1.10	1.00	90.90
2	Research Minikits	Hect.	--	--	--	--	--	--	--	--	--	--	--	--
3	Block Demonstrations	Hect.	30	30	100.00	2.70	2.70	100.00	10	10	100.00	0.90	0.90	100.00
4	Trainings	No.	2	2	100.00	0.20	0.20	100.00	1	1	100.00	0.10	0.10	100.00
5	Seed Villages	Qtls.	400	1,067	266.75	0.80	2.13	266.25	300	610	203.33	0.60	1.22	203.33
6	Foundation Seeds	Qtls	3,250	1,640	50.46	13.00	6.56	50.46	100	53	53.00	0.40	0.37	92.50
7	Certified Seeds	Qtls	500	556	111.20	1.50	1.67	111.33	400	390	97.50	1.20	1.17	97.50
8.	Plant Protection Implement	No.	--	--	--	--	--	--	--	--	--	--	--	--
9	Plant Protection Management	Hect.	--	--	--	--	--	--	--	--	--	--	--	--
10	Farm Implements	No.	--	--	--	--	--	--	--	--	--	--	--	--
11	Sprinkler Sets	No.	5	5	100.00	2.25	2.25	100.00	5	5	100.00	1.25	1.25	100.00
12	Pheromone traps	No.	40	40	100.00	0.20	0.20	100.00	30	30	100.00	0.15	0.13	86.66
13	IPM Demonstration	Hect.	4	4	100.00	0.60	0.46	76.66	2	2	100.00	0.30	0.30	100.00
14.	Dal Processors	No.	7	--	--	0.28	--	--	5	5	100.00	0.20	0.20	100.00
15	Storage Bins	No.	23	--	--	--	--	--	10	--	--	--	--	--
16	Rhizobium Culture	No./Hect.	1,660	1,660	100.00	0.41	0.42	102.44	740	725	97.97	0.185	0.14	75.67
17	PSB Culture	No.	--	--	--	--	--	--	--	--	--	--	--	--
18	Micro- nutrients	No.	170	130	76.47	0.17	0.13	76.47	170	100	58.82	0.17	0.07	41.17
19	Retail Outlets	No.	--	--	--	--	--	--	--	--	--	--	--	--
20	Contingencies	--	--	--	--	--	--	--	--	--	--	--	--	--
Total			--	--	--	--	--	--	--	--	--	--	--	--

Continued.....

Table 3.3 Continued.....

S. No	Components	Units	West Bengal (1995-96) (Physical)									Uttar Pradesh (1996-97)			
			Purulia			Malda			Cooch Behar			Udhamsingh Nagar	Aligarh	Bahraich	Lalitpur
			Target	Achieve-ment	% of achieve-ment to target	Target	Achieve-ment	% of achieve-ment to target	Target	Achieve-ment	% of achieve-ment to target	Distribution of Certified seeds (Qtls)			
1	Seed Minikits	No.	1,750	1,750	100.00	4,900	4,900	100.00	3,075	192	6.24	--	--	--	-
2	Research Minikits	Hect.	-	--	-	--	--	--	--	--	--	--	--	--	-
3	Block Demonstrations	Hect.	225	225	100.00	250	250	100.00	75	73	97.33	--	--	--	-
4	Trainings	No.	--	--	--	--	--	--	--	--	--	--	--	--	-
5	Seed Villages	Qtls.	--	--	--	--	--	--	--	--	--	--	--	--	-
6	Foundation Seeds	Qtls	--	--	--	--	--	--	--	--	--	--	--	--	-
7	Certified Seeds	Qtls	--	--	--	--	--	--	--	--	--	--	1,130	575	1,740
8.	Plant Protection Implement	No.	--	--	--	--	--	--	--	--	--	--	--	--	-
9	Plant Protection Management	Hect.	--	--	--	--	--	--	--	--	--	--	--	--	-
10	Farm Implements	No.	--	--	--	--	--	--	--	--	--	--	--	--	-
11	Sprinkler Sets	No.	--	--	--	--	--	--	--	--	--	--	--	--	-
12	Pheromone traps	No.	--	--	--	--	--	--	--	--	--	--	--	--	-
13	IPM Demonstration	Hect.	--	--	--	--	--	--	--	--	--	--	--	--	-
14.	Dal Processors	No.	--	--	--	--	--	--	--	--	--	--	--	--	-
15	Storage Bins	No.	--	--	--	--	--	--	--	--	--	--	--	--	-
16	Rhizobium Culture	No./Hect.	--	--	--	--	--	--	--	--	--	--	--	--	-
17	PSB Culture	No.	--	--	--	--	--	--	--	--	--	--	--	--	-
18	Micro- nutrients	No.	--	--	--	--	--	--	--	--	--	--	--	--	-
19	Retail Outlets	No.	--	--	--	--	--	--	--	--	--	--	--	--	-
20	Contingencies	--	--	--	--	--	--	--	--	--	--	--	--	--	-
Total		--	--	--	--	--	--	--	--	--	--	--	--	--	-

For Assam, Maharashtra and Rajasthan (data not available).

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CHAPTER IV

RESULTS AND DISCUSSION

4.1 Characteristics of Sample Farmers

4.1.1 Structure of Family

Three districts namely Guntur, Anantapur and Khammam were selected from Andhra Pradesh. Fifty farmers in each selected district are sampled to form a total sample of 150 (Table 4.1).

In Assam, 100 selected farmers spread over 10 villages of Jorhat and Nagaon districts. The sample of 100 families had a total population of 720. Thus average size of family was 7.20. The total number of workers in the sample was 427, the average number of workers per family being 4.27. The number of workers per family increased with the increase of operational holdings.

In Bihar, 100 farmers (50 from each district) were selected from Bhagalpur and Godda districts. Majority of the sample farmers were from small size groups. The average family size of the respondents was 5.66 and 6.15 in Bhagalpur and Godda districts respectively (Table 4.1).

In Vadodara and Panchmahals districts of Gujarat, the 50 sample households had a population of 359. Thus, the average size of family worked out to 7.20 in both the districts.

The total population of the 50 sample households in Bhiwani district of Haryana was 394. In Ambala district, the total population was 521. The average size of family was 8 persons in Bhiwani and 11 persons in Ambala. The total number of workers in Bhiwani and Ambala were 193 and 203 respectively. The highest proportion of workers was found on big farms in Bhiwani and on marginal farms in Ambala. The average number of workers per family was 3.86 and 4.06 in Bhiwani and Ambala districts respectively (Table 4.1).

In Durg district of Madhya Pradesh, total number of family members in the selected 50 households was 358. The average size of family was 7.16. The number of workers per family was 3.80. The number of workers generally decreased with the size of farms. In Jhabua district, the number of members in 50 families was 352, the average size

Table 4.1 Structure of family of the selected farmers

AERC / Selected Districts	Andhra Pradesh			Assam		Bihar		Gujarat		Haryana		Madhya Pradesh		
Particulars	Guntur	Ananta-pur	Khammam	Jorhat	Nagaon	Bhagal-pur	Godda	Vado-dara	Panch-Mahals	Bhiwani	Ambala	Durg	Jhabua	Narsingh-pur
1. No. of families	50	50	50	50	50	50	50	50	50	50	50	50	50	50
2. Total no. of members	--	--	--	720		--	--	359	359	394	521	358	352	321
3. No.of member per family	--	--	--	7.20		5.66	6.15	7.20	7.20	8	11	7.16	7.04	6.42
No. of workers	--	--	--	427		--	--	--	--	193	203	190	191	183
5. Workers per family	--	--	--	4.27		--	--	--	--	3.86	4.06	3.80	3.82	3.66

AERC/Selected Districts	Maharashtra				Orissa			Punjab		Rajasthan		Tamil Nadu	
Particulars	Amravati	Yavatmal	Ahmed-Nagar	Nasik	Ganjam	Cuttack	Kalahandi	Ludhiana	Firozpur	Nagaur	Hanumangarh	Salem	Tuticorin
No. of families	25	25	25	25	50	50	50	50	50	50	50	50	50
Total no. of members	--	--	--	--	--	--	--	411	415	381	452	254	241
No.of member per family	--	--	--	--	--	--	--	8.2	8.3	7.6	9.0	5.08	4.8
No. of workers	--	--	--	--	--	--	--	156	129	198	231	136	109
Workers per family	--	--	--	--	--	--	--	3.12	2.58	3.9	4.6	2.7	2.2

AERC/Selected Districts	Uttar Pradesh				West Bengal		
Particulars	Nainital	Aligarh	Bahraich	Lalitpur	Purulia	Malda	Cooch Behar
No.of families	50	50	50	50	50	50	50
Total no. of members	472	462	397	436	343	336	305
No.of member per family	9.44	9.24	7.94	8.72	6.9	6.7	6.1
No.of workers	303	279	218	245	116	123	113
Workers per family	6.06	5.58	4.36	4.90	2.3	2.5	2.3

being 7.04. The number of workers per family was 3.82. In Narsinghpur district, there were 321 members in 50 households. The average size of family was 6.42 and the average number of workers per family was 3.66.

In Maharashtra, 100 farm families (25 families each from 4 districts) were selected.

From Orissa State, 150 farmers (50 farmers each from three selected districts) were selected.

In Ludhiana district of Punjab, the total population of the sample households was 411. In Firozpur district, the total population was 415. The average size of family was 8 in Ludhiana as well as in Firozpur. The total number of workers in these two districts was 156 and 129 respectively. The average number of workers per family was 3.12 and 2.58 respectively.

The total number of family members in Nagaur and Hanumangarh districts of Rajasthan was 381 and 452 respectively. The average size of family was 7.6 and 9.0. The total number of workers in both the districts was 198 and 231 respectively. The average number of workers in the selected households was 3.9 and 4.6 respectively in two districts.

One hundred (fifty from each district) pulses growing families were selected from Salem and Tuticorin districts of Tamil Nadu. The average size of family in selected districts was 5.08 and 4.80 respectively. The average number of workers in the selected households of two districts was 2.7 and 2.2 respectively.

In Nainital district of Uttar Pradesh, number of members per household was 9.44. Regarding work force of the family, average workers per family was 6.06. In Aligarh district, members per family and workers per family was 9.24 and 5.58 respectively. In Bahraich district, it was 7.94 and 4.36 respectively. In Lalitpur district, average size of family was 8.72. The average number of workers per family was 4.90.

In Purulia, Malda and Cooch Behar districts of West Bengal, the modal size of the households was six in the sample districts. The average number of workers per family stood around 2.00 in all the sample districts (Table 4.1).

4.1.2 Characteristics of Land Holdings and Irrigated Area

Land details are important because they indicate the economic and social status of the farmers. In Andhra Pradesh the average size of land holding was highest in

Table 4.2 Land holdings and irrigated area of the sample farms

(Figures in hectare)

Operated area		Andhra Pradesh			Assam		Bihar		Gujarat		Haryana		Madhya Pradesh		
		Guntur	Ananta-pur	Khammam	Jorhat	Nagaon	Bhagal-pur	Godda	Vado-dara	Panch-Mahals	Bhiwani	Ambala	Durg	Jhabua	Narsingh-pur
1.	Owned cultivated land	113	185	140	259.70		150.50	182.50	216.06	97.76	248.53	237.44	133.38	89.86	145.02
2.	Leased out land	--	--	--	21.82		--	--	0.24	0.60	8.42	5.58	1.62	--	8.91
3.	Leased in land/ mortgage in land	7 --	6.50 --	12.50 --	31.86 --		14.50 --	18.50 --	9.19 3.52	-- 4.05	40.39 --	61.64 --	-- --	-- --	6.89 --
4.	Operated area	120	191.50	152.50	269.74		165.00	201.00	228.53	101.21	280.50	293.50	131.76	89.86	143.00
5.	Average size of holding	2.40	3.83	3.05	2.69		3.30	4.02	4.57	2.02	5.64	5.91	2.64	1.80	2.86
Irrigation															
1.	Irrigated area	109	19.50	52.00	--		--	--	118.25	54.57	169.70	208.38	29.02	26.77	111.85
2.	Unirrigated area	11	172	100.50	--		--	--	110.28	46.64	110.80	85.12	102.74	63.09	31.15

Operated area	Maharashtra				Orissa			Punjab		Rajasthan		Tamil Nadu	
	Amra-vati	Yavat-mal	Ahmed-Nagar	Nasik	Ganjam	Cuttack	Kala-handi	Ludhiana	Firozpur	Nagaur	Hanuman-garh	Salem	Tuticorin
Owned cultivated land	90.25	100.25	94.00	90.75	86.50	71.00	101.00	248.03	330.97	436.08	438.37	242.57	233.79
Leased out land	--	--	--	--	--	--	--	15.88	16.06	--	20.00	--	--
Leased in land	--	--	--	--	4.50	2.50	1.00	315.30	42.09	4.16	44.25	--	--
Operated area	90.25	100.25	94.00	90.75	98.00	74.00	112.50	547.50	357.00	437.04	452.12	242.57	233.79
Average size of holding	3.61	4.01	3.76	3.63	1.96	1.48	2.25	10.95	7.14	8.74	9.04	4.85	4.67
Irrigation													
Irrigated area	10.00	34.75	93.00	71.50	47.00	5.50	--	547.50	316.12	105.36	77.25	135.17	95.60
Unirrigated area	80.25	65.50	1.00	19.25	51.00	68.50	112.50	--	40.88	331.68	374.87	107.40	138.19

Operated area	Uttar Pradesh				West Bengal		
	Nainital	Aligarh	Bahraich	Lalitpur	Purulia	Malda	Cooch Behar
Owned cultivated land	363.50	102.50	119.50	268.50	95.54	103.55	113.85
Leased out land	--	--	--	--	--	3.09	11.37
Leased in land	3.00	--	4.00	1.00	0.33	4.51	0.27
Operated area	366.50	102.50	123.50	269.50	95.87	104.97	102.75
Average size of holding	7.33	2.05	2.47	5.39	1.92	2.10	2.05
Irrigation							
Irrigated area	366.50	102.50	65.00	230.00	27.26	73.38	39.64
Unirrigated area	--	--	58.50	39.50	68.61	31.59	63.11

Anantapur district (3.83 ha.) followed by Khammam (3.05 ha.) and Guntur district (2.40 ha.). The area operated by sample farmers in Anantapur district was 191.50 ha (highest) and lowest in Guntur (120.00 ha.). The leased in land was highest in Khammam (12.50 ha.) followed by Guntur (7.00 ha.) and Anantapur (6.50 ha.) districts. There was no case of leased out land in any district. The proportion of irrigated area in the operated area was smaller in Anantapur and Khammam districts than in Guntur district.

The total operated area on selected farms in Assam was 269.74 ha, out of which 259.70 ha. was owned, 21.82 ha. was leased-out and 31.86 ha. was leased in. The average size of holding was 2.69 hectares.

In Bihar, the operated area in Godda district was higher (201.00 ha.) than Bhagalpur (165.00 ha.). There was no leased out land in both the districts. In Godda, owned cultivated land and leased in land was 182.50 ha. and 18.50 ha. respectively. In Bhagalpur district it was 150.50 ha. and 14.50 ha. respectively. The average size of holding in Godda and Bhagalpur districts was 4.02 ha. and 3.30 ha. respectively.

An important feature of land holdings in Vadodara district of Gujarat was that there was marginal variation in land owned and land operated. As regards the practice of leasing and mortgaging land, it was observed that 9.19 and 3.52 hectares of land for all the sample households was leased-in or mortgaged-in. The average size of holding was 4.57 ha. Of the total operated area, about 50 per cent was irrigated. In Panchmahals district, the practice of leasing and mortgaging land was observed on 4.05 hectares of total operated area. Average size of operational holding for the entire sample worked out to 2.02 ha. In both the districts, about 50 per cent area was irrigated.

The average size of holding in Bhiwani as well as in Ambala district of Haryana was around 6 hectares. Of the total operated area in Bhiwani district, the proportion of owned land was 88.6 per cent. The leased-in land was 14.4 per cent and leased-out land was 3.0 per cent. About 60.5 per cent of the operated area was irrigated. In Ambala district, the percentage of owned land was about 81. The percentage of leased-in and leased-out land was 21.0 and 1.9 respectively. About 71 per cent of the operated area was irrigated. The pattern of operated land was highly skewed towards big farms. Particularly, small & marginal farms were found less irrigated. The main source of irrigation in Ambala was tubewells while in Bhiwani, canals were the major source (Table 4.2).

In Durg district of Madhya Pradesh, the operated area per holding or average size of holding was 2.64 hectares. No farm had leased-in land. The system of leasing out area was uncommon as only 1.62 hectares of the area owned was leased-out. The

percentage of irrigated area to the operated area was about 22. Of the different irrigation sources, wells commanded largest percentage (66.64) followed by canals (27.98). The average size of holdings in Jhabua district was 1.80 hectares. None of the selected farms either leased-in or leased-out any area. Of the total operated area about 30 per cent was irrigated. Wells were the major sources of irrigation commanding 72.13 per cent of the irrigated area. Other sources of irrigation were nallahs, rivers and lift irrigation done from these sources. There was no area irrigated by tanks and canals. The average size of holding in Narsinghpur district was 2.86 hectares. The owned cultivated area was 145.02 hectares. Of this, 8.91 hectares was leased out and 6.89 hectares was leased-in. Of the total operated area, about 78 per cent area was irrigated. Wells and tubewells were the only sources of irrigation and commanded 99.64 per cent.

In Maharashtra, the average size of holding was highest (4.01 hectares) in Yavatmal district followed by Ahmednagar (3.76 hectares), Nasik (3.63 hectares) and Amravati district (3.61 hectares). In all the four districts, none of the farms either leased-in or leased-out area. The percentage of irrigated area to the operated area was highest (99 per cent) in Ahmednagar followed by 79 per cent in Nasik, 35 per cent in Yavatmal, and 11 per cent in Amravati.

In Orissa, the average size of holding was highest (2.25 ha.) in Kalahandi district followed by Ganjam district (1.96 ha.) and Cuttack district (1.48 ha.). The system of leasing out area was absent in all the three selected districts. The proportion of irrigated area to the operated area was smaller in Cuttack district than in Ganjam district. No irrigated area was reported in Kalahandi district. The irrigated area in Ganjam and Cuttack districts was 47.96 per cent and 7.43 per cent respectively.

In Punjab, the average size of holding in Ludhiana district was 10.95 hectares while it was 7.14 hectares in Firozpur. In Ludhiana, 45.30 per cent of operated land was owned. A fraction of cultivated land (2.90 per cent) was found leased out. The system of leasing-in was found common as 57.59 per cent of operated land was leased-in. The system of leasing out was not popular in Firozpur too as merely 4.50 per cent of operated land was leased out, while 11.79 per cent of cultivated land was leased-in. In Ludhiana, 100.00 per cent of operated land was irrigated while in Firozpur 88.55 per cent of operated land was irrigated. The main source of irrigation in Ludhiana was tubewells while in Firozpur canals were the major sources, which were supplemented by tube wells (Table 4.2).

In Nagaur district of Rajasthan, average size of holding of the selected households was 8.74 hectares. No area was leased-out. Wells and tubewells were the main sources of irrigation. The percentage of irrigated area to operated area was 24.00.

In Hanumangarh district, the average size of holding was 9.04 hectares. The area of operational holding and owned cultivated land was 452.12 ha. and 438.37 ha. respectively. The area leased-out and leased-in was 20.00 ha. and 44.25 ha. respectively. The percentage of irrigated area to operated area was 17.08. Canals were the main sources of irrigation.

In Tamil Nadu, the average size of holding in Salem and Tuticorin districts was 4.85 ha. and 4.67 ha. respectively. In both the districts, none of the farms either leased-in or leased-out any land. The percentage of irrigated area to operated area in Salem and Tuticorin districts was 55.72 and 40.89 respectively.

Among the four districts of Uttar Pradesh, the average size of holding was highest in Nainital district (7.33 ha.) followed by Lalitpur (5.39 ha.), Bahraich (2.47 ha.) and Aligarh (2.05 ha.) districts. There was no case of leased-out land in any district. Except Aligarh district, other three districts had cases of leased-in land. The percentage of irrigated area to operated area was 100 per cent in Nainital and Aligarh districts. In Bahraich and Lalitpur districts the percentage was 52.63 and 85.34 respectively (Table 4.2).

In West Bengal, the average size of operational holding of the selected farm households was 1.92, 2.10 and 2.05 hectares in the districts of Purulia, Malda and Cooch-Behar respectively. The sample farm holdings were mostly owner operated. The proportion of leased-in area to total operated area constituted 0.34 per cent in Purulia, 0.25 per cent in Cooch-Behar and 4.29 per cent in Malda. The district of Malda was relatively better irrigated (69.90 per cent). The district of Purulia was worst placed with only 28.43 per cent of the irrigated area to the total operated area. The district of Cooch-Behar had 38.59 per cent of the operated area irrigated (Table 4.2).

4.1.3 Cropping Pattern

Cropping pattern signifies the proportion of cultivated area under different crops at a point of time. Cropping pattern of an area depends on the soil, water and temperature. The information about the cropping pattern of sample farms in selected districts of the states was for the year 1996-97.

In Guntur district of Andhra Pradesh, paddy accounted for 47.74 per cent of the gross cropped area in kharif season while urad accounted for 47.74 per cent of the gross cropped area in rabi. This indicated that presumably all the paddy fallows are used for urd. In Anantapur district, tur was grown as mixed crop along with groundnut in 84.97 per cent of the gross cropped area. In Khammam district, moong was grown as a mixed crop with tur in kharif as well as pure crop. Among kharif crops, moong mixed with tur accounted for 22.77 per cent and the pure crop accounted for 15.49 per cent and in rabi paddy accounted for 3.13 per cent of the gross cropped area.

The cropping pattern of Assam showed that the pulses were raised in rabi only. There was not a single pulse crop grown in kharif season. Sali (HYV and Local), Bao, Ahu (HYV and Local) and jute were the main crops in kharif season. The pulse crops grown in rabi were urd, moong, pea, lentil and teora. Urd was the most important pulse crop occupying 5.96 per cent area followed by pea (5.40 per cent), lentil (1.49 per cent), teora (0.81 per cent) and moong (0.62 per cent). Among other crops, mustard occupied 7.46 per cent and wheat, 0.87 per cent of the gross cropped area.

In Bhagalpur district of Bihar, wheat, paddy, maize and gram were the main crops which accounted for 34.58 per cent, 27.52 per cent, 11.17 per cent and 9.18 per cent of the gross cropped area respectively. Similarly in Godda district paddy, arhar, maize and wheat were the main crops which accounted for 67.98 per cent, 9.36 per cent, 4.76 per cent and 4.01 per cent of the gross cropped area respectively. Gram was the main pulse crop of Bhagalpur district and arhar was the main pulse crop of Godda district (Table 4.3).

In Vadodara district of Gujarat, arhar (37.20 per cent) occupied highest percentage of area in the cropping pattern followed by cotton, jowar fodder, fodder, grass and wheat. Gram occupied 0.21 per cent area of the gross cropped area. In the cropping pattern of Panchmahals district, paddy occupied highest area (23.52 per cent) followed by maize (18.47per cent), gram (16.31per cent), wheat (14.99 per cent), arhar (2.02 per cent) and groundnut (1.13 per cent) of the gross cropped area (Table 4.3).

In Haryana, cropping pattern in Bhiwani was dominated by pulses (31.30 per cent of GCA) followed by mustard (16.62 per cent of GCA), bajra (15.98 per cent of GCA) and wheat (13.86 per cent of GCA). The allocation of GCA to important crops on sample farms in Ambala district was significantly different. Cropping pattern in Ambala was dominated by wheat (37.13 per cent of GCA) followed by paddy (17.73 per cent of GCA). Pulses occupied 11.45 per cent of GCA. Other important crops of the district were maize and sugarcane. The cropping pattern of sample farms in Bhiwani district was dominated by gram. Pulse economy of Ambala was dominated by lentil followed by gram (Table 4.3).

The cropping pattern of Durg district (Madhya Pradesh) was dominated by paddy (45.80 per cent) followed by teora (25.10 per cent), gram (13.82 per cent), soybean (4.37 per cent), urad (1.34 per cent) and lentil (0.73 per cent). Cropping pattern of Jhabua district was dominated by urad (26.90 per cent) followed by wheat (15.94 per cent), maize (15.47 per cent), gram (9.40 per cent), cotton (6.52 per cent), soybean (6.12 per cent) and paddy (5.34 per cent). In Narsinghpur district, soybean occupied 41.20 per cent area followed by gram (18.37 per cent), wheat (15.83 per cent), lentil (11.55 per cent) and sunflower (1.98 per cent) of the gross cropped area. Pulse economy of Durg district was dominated by teora and gram. The cropping pattern of sample farms in Jhabua district was dominated by urad followed by gram. Similarily, the pulse economy of Narsinghpur district was dominated by gram followed by lentil (Table 4.3).

Table 4.3 Cropping pattern of the selected farms

(Percentage to gross cropped area)

Selected States / Districts	Andhra Pradesh			Assam		Bihar		Gujarat		Haryana		Madhya Pradesh		
Crops	Guntur	Anantapur	Khammam	Jorhat	Nagaon	Bhagalpur	Godda	Vadodara	Panch-Mahals	Bhiwani	Ambala	Durg	Jhabua	Narsingh-pur
Kharif : Paddy	47.74	3.72	24.18	--	--	27.52	67.98	0.31	23.52	---	17.73	45.80	5.34	0.16
Ahu (HYV / Local)	--	--	--	5.14 / 6.43		--	--	--	--	--	--	--	--	--
Sali (HYV/ Local)	--	--	--	17.46 / 21.25		--	--	--	--	--	--	--	--	--
Bao	--	--	--	15.81		--	--	--	--	--	--	--	--	--
Jowar	--	--	0.94	--	--	--	--	0.95	--	3.74	0.27	---	3.58	---
Maize	--	--	0.94	--	--	11.17	4.76	--	18.47	--	9.21	--	15.47	--
Bajra	--	--	--	--	--	--	--	--	--	15.98	0.86	--	--	--
Moong (Greengram)	--	--	15.49	--	--	--	--	--	--	--	--	--	0.34	--
Greengram + Redgram	--	--	22.77	--	--	--	--	--	--	--	--	--	--	--
Arhar (Redgram)	--	--	---	--	--	--	9.36	37.20	2.02	1.02	--	0.46	1.35	0.95
Urad (Blackgram)	--	--	--	--	--	--	--	--	--	--	--	0.83	26.90	0.20
Redgram + Groundnut	--	84.97	--	--	--	--	--	--	--	--	--	--	0.42	--
Groundnut	--	1.66	--	--	--	--	--	--	1.13	--	--	--	0.25	--
Sunflower	--	--	2.66	--	--	--	--	--	--	--	--	--	--	1.98
Soybean	--	--	--	--	--	--	--	--	--	--	--	4.37	6.12	41.20
Redgram + Cotton	--	--	0.94	--	--	--	--	--	--	--	--	--	--	--
Cotton	--	--	25.04	--	--	--	--	HB- 34.58 Deshi 11.10	---	9.06	--	--	6.52	--
Jute	--	--	--	3.93		--	--	--	--	--	--	--	--	--
Sugarcane	--	--	--	--	--	2.42	0.29	1.48	--	0.88	4.83	--	--	1.27
Vegetables	--	0.87	--	--	--	1.46	0.63	--	--	0.88	0.96	1.30	--	0.40
Chillies	--	--	3.91	--	--			0.53	--	--	--	--	--	--
Potato	--	--	--	--	--	1.12	0.64	--	--	--	--	--	--	--
Betel leaves	4.52	--	--	--	--	--	--	--	--	--	--	--	--	--
Jowar fodder	--	--	--	--	--	--	--	5.76	--	1.04	--	--	--	--
Grass / Fodder	--	--	--	--	--	--	--	5.09	0.51	--	10.61	--	--	--
Rabi : Wheat	--	--	--	0.87		35.58	4.01	2.57	14.99	13.86	37.13	2.80	15.94	15.83
Paddy	--	2.76	3.13	--	--	--	--	--	--	--	--	--	--	--
Gram	--	--	--	--	--	9.18	--	0.21	16.31	23.87	4.14	13.82	9.40	18.37
Urad	47.74	--	--	5.96		--	--	--	--	--	--	1.34	--	0.64
Moong	--	--	--	0.62		--	--	--	--	6.23	--	--	--	--
Pea	--	--	--	5.40		--	--	--	--	--	--	--	--	5.30
Masoor (Lentil)	--	--	--	1.49		--	--	--	--	--	6.21	0.73	--	11.55
Khesari (Lathyrus)	--	--	--	0.81		--	--	--	--	--	--	25.10	--	--
Mustard	--	--	--	7.46		--	--	--	0.25	16.62	0.10	--	--	0.96
Groundnut	--	6.02	--	--		--	--	--	--	--	--	--	--	--
Others	--	--	--	--		--	--	--	--	--	--	--	--	--
Gross cropped area (Hect.)	168.63 (100.0)	146.78 (100.0)	129.30 (100.0)	461.42 (100.0)		193.50 (100.0)	201.00 (100.0)	229.30 (100.0)	159.64 (100.0)	(100.0)	(100.0)	194.39 (100.0)	118.09 (100.0)	253.74 (100.0)

Table 4.3 .....Continued

(Percentage to gross cropped area)

Selected States / Districts	Maharashtra				Orissa			Punjab		Rajasthan	
Crops	Amravati	Yavatmal	Ahmed Nagar	Nasik	Ganjam	Cuttack	Kalahandi	Ludhiana	Firozpur	Nagaur	Hanumangarh
Kharif : Paddy	--	--	--	--	54.39	63.02	57.71	36.20	7.10	--	--
Ahu (HYV / Local)	--	--	--	--	--	--	--	--	--	--	--
Sali (HYV/ Local)	--	--	--	--	--	--	--	--	--	--	--
Bao	--	--	--	--	--	--	--	--	--	--	--
Jowar	--	--	4.10	--	--	--	--	--	1.10	4.60	--
Maize	--	--	5.15	--	--	--	--	3.10	0.20	--	--
Bajra	--	--	--	--	--	--	--	--	0.10	17.50	6.60
Moong (Greengram)	--	--	--	1.62	--	--	--	8.60	6.90	26.70	6.30
Greengram + Redgram	--	--	--	--	--	--	--	--	--	--	--
Arhar (Redgram)	19.12	18.12	0.90	3.00	0.68	--	12.38	0.20	--	--	--
Urad (Blackgram)	--	--	--	0.24	--	--	1.58	--	--	--	--
Redgram + Groundnut	--	--	--	--	--	--	0.40	--	--	--	--
Groundnut	--	--	--	--	1.02	--	--	--	0.50	--	--
Sunflower	--	--	--	--	--	--	--	1.90	--	--	--
Soybean	--	--	--	--	--	--	--	--	--	--	--
Redgram + Cotton	--	--	--	--	--	--	2.38	--	--	--	--
Cotton	--	--	--	--	7.76	--	--	0.20	10.30	--	5.90
Jute	--	--	--	--	--	--	--	--	--	--	--
Sugarcane	--	--	7.00	--	--	1.47	--	1.50	--	--	--
Vegetables	--	--	--	--	0.34	--	--	10.00	0.20	0.80	--
Chillies	--	--	--	--	--	--	--	--	--	--	--
Potato	--	--	--	--	--	--	--	--	--	--	--
Betel leaves	--	--	--	--	--	--	--	--	--	--	--
Guvar	71.23	62.75	41.23	49.13	--	--	--	--	--	--	21.50
Grass / Fodder	--	--	--	1.00	--	--	--	6.60	7.60	--	--
Rabi : Wheat	--	--	--	--	--	--	--	33.10	27.80	4.00	7.70
Paddy	--	--	--	--	--	--	--	--	--	--	--
Gram	2.36	--	13.17	11.09	--	--	--	--	12.10	3.00	42.70
Urad	1.07	--	--	--	--	30.91	1.19	--	--	--	--
Moong	1.50	--	--	--	32.23	4.42	--	--	--	--	--
Pea	--	--	--	--	--	--	--	--	--	--	--
Masoor (Lentil)	--	--	--	--	--	--	--	--	--	--	--
Khesari (Lathyrus)	--	--	--	--	--	--	--	--	--	--	--
Mustard	--	--	--	--	--	--	--	0.30	3.20	12.50	4.20
Groundnut	--	--	--	--	3.58	--	--	--	--	--	--
Others	4.72	19.13	28.45	33.92	--	0.18	--	0.10	--	--	--
Gross cropped area (Hect.)	93.22 (100.0)	113.95 (100.0)	155.70 (100.0)	160.42 (100.0)	118.67 (100.0)	109.97 (100.0)	102.14 (100.0)	-- (100.0)	-- (100.0)	486.16 (100.0)	497.99 (100.0)

Table 4.3 ..... Continued

(Percentage to gross cropped area)

Selected States / Districts	Tamil Nadu		Uttar Pradesh				West Bengal		
Crops	Salem	Tuticorin	Udhamsingh Nagar	Aligarh	Bahraich	Lalitpur	Purulia	Malda	Cooch Behar
Kharif : Paddy	17.67	16.44	18.32	--	12.19	4.51	60.00	30.00	61.93
Ahu (HYV / Local)	--	--	--	--	--	--	--	--	--
Sali (HYV/ Local)	--	--	--	--	--	--	--	--	--
Bao	--	--	--	--	--	--	--	--	--
Jowar	--	--	--	--	--	--	--	--	--
Maize	--	--	5.34	13.95	12.64	5.34	0.25	4.91	--
Bajra	--	--	--	--	--	--	--	--	--
Moong (Greengram)	--	--	--	0.11	0.04	--	--	--	--
Greengram + Redgram	--	--	--	--	--	--	--	--	--
Arhar (Redgram)	--	--	--	0.34	0.55	--	--	--	--
Urad (Blackgram)	8.34	17.96	--	0.09	0.16	1.30	10.19	4.06	2.72
Redgram + Groundnut	--	--	--	--	--	--	--	--	--
Groundnut	5.75	--	--	--	--	--	--	--	--
Sunflower	--	--	--	--	--	--	--	--	--
Soybean	--	--	--	--	--	--	--	--	--
Redgram + Cotton	--	--	--	--	--	--	--	--	--
Cotton	--	14.59	--	--	--	--	--	--	--
Jute	--	--	--	--	--	--	--	18.81	10.48
Sugarcane	2.88	--	24.55	1.89	2.66	--	--	--	--
Vegetables	6.17	6.63	0.29	0.24	1.55	--	1.53	1.11	3.32
Chillies	--	--	--	--	--	--	--	--	--
Potato	--	--	--	--	--	--	2.59	0.59	2.63
Betel leaves	--	--	--	--	--	--	--	--	--
Guvar	--	--	4.82	--	--	--	--	--	0.84
Grass / Fodder	--	--	--		--	--	--	--	--
Rabi : Wheat	--	--	15.58	18.44	16.58	14.73	7.42	12.92	3.80
Paddy	--	--	0.01	--	--	--	--	--	--
Gram	--	--	0.02	0.13	0.08	1.68	4.70	2.06	--
Urad	--	--	0.10	--	0.05	--	0.60	1.70	0.94
Moong	9.01	10.69	0.81	2.36	1.11	--	1.58	0.39	--
Pea	--	--	0.25	0.52	0.01	1.28	--	--	--
Masoor (Lentil)	--	--	0.67	0.07	0.70	0.87	2.17	5.80	4.38
Khesari (Lathyrus)	--	--	--	--	--	--	2.23	0.13	6.77
Mustard	--	--	--	--	--	--	6.73	5.05	2.19
Groundnut	--	--	--	--	--	--	--	--	--
Others	--	--	--	--	--	--	--	--	--
Gross cropped area (Hect.)	242.57 (100.00)	233.79 (100.00)	674.00 (100.00)	211.50 (100.00)	225.50 (100.00)	421.00 (100.00)	135.75 (100.00)	206.00 (100.00)	190.00 (100.00)

Of the gross cropped area of Amravati district (Maharashtra), the area occupied by tur was 19.12 per cent followed by gram (2.36 per cent), moong (1.50 per cent) and urad (1.07 per cent). Tur (18.12 per cent) dominated the cropping pattern in Yavatmal district. Of the gross cropped area of Ahmednagar, gram occupied 13.17 per cent followed by sugarcane (7.00 per cent), maize (5.15 per cent) and jowar (4.10 per cent). In Nasik district, gram occupied 11.09 per cent of the gross cropped area. The other important crops were tur, moong, urad and fodder.

The cropping pattern followed by the sample households in three districts of Orissa showed that paddy was the major crop and occupied 54.39, 63.02 and 57.71 per cent area of the total cropped area in Ganjam, Cuttack and Kalahandi districts respectively. Urd in Cuttack, moong in Ganjam district and tur in Kalahandi accounted for 30.91 per cent, 32.23 per cent and 12.38 per cent respectively. In Ganjam district other crops were cotton, groundnut and fruits and vegetables. In Cuttack district, sugarcane occupied 1.47 per cent area of the gross cropped area. In Kalahandi there was a practice of growing tur alongwith paddy, cotton and groundnut as a mixed crop to avoid risk (Table 4.3).

Cropping pattern in Ludhiana district of Punjab was dominated by paddy (36.20 per cent of GCA) followed by wheat (33.10 per cent). The other important crops were vegetables (10.00 per cent), fodder (6.60 per cent), pulses (8.90 per cent), maize (3.10 per cent), sunflower (1.90 per cent) and sugarcane (1.50 per cent). The entire cropped area was irrigated. The allocation of gross cropped area to important crops on sample farms in Firozpur district indicated that crop pattern during 1996-97 was dominated by wheat (27.80 per cent), but the proportionate area under cultivation of pulses (19.00 per cent) was higher than in Ludhiana. Other important crops of the district were cotton (10.30 per cent), fodder(7.60 per cent) and paddy (7.10 per cent) (Table 4.3).

In Nagaur district of Rajasthan, the main kharif crops of the sample cultivators were moong, bajra, jowar and cow pea and rabi crops were gram, wheat and mustard. The area under kharif pulses was 31 per cent and moong alone occupied 26.7 per cent. In the case of rabi crops, mustard occupied 12.5 per cent, wheat (4.00 per cent) and gram (3.00 per cent) of the gross cropped area. The main crops of selected farmers in Hanumangarh district were gram, guvar, wheat, bajra, moong, cotton and mustard. Gram occupied 42.7 per cent of the GCA. Guvar occupied 21.5 per cent of the GCA, wheat covered 7.70 per cent, bajra occupied 6.60 per cent, moong (6.30 per cent), cotton (5.90 per cent) and mustard (4.20 per cent) of the GCA (Table 4.3).

The cropping pattern of Tamil Nadu was dominated by paddy. In Salem district, paddy occupied 17.67 per cent, moong (9.01 per cent), urad (8.34 per cent), fruits and vegetables (6.17 per cent), groundnut (5.75 per cent) and sugarcane (2.88 per cent) of the gross cropped area. In Tuticorin district, urad formed 17.96 per cent, paddy 16.44 per cent, cotton 14.54 per cent, moong 10.69 per cent and fruits & vegetables 6.63 per cent of the gross cropped area (Table 4.3).

The cropping pattern of the State of Uttar Pradesh was dominated by wheat. In Nainital district, sugarcane occupied 24.55 per cent of the GCA followed by paddy (18.32 per cent), wheat (15.58 per cent), maize (5.34 per cent) and moong. In Aligarh district, wheat occupied 18.44 per cent area followed by maize (13.95 per cent), moong (2.36 per cent) and sugarcane (1.89 per cent). The cropping pattern of Bahraich district was dominated by wheat (16.58 per cent) followed by maize (12.64 per cent), paddy (12.19 per cent), sugarcane (2.66 per cent), fruits and vegetables (1.55 per cent) and moong (1.11 per cent). In Lalitpur district, the area occupied by wheat was 14.73 per cent. The other important crops were maize, paddy, gram, urad, pea and lentil (Table 4.3).

In West Bengal, paddy occupied the central place in the cropping pattern in all the selected districts. In Purulia district it occupied 60.00 per cent followed by pulses (21.47 per cent). Other crops in order of importance were wheat (7.42 per cent), mustard (6.73 per cent), potato (2.59 per cent), vegetables (1.53 per cent) and maize (0.25 per cent). Among pulses, urad occupied 10.19 per cent followed by gram (4.70 per cent), teora (2.23 per cent), lentil (2.17 per cent) and moong (1.58 per cent).

The district of Malda exhibited a very diversified cropping pattern. The crops grown in the district were paddy, jute, maize, wheat, potato, mustard, vegetables and pulses. Paddy accounted for 30.00 per cent of the gross cropped area followed by jute (18.81 per cent), pulses (14.16 per cent), wheat (12.92 per cent) and orchards (10.62 per cent). Other crops included mustard (5.05 per cent), maize (4.91 per cent), vegetables (1.11 per cent) and potato (0.59 per cent). Among pulses, lentil occupied 5.80 per cent followed by urad (4.06 per cent in kharif and 1.70 per cent in rabi), gram (2.06 per cent) and teora (0.13 per cent).

In Cooch- Behar, paddy shared 61.93 per cent of the gross cropped area. The next important crop group was pulses which covered 14.81 per cent of the gross cropped area. Other crops in order of importance were jute (10.48 per cent), wheat (3.80 per cent), vegetables (3.32 per cent), potato (2.63 per cent), mustard (2.19 per cent) and tobacco (0.84 per cent). Among pulses, teora covered 6.77 per cent area of the gross cropped area followed by lentil (4.38 per cent) and urad (2.72 per cent in kharif and 0.94 per cent in rabi) (Table 4.3).

4.2 Pulse Crops Grown on the Sample Farms

In Guntur district of Andhra Pradesh, urad was sown as a single crop in rabi season by line sowing method. In Anantapur district tur was grown as mixed crop alongwith groundnut in kharif season. In Khammam district, moong was grown as mixed crop with tur in kharif season as well as a pure crop. Generally, marginal and unirrigated lands were used (Table 4.4).

In Assam, pulses were raised in rabi season only. The pulse crops grown were urd, moong, pea, lentil and teora. Both teora and lentil were grown in Nagaon district. None of the selected farmers of Jorhat district cultivated these two pulse crops. From the point of area, pea was the second important crop of the sample farmers in Jorhat district. The crop was grown as inter crop as well as single crop. Lentil was generally grown as pure crop. Teora was generally grown on the residual moisture in rice fields as single crop (Table 4.4).

Gram was grown in rabi season in Bhagalpur district and arhar in kharif season in Godda district. Both the pulse crops were grown as single crop. In Bihar State, most of the farmers were not interested in the cultivation of pulses on commercial lines (Table 4.4).

In Gujarat, gram was the main pulse crop in rabi season in Panchmahals district. It was grown as a single crop. The area allocated to gram was declining due to diseases. Tur was another important pulse crop in Vadodara district in kharif season as a single crop. The area allocated to tur crop was marginal, less fertile and rainfed (Table 4.4).

The pulse economy of sample farms in Bhiwani district of Haryana was dominated by gram. The next important pulse crop of the district was moong which accounted for 24.39 per cent of area under pulses. The allocation of area under pulse crops on sample farms in Ambala district indicated significant divergence. Pulse economy of Ambala district was dominated by lentil (Table 4.4).

In Durg district of Madhya Pradesh, urad and arhar were the most important pulse crops of kharif season. Urad was grown as pure crop. Arhar was grown as mixed crop with soybean. In rabi season teora was the main pulse crop followed by gram and lentil. No pulse crop was grown in summer. In Jhabua district, urad was the major pulse crop grown in kharif season. The next pulse crop was kulthi. Gram was the main pulse crop of rabi season. Arhar was the main pulse crop of Narsinghpur district in kharif season. Gram, lentil and batari were the important rabi pulses. In summer season urad was grown (Table 4.4).

In Amravati district of Maharashtra, tur was grown as inter crop in kharif season. In rabi season, gram and moong were the important pulse crops as single crops. In Yavatmal district, tur, urad and moong were the important pulse crops of kharif season and gram of rabi season.

Tur was grown as kharif crop and gram was grown as rabi crop in Ahmednagar district. The similar scene was observed in Nasik district (Table 4.4).

Table 4.4 Pulse crops grown on the sample farms – 1996-97

(Percentage to Gross cropped area)

State/ Districts	Season / Crops	Area sown as			Area sown		Land type			Total Area under Pulses
		Single crop	Mixed crop	Inter crop	Broad cast	Line	Marginal	Rich land		
								Irrigated	Unirrigated	
1. Andhra Pradesh										
Guntur District	**A) Kharif**	--	--	--	--	--	--	--	--	--
	B) Rabi Urad	45.41	--	--	--	45.41	--	45.41	--	45.41
	C) Summer	--	--	--	--	--	--	--	--	--
Anantapur District	**A) Kharif** Tur	--	84.83	--	--	84.83	84.83	--	--	84.83
	B) Rabi	--	--	--	--	--	--	--	--	--
	C) Summer	--	--	--	--	--	--	--	--	--
Khammam District	**A) Kharif** Moong	15.50	22.77	--	--	38.27	15.50	--	22.77	38.27
	B) Rabi	--	--	--	--	--	--	--	--	--
	C) Summer	--	--	--	--	--	--	--	--	--
2. Assam										
Jorhat District	**A) Kharif**	--	--	--	--	--	--	--	--	--
	B) Rabi Urad	10.20	--	--	10.20	--	10.20	--	--	10.20
	Moong	1.06	--	--	1.06	--	1.06	--	--	1.06
	Pea	2.58	--	6.65	9.23	--	2.58	--	6.65	9.23
	C) Summer	--	--	--	--	--	--	--	--	--
Nagaon District	**A) Kharif**	--	--	--	--	--	--	--	--	--
	B) Rabi Lentil	2.56	--	--	2.56	--	--	--	--	2.56
	Khesari	1.39	--	--	1.39	--	--	--	1.39	1.39
	C) Summer	--	--	--	--	--	--	--	--	--
3. Bihar										
Bhagalpur District	**A) Kharif**	--	--	--	--	--	--	--	--	--
	B) Rabi Gram	7.57	--	--	--	7.57	--	7.57	--	7.57
	C) Summer	--	--	--	--	--	--	--	--	--
Godda District	**A) Kharif** Tur	10.53	--	--	10.53	--	10.53	--	--	10.53
	B) Rabi	--	--	--	--	--	--	--	--	--
	C) Summer	--	--	--	--	--	--	--	--	--

Table 4.4 .....Continued

(Percentage to Gross cropped area)

State/ Districts	Season / Crops	Area sown as			Area sown		Land type			Total Area under Pulses
		Single crop	Mixed crop	Inter crop	Broad cast	Line	Marginal	Rich land		
								Irrigated	Unirrigated	
4. Gujarat										
Panchmahals District	**A) Kharif**	--	--	--	--	--	--	--	--	--
	B) Rabi Gram	16.31	--	--	--	16.31	--	16.31	--	16.31
Vadodara District	**A) Kharif** Tur	37.20	--	--	--	37.20	37.20	--	--	37.20
	B) Rabi	--	--	--	--	--	--	--	--	--
5. Haryana										
Bhiwani District	**A) Kharif**	--	--	--	--	--	--	--	--	--
	B) Rabi Gram	23.87	--	--	--	23.87	--	23.87	--	23.87
Ambala District	**A) Kharif**	--	--	--	--	--	--	--	--	--
	B) Rabi Lentil	6.21	--	--	6.21	--	6.21	--	--	6.21
6. Madhya Pradesh										
Durg District	**A) Kharif** Urad	0.83	--	--	0.83	--	--	--	0.83	0.83
	Soybean + Tur	--	1.26	--	--	1.26	--	--	1.26	1.26
	B) Rabi Teora	25.21	--	--	25.21	--	--	--	25.21	25.21
	Gram	13.81	--	--	--	13.81	--	--	13.81	13.81
	Lentil	0.73	--	--	--	0.73	--	--	0.73	0.73
	C) Summer	--	--	--	--	--	--	--	--	--
Jhabua District	**A) Kharif** Urad	26.88	--	--	10.31	16.57	10.31	--	16.57	26.88
	Kulthi	3.46	--	--	--	3.46	1.45	--	2.01	3.46
	B) Rabi Gram	9.40	--	--	--	9.40	--	5.81	3.59	9.40
	C) Summer	--	--	--	--	--	--	--	--	--
Narsinghpur District	**A) Kharif** Tur	0.95	--	--	0.63	0.32	0.20	0.59	0.16	0.95
	B) Rabi Gram	18.36	--	--	0.79	17.57	0.46	14.38	3.52	18.36
	Lentil	11.55	--	--	--	11.55	0.12	8.80	2.62	11.54
	Batari	5.30	--	--	--	5.30	--	3.02	2.28	5.30
	C) Summer Urad	0.64	--	--	--	0.64	--	--	0.64	0.64

Table 4.4 .....Continued

(Percentage to Gross cropped area)

State/ Districts	Season / Crops	Area sown as			Area sown		Land type			Total Area under Pulses
		Single crop	Mixed crop	Inter crop	Broad cast	Line	Marginal	Rich land		
								Irrigated	Unirrigated	
7. Maharashtra										
Amravati District	**A) Kharif** Tur	--	--	19.12	--	19.12	--	--	19.12	19.12
	B) Rabi Gram	2.36	--	--	--	2.36	--	0.43	1.93	2.36
	Moong	1.50	--	--	--	1.50	--	--	1.50	1.50
Yavatmal District	**A) Kharif** Tur	--	--	13.16	--	13.16	--	--	13.16	13.16
	Urad - Moong	1.75	--	--	--	1.75	--	--	1.75	1.75
	B) Rabi Gram	3.20	--	--	--	3.20	--	3.20	--	3.20
Ahmednagar District	**A) Kharif** Tur	0.90	--	--	--	0.90	--	0.90	--	0.90
	B) Rabi Gram	13.17	--	--	--	13.17	--	13.17	--	13.17
Nasik District	**A) Kharif** Tur	3.24	--	--	--	3.24	--	0.50	2.74	3.24
	B) Rabi Gram	11.09	--	--	--	11.09	--	11.09	--	11.09
8. Orissa										
Ganjam District	**A) Kharif** Tur	0.68	--	--	--	0.68	0.68	--	--	0.68
	B) Rabi Gram	2.23	--	--	--	2.23	--	2.23	--	2.23
Cuttack District	**A) Kharif**	--	--	--	--	--	--	--	--	--
	B) Rabi Urad	30.91	--	--	--	30.91	--	--	30.91	30.91
	Moong	4.42	--	--	--	4.42	--	4.42	--	4.42
Kalahandi District	**A) Kharif** Tur	12.37	23.48	--	--	35.85	--	--	35.85	35.85
	Urad	1.57	--	--	--	1.57	--	1.57	--	1.57
	Moong	0.59	--	--	--	0.59	--	0.59	--	0.59
	B) Rabi Urad	1.17	--	--	--	1.17	--	1.17	--	1.17
9. Punjab										
Ludhiana District	**A) Kharif** Moong	--	--	--	--	--	--	--	--	8.60
	Tur	--	--	--	--	--	--	--	--	0.20
	B) Rabi	--	--	--	--	--	--	--	--	--
Firozpur District	**A) Kharif** Moong	--	--	--	--	--	--	--	--	6.90
	B) Rabi Gram	--	--	--	--	--	--	--	--	12.10

Table 4.4 .....Continued

(Percentage to Gross cropped area)

State/ Districts	Season / Crops	Area sown as			Area sown		Land type			Total Area under Pulses
		Single crop	Mixed crop	Inter crop	Broad cast	Line	Marginal	Rich land		
								Irrigated	Unirrigated	
10. Rajasthan										
Nagaur District	**A) Kharif** Moong	25.77	--	--	--	25.77	25.77	--	--	25.77
	Moth	1.48	--	--	--	1.48	1.48	--	--	1.48
	Moong + Moth	--	6.75	--	--	6.75	6.75	--	--	6.75
	Cowpea	3.72	--	--	--	3.72	3.72	--	--	3.72
	B) Rabi Gram	3.09	--	--	--	3.09	1.32	1.77	--	3.09
Hanumangarh District	**A) Kharif** Moth	1.96	--	--	--	1.96	1.96	--	--	1.96
	Moong	0.40	--	--	--	0.40	0.40	--	--	0.40
	Moong + Moth	--	7.29	--	--	7.29	7.29	--	--	7.29
	B) Rabi Gram	42.93	--	--	--	42.93	41.12	1.81	--	42.93
	Gram +Rape mustard	--	3.37	--	--	3.37	3.37	--	--	3.37
11. Tamil Nadu										
Salem District	**A) Kharif** Urad	20.21	--	--	--	20.21	--	11.87	8.34	20.21
	Moong	17.68	--	--	--	17.68	--	8.67	9.01	17.68
	Cowpea	4.79	--	--	--	4.79	--	1.88	2.91	4.79
	Cowpea + Tapiaco	--	2.68	--	--	2.68	--	1.95	0.73	2.68
	B) Rabi	--	--	--	--	--	--	--	--	--
Tuticorin District	**A) Kharif** Urad	18.64	--	--	--	18.64	--	5.76	12.88	18.64
	Moong	12.38	--	--	--	12.38	--	1.87	10.51	12.38
12. Uttar Pradesh										
Udhamsingh Nagar	**A) Kharif**	--	--	--	--	--	--	--	--	--
	B) Rabi Pea	0.37	--	--	--	0.37	--	0.37	--	0.37
	Lentil	0.99	--	--	--	0.99	--	0.99	--	0.99
	Gram	0.03	--	--	--	0.03	--	0.03	--	0.03
	Early Tur	0.01	--	--	--	0.01	--	0.01	--	0.01
	C) Summer Urad	0.15	--	--	--	0.15	--	--	0.15	0.15
	Moong	0.01	--	--	--	0.01	--	--	0.01	0.01

Table 4.4 .....Continued

(Percentage to Gross cropped area)

State/ Districts	Season / Crops	Area sown as			Area sown		Land type			Total Area under Pulses
		Single crop	Mixed crop	Inter crop	Broad cast	Line	Marginal	Rich land		
								Irrigated	Unirrigated	
Aligarh District	**A) Kharif** Tur	1.61	--	--	--	1.61	--	--	1.61	1.61
	urad	0.42	--	--	--	0.42	--	--	0.42	0.42
	B) Rabi Pea	2.46	--	--	--	2.46	--	--	2.46	2.46
	Lentil	0.33	--	--	--	0.33	--	--	0.33	0.33
	Gram	0.61	--	--	--	0.61	--	--	0.61	0.61
	C) Summer Urad	0.33	--	--	--	0.33	--	--	0.33	0.33
	Moong	0.94	--	--	--	0.94	--	--	0.94	0.94
Bahraich District	**A) Kharif** Tur	2.44	--	--	--	2.44	--	--	2.44	2.44
	Urad	0.07	--	--	--	0.07	--	--	0.07	0.07
	Moong	0.18	--	--	--	0.18	--	--	0.18	0.18
	B) Rabi Pea	0.04	--	--	--	0.04	--	0.04	--	0.04
	Lentil	3.10	--	--	--	3.10	--	3.10	--	3.10
	Gram	0.35	--	--	--	0.35	--	0.35	--	0.35
	Early Tur	1.90	--	--	--	1.90	--	1.90	--	1.90
	C) Summer Urad	0.22	--	--	--	0.22	--	0.22	--	0.22
Lalitpur District	**A) Kharif** Urad	3.09	--	--	--	3.09	--	--	3.09	3.09
	B) Rabi Pea	3.04	--	--	--	3.04	--	3.04	--	3.04
	Lentil	2.07	--	--	--	2.07	--	2.07	--	2.07
	Gram	3.99	--	--	--	3.99	--	3.99	--	3.99
13. West Bengal										
Purulia District	**A) Kharif** Urad	10.22	--	--	10.22	--	10.22	--	--	10.22
	B) Rabi Urad	0.59	--	--	0.59	--	--	0.59	--	0.59
	Gram	4.71	--	--	4.71	--	--	1.19	3.52	4.71
	Lentil	2.18	--	--	2.18	--	--	0.40	1.78	2.18
	Khesari	--	2.23	--	2.23	--	--	--	2.23	2.23
	C) Summer Moong	1.98	--	--	1.98	--	--	1.98	--	1.98

Table 4.4 .....Continued

(Percentage to Gross cropped area)

State/ Districts	Season / Crops	Area sown as			Area sown		Land type			Total Area under Pulses
		Single crop	Mixed crop	Inter crop	Broad cast	Line	Marginal	Rich land		
								Irrigated	Unirrigated	
Malda District	**A) Kharif** Urad	4.05	--	--	4.05	--	4.05	--	--	4.05
	B) Rabi Urad	1.70	--	--	1.70	--	--	1.70	--	1.70
	Gram	2.06	--	--	2.06	--	--	0.53	1.53	2.06
	Lentil	5.78	--	--	5.78	--	--	2.42	3.36	5.78
	Khesari	--	0.13	--	0.13	--	--	0.13	--	0.13
	C) Summer	0.39	--	--	0.39	--	--	0.39	--	0.39
Cooch Behar District	**A) Kharif** Urad	2.80	--	--	2.80	--	2.80	--	--	2.80
	B) Rabi Urad	0.97	--	--	0.97	--	--	0.97	--	0.97
	Lentil	4.51	--	--	4.51	--	--	2.09	2.42	4.51
	Khesari	--	6.98	--	6.98	--	--	2.66	4.32	6.98
	C) Summer	--	--	--	--	--	--	--	--	--

In Ganjam district of Orissa, gram was the main pulse crop in rabi season as a single crop. In kharif, arhar was grown. There was no kharif pulse in Cuttack district. Urad and moong were the main rabi pulses. In Kalahandi district, arhar, urad and moong were grown as kharif pulses. Urad was grown in rabi (Table 4.4).

In Punjab, moong, arhar and gram were the major pulses. Moong and arhar were grown in Ludhiana district in kharif season whereas gram was grown as rabi crop in Firozpur district (Table 4.4).

Moong, moth and cowpea were the major kharif pulse crops of Nagaur district of Rajasthan. In rabi season, gram was grown. In this district, moong and moth were grown as single crops as well as mixed crops.

In Hanumangarh district of Rajasthan, gram was grown as single crop as well as mixed crop with rape and mustard. In kharif season, moong and moth were grown as single or mixed crops (Table 4.4).

Only kharif pulses were grown in Salem and Tuticorin districts of Tamil Nadu. The pulse crops grown in Salem district were urad, moong, cowpea and cowpea. In Tuticorin district, urad and moong were the major pulses. In both the districts, all the pulse crops were grown as a single crop in lines on rich lands (Table 4.4).

In Udham Singh Nagar (Nainital) district of Uttar Pradesh, no kharif pulses were grown. Lentil, pea, gram and early arhar were the rabi pulses. Urad and moong were grown in summer. All the pulse crops were grown as a single crops in the district. Arhar, moong and urad in kharif, pea, gram and lentil in rabi and moong and urad in summer were the main pulses grown in Aligarh district. All the pulse crops were grown as single crops in lines on unirrigated fields. In Bahraich district, arhar, moong and urad were grown in kharif season. Lentil, early arhar, gram and pea were grown in rabi season and urad in summer season. All the pulses were sown as single crops in lines. In Lalitpur district, urad was major kharif pulse. Major pulses of rabi were gram, pea and lentil. In this district also, all the pulses were grown as single crops in lines (Table 4.4).

In West Bengal, pulses were sown as single crops. The practice of inter-cropping was totally absent. Mixed cropping is practised only in the case of teora. Pulses are entirely sown by broadcasting method. These are observed to be common in all the sample districts namely Purulia, Malda and Cooch Behar. Pulses are mostly grown under rainfed condition whether they are cultivated on marginal or on rich soil. In Purulia, pulses were grown predominantly under non-irrigated condition. Farmers in the district of Malda devoted relatively greater proportion of pulses area under irrigated conditions as compared to the district of Purulia. This may be due to greater availability of irrigation facility in the district. In the district of Cooch Behar, the proportion of pulses area occupying marginal

land accounts for 18.36 per cent of the aggregate area of pulses. Pulses sown on irrigated rich fields comprised the area to the extent of 37.45 per cent as against the proportion of 44.19 per cent for unirrigated rich field. The phenomenon which is common to all the sample districts has been that kharif pulses (mash kalai or urd) were sown on marginal lands where other crops would give uneconomic yield. Against this, rabi pulses were grown on rich soils (Table 4.4).

4.3 Input Used (Cost per Hectare)

The input cost per hectare for different pulses was calculated for selected farms of different States. Input cost was calculated separately for irrigated and unirrigated areas. All actual expenses involved in cash and kind in the production of pulses plus rent paid for leased in land were taken into account in the estimation of inputs. (Cost A_2) (Table 4.5).

The total input value per hectare in the production of urad ranged between Rs.1,000.85 in Cuttack district of Orissa to Rs.4,802 in Salem district of Tamil Nadu. In the case of irrigated urad the cost per hectare was highest (Rs.6,408) in Salem district of Tamil Nadu and lowest (Rs.3,199) in Tuticorin district of the same state. In the case of unirrigated urad the cost per hectare was lowest (Rs.1,000.85) in Cuttack district of Orissa and highest (Rs.4,883.95) in Narsinghpur district of Madhya Pradesh (Table 4.5).

Tur was grown as irrigated and unirrigated crop in the State of Madhya Pradesh and Maharashtra. In the case of irrigated tur, the cost per hectare was highest (Rs.10,833) in Yavatmal district of Maharashtra and lowest (Rs.6,459) in Narsinghpur district of Madhya Pradesh. In the case of unirrigated tur, cost per hectare ranged between Rs.2,347.98 (Cuttack district of Orissa) and Rs.7,048.00 (Amravati of Maharashtra). In the case of tur as a whole, the cost per hectare was lowest ((Rs.1,569) in Panchmahals district of Gujarat and highest (Rs.6,852.39) in Anantapur district of Andhra Pradesh (Table 4.5).

Moong was also grown as irrigated and unirrigated crop in Orissa and Tamil Nadu. The cost per hectare was lowest (Rs.2,277.85) in Ganjam district of Orissa and highest (Rs.6,515.00) in Salem district of Tamil Nadu in irrigated moong. In the case of unirrigated moong it was highest (Rs.3,948.00) in Tuticorin district of Tamil Nadu followed by Rs.3,858.00 in Ludhiana district of Punjab, Rs. 3,279.00 in Salem district of Tamil Nadu, Rs.2,956.50 in Jhabua district of Madhya Pradesh and Rs.2,259.77 in Ganjam district of Orissa. In the case of total moong, value of inputs used per hectare was high (between Rs.4,100 and Rs. 5,000) in the States of W. Bengal, Tamil Nadu and Assam. It was highest (Rs.4,959.00) in Purulia district of W.Bengal and lowest (Rs.1,820.00) in Hanumangarh district of Rajasthan (Table 4.5).

In the case of pea, the cost per hectare was highest (Rs.7,243.00) in Nainital district of Uttar Pradesh and lowest (Rs.2,041.00) in Jorhat district of Assam. In Narsinghpur district of Madhya Pradesh, it was Rs.5,546.81.

Table 4.5 Input used per hectare (cost per hectare) on sample farms

(Figures in Rs.)

District / Crops	Urad (Blackgram)			Tur (Redgram)			Moong (Greengram)			Greengram + Reggram		
	Irrigated	Un-irrigated	Total	Irrigated	Un-irrigated	Total	Irrigated	Un-irrigated	Total	Irrigated	Un-irrigated	Total
Andhra Pradesh												
Guntur	--	--	3146.71	--	--	--	--	--	--	--	--	--
Anantapur	--	--	--	--	--	(Mixed Gr. Nut) 6852.39	--	--	--	--	--	--
Khammam	--	--	--	--	--	--	--	--	2313.12	--	--	4243.78
Assam												
Jorhat	--	--	4144.00	--	--	--	--	--	4397.00	--	--	--
Nagaon	--	--	--	--	--	--	--	--	--	--	--	--
Bihar												
Bhagalpur	--	--	--	--	--	--	--	--	--	--	--	--
Godda	--	--	--	--	--	3303.81	--	--	--	--	--	--
Gujarat												
Vadodara	--	--	--	--	--	6329.00	--	--	--	--	--	--
Panchmahal	--	--	--	--	--	1569.00	--	--	--	--	--	--
Haryana												
Bhiwani	--	--	--	--	--	--	--	--	--	--	--	--
Ambala	--	--	--	--	--	--	--	--	--	--	--	--
Madhya Pradesh												
Durg	--	3540.92	3540.92	--	3500.00	3500.00	--	--	--	--	--	--
Jhabua	--	2330.66	2330.66	--	2511.22	2511.22	--	2956.50	2956.50	--	--	--
Narsinghpur	4023.39	4883.95	4676.98	6459.00	2798.37	4313.53	--	--	--	--	--	--
Maharashtra												
Amravati	--	--	--	9495.00	7048.00	--	--	--	--	--	--	--
Yavatmal	--	--	--	10833.00	6320.00	--	--	--	--	--	--	--
Ahmednagar	--	--	--	--	--	--	--	--	--	--	--	--
Nasik	--	--	--	--	--	--	--	--	--	--	--	--
Orissa												
Ganjam	--	--	--	--	--	--	2277.85	2259.77	2260.00	--	--	--
Cuttack	--	1000.85	1000.85	--	--	--	--	--	--	--	--	--
Kalahandi	--	--	--	--	2347.98	2347.98	--	--	--	--	--	--
Punjab												
Firozpur	--	--	--	--	--	--	--	--	--	--	--	--
Ludhiana	--	--	--	--	--	--	--	3858.00	3858.00	--	--	--
Rajasthan												
Nagaur	--	--	--	--	--	--	--	--	2891.00	--	--	--
Hanumangarh	--	--	--	--	--	--	--	--	1820.00	--	--	--
Tamil Nadu												
Salem	6408.00	3197.00	4802.00	--	--	--	6515.00	3279.00	4897.00	--	--	--
Tuticorin	3199.00	2848.00	3023.00	--	--	--	4435.00	3948.00	4191.00	--	--	--
Uttar Pradesh												
Nainital	--	--	Summer 2922.00	--	--	4160.00	--	--	Summer 2964.00	--	--	--
Aligarh	--	--	2437.00	--	--	3683.00	--	--	3180.00	--	--	--
Bahraich	--	--	2168.00	--	--	3254.00	--	--	3415.00	--	--	--
Lalitpur	--	--	3950.00	--	--	--	--	--	--	--	--	--
West Bengal												
Purulia	4214.00	2969.00	3592.00	--	--	--	--	--	4959.00	--	--	--
Malda	4342.00	3447.00	3895.00	--	--	--	--	--	4884.00	--	--	--
Cooch Behar	4286.00	3348.00	3817.00	--	--	--	--	--	--	--	--	--

Continued....

Table 4.5 Continued.....

(Figures in Rs.)

District / Crops	Pea			Masoor (Lentil)			Khesari (Lathyrus)			Gram		
	Irrigated	Un-irrigated	Total	Irrigated	Un-irrigated	Total	Irrigated	Un-irrigated	Total	Irrigated	Un-irrigated	Total
Andhra Pradesh												
Guntur	--	--	--	--	--	--	--	--	--	--	--	--
Anantapur	--	--	--	--	--	--	--	--	--	--	--	--
Khammam	--	--	--	--	--	--	--	--	--	--	--	--
Assam												
Jorhat	--	--	2041.00	--	--	--	--	--	--	--	--	--
Nagaon	--	--	--	--	--	5349.00	--	--	3621.00	--	--	--
Bihar												
Bhagalpur	--	--	--	--	--	--	--	--	--	--	--	4190.13
Godda	--	--	--	--	--	--	--	--	--	--	--	--
Gujarat												
Vadodara	--	--	--	--	--	--	--	--	--	--	--	2829.00
Panchmahals	--	--	--	--	--	--	--	--	--	--	--	3144.00
Haryana												
Bhiwani	--	--	--	--	--	--	--	--	--	--	--	2263.00
Ambala	--	--	--	--	--	3794.00	--	--	--	--	--	--
Madhya Pradesh												
Durg	--	--	--	--	4734.75	4734.75	--	3178.75	3178.75	6915.97	6458.60	6558.95
Jhabua	--	--	--	--	--	--	--	--	--	3988.56	3368.08	3656.71
Narsinghpur	5546.81	--	5546.81	5101.67	5642.58	5230.19	--	--	--	6467.98	6474.27	6469.16
Maharashtra												
Amravati	--	--	--	--	--	--	--	--	--	--	--	--
Yavatmal	--	--	--	--	--	--	--	--	--	--	--	--
Ahmednagar	--	--	--	--	--	--	--	--	--	10793.00	--	10793.00
Nasik	--	--	--	--	--	--	--	--	--	10356.00	--	10356.00
Orissa												
Ganjam	--	--	--	--	--	--	--	--	--	--	--	--
Cuttack	--	--	--	--	--	--	-	--	--	--	--	--
Kalahandi	--	--	--	--	--	--	--	--	--	--	--	--
Punjab												
Firozpur	--	--	--	--	--	--	--	--	--	4818.00	--	4818.00
Ludhiana	--	--	--	--	--	--	--	--	--	--	--	--
Rajasthan												
Nagaur	--	--	--	--	--	--	--	--	--	--	--	4030.00
Hanumangarh	--	--	--	--	--	--	--	--	--	--	--	1890.00
Tamil Nadu												
Salem	--	--	--	--	--	--	--	--	--	--	--	--
Tuticorin	--	--	--	--	--	--	--	--	--	--	--	--
Uttar Pradesh												
Nainital	--	--	7243.00	--	--	4305.00	--	--	--	--	--	7594.00
Aligarh	--	--	6585.00	--	--	4686.00	--	--	--	--	--	4797.00
Bahraich	--	--	5968.00	--	--	4191.00	--	--	--	--	--	5446.00
Lalitpur	--	--	5425.00	--	--	5470.00	--	--	--	--	--	6251.00
West Bengal												
Purulia	--	--	--	--	--	3440.00	--	--	1211.00	--	--	4412.00
Malda	--	--	--	--	--	3967.00	--	--	--	--	--	4601.00
Cooch Behar	--	--	--	--	--	3750.00	--	--	1229.00	--	--	--

Continued.....

Table 4.5 Continued.....

(Figures in Rs.)

District / Crops	Kulthi			Batari			Cowpea			Moth		
	Irrigated	Un-irrigated	Total	Irrigated	Un-irrigated	Total	Irrigated	Un-irrigated	Total	Irrigated	Un-irrigated	Total
Andhra Pradesh												
Guntur	--	--	--	--	--	--	--	--	--	--	--	--
Anantapur	--	--	--	--	--	--	--	--	--	--	--	--
Khammam	--	--	--	--	--	--	--	--	--	--	--	--
Assam												
Jorhat	--	--	--	--	--	--	--	--	--	--	--	--
Nagaon	--	--	--	--	--	--	--	--	--	--	--	--
Bihar												
Bhagalpur	--	--	--	--	--	--	--	--	--	--	--	--
Godda	--	--	--	--	--	--	--	--	--	--	--	--
Gujarat												
Vadodara	--	--	--	--	--	--	--	--	--	--	--	--
Panchmahals	--	--	--	--	--	--	--	--	--	--	--	--
Haryana												
Bhiwani	--	--	--	--	--	--	--	--	--	--	--	--
Ambala	--	--	--	--	--	--	--	--	--	--	--	--
Madhya Pradesh												
Durg	--	--	--	--	--	--	--	--	--	--	--	--
Jhabua	--	2308.07	2308.07	--	--	--	--	--	--	--	--	--
Narsinghpur	--	--	--	4588.15	6528.73	5421.31	--	--	--	--	--	--
Maharashtra												
Amravati	--	--	--	--	--	--	--	--	--	--	--	--
Yavatmal	--	--	--	--	--	--	--	--	--	--	--	--
Ahmednagar	--	--	--	--	--	--	--	--	--	--	--	--
Nasik	--	--	--	--	--	--	--	--	--	--	--	--
Orissa												
Ganjam	--	--	--	--	--	--	--	--	--	--	--	--
Cuttack	--	--	--	--	--	--	--	--	--	--	--	--
Kalahandi	--	--	--	--	--	--	--	--	--	--	--	--
Punjab												
Firozpur	--	--	--	--	--	--	--	--	--	--	--	--
Ludhiana	--	--	--	--	--	--	--	--	--	--	--	--
Rajasthan												
Nagaur	--	--	--	--	--	--	--	--	2018.00	--	--	2119.00
Hanumangarh	--	--	--	--	--	--	--	--	--	--	--	1401.00
Tamil Nadu												
Salem	--	--	--	--	--	--	--	--	--	3096.00	1848.00	2472.00
Tuticorin	--	--	--	--	--	--	--	--	--	--	--	--
Uttar Pradesh												
Nainital	--	--	--	--	--	--	--	--	--	--	--	--
Aligarh	--	--	--	--	--	--	--	--	--	--	--	--
Bahraich	--	--	--	--	--	--	--	--	--	--	--	--
Lalitpur	--	--	--	--	--	--	--	--	--	--	--	--
West Bengal												
Purulia	--	--	--	--	--	--	--	--	--	--	--	--
Malda	--	--	--	--	--	--	--	--	--	--	--	--
Cooch Behar	--	--	--	--	--	--	--	--	--	--	--	--

Lentil was mainly grown in Uttar Pradesh, Madhya Pradesh, W. Bengal, Assam and Haryana. The cost per hectare was high in the States of Uttar Pradesh, Madhya Pradesh and Assam and comparatively low in W. Bengal and Haryana. It was highest (Rs. 5,470.00) in Lalitpur district of Uttar Pradesh and lowest (Rs. 3,440.00) in Purulia district of W. Bengal (Table 4.5).

Teora was grown in Madhya Pradesh, W. Bengal and Assam. The cost of inputs per hectare was lowest (Rs. 1,211.00) in Purulia district of W. Bengal and highest (Rs. 3,621.00) in Nagaon district of Assam. In Durg district of Madhya Pradesh it was Rs. 3,178.75 per hectare.

Gram was the important pulse crop of the country. It was grown in Madhya Pradesh, Maharashtra, Rajasthan, Uttar Pradesh, W. Bengal, Punjab, Bihar, Haryana and Gujarat. The cost per hectare was highest (Rs. 10,793.00) in Ahmednagar district of Maharashtra and lowest in Hanumangarh district of Rajasthan (Rs. 1,890.00). In the States of Maharashtra, Uttar Pradesh and Madhya Pradesh, the cost of input per hectare was comparatively high (Table 4.5).

Kulthi was grown in Jhabua district of Madhya Pradesh. The cost of inputs used per hectare was Rs. 2,308.07. Similarly, batari was grown in Narsinghpur district of Madhya Pradesh. The cost per hectare was Rs. 5,421.31.

Cowpea was grown in Nagaur and Hanumangarh districts of Rajasthan and Salem district of Tamil Nadu. The cost of input per hectare was highest (Rs.2,472.00) in Salem district of Tamil Nadu and lowest (Rs.1,401.00) in Hanumangarh district of Rajasthan (Table 4.5).

4.4 Profit per hectare and Input Output Ratio (Costs and Returns)

From the farmers' point of view profit per hectare and input-output ratio were the important criteria of profitability. In Andhra Pradesh, paddy, urad, groundnut, tur, moong, cotton and chillies were the main crops. The profit per hectare was found to be highest (Rs. 19,282.41) in chillies in Khammam district and lowest in groundnut (Rs. 1,550.57) in Anantapur district. In the case of urad, the profit per hectare was Rs.6,900.30 in Guntur district. The input-output ratio was highest (3.53) in paddy followed by urad (3.19), moong (2.62), chillies (2.56), cotton (2.24), groundnut + tur (1.82) and groundnut (1.21). In Andhra Pradesh profit per hectare was found to be more in the case of non-pulse crops (chillies, cotton and paddy) as compared to pulse crops (urad, red gram and moong) (Table 4.6).

Paddy, urad, moong, pea, lentil, teora, mustard, potato, vegetables and paddy (traditional & HYV) were the major crops of Assam. Among these crops, profit per hectare and input output ratio was maximum in the case of vegetables. Among pulses input output ratio was low and was minimum in the case of urad (Table 4.6).

In Bihar, the input output ratio of gram in Bhagalpur district was 1.92. The net income per hectare was Rs. 3,882.91. Similarly in the case of tur in Godda district, the profit per hectare was Rs. 7,088.17 and input output ratio was 3.15 (Table 4.6).

In Gujarat, paddy, cotton, gram, tur, wheat and maize were the major crops. Among these crops input output ratio was maximum (4.44) in the case of tur in Panchmahals district. The profit per hectare was maximum (Rs. 15,963.00) in the case of wheat in Vadodara district. The input output ratio (1.40) was minimum in the case of maize in Panchmahals district of Gujarat (Table 4.6).

In Haryana, the input output ratio was more than two in all the crops grown. It was highest (4.19) in the case of gram in Bhiwani district and lowest (2.20) in the case of bajra in the same district. The net profit per hectare was maximum (Rs. 13,557.00) in wheat in Ambala district and lowest (Rs. 2,559.00) in the case of bajra in Bhiwani district (Table 4.6).

Of the crops studied in Durg district of Madhya Pradesh, input and output values per hectare were highest Rs. 15,662.00 and Rs. 42,292.00 respectively for vegetables. The value of net profit per hectare came to Rs. 26,630.00, highest among all the crops. The input output ratio was highest (2.70) for vegetables. The input value per hectare was lowest (Rs. 3,179) for teora. The output value per hectare was also lowest (Rs. 2,554.00) for teora. The net profit per hectare was lowest (Rs.137.00) for kodo. The input output ratio was lowest (0.77) for linseed. Among pulses lentil earned highest profit per hectare of Rs. 6,571. Gram (irrigated) and tur were next important pulses on the ladder of profit per hectare. Except lentil and irrigated gram none of the pulses could compete with the other non- pulses crops (specially irrigated ones) on the criterion of profit per hectare. In Jhabua district of Madhya Pradesh, input value per hectare was highest for cotton (Rs. 4,717.00) followed by rice (Rs. 3,692.00) and gram (Rs. 3,657.00). The value of output per hectare was highest for cotton (Rs. 11,792.00) followed by gram (Rs. 7,675.00) and groundnut (Rs. 7,364.00). The profit per hectare was highest for cotton (Rs. 7,075.00) followed by groundnut (Rs. 4,225.00) and gram (Rs. 4,018.00). Thus, from profitability point of view cotton ranked first followed by groundnut and gram. Others on the ladder were maize, wheat, arhar and soybean. On the criterion of input output ratio cotton ranked first (2.50) followed by maize (2.37) and groundnut (2.35). Arhar, gram and urad were other crops in order and had input output ratio of more than 2.0. On the criterion of profit per hectare only gram and arhar could compete with other crops. In Narsinghpur district of Madhya Pradesh, it was observed that sunflower and mustard were most profitable crops. Gram and batari came next. Wheat, soybean and sugarcane were also competitive crops to pulses. Thus, pulses were not in a position to substitute oilseeds like soybean and mustard, even on profitability criterion. Among pulses gram and batari were two most profitable crops. Input-output analysis showed that net profit per hectare was highest for sunflower followed by mustard, gram, batari, wheat, sugarcane, lentil, soybean, vegetables and urad. On the criterion of input-output ratio mustard (2.50) and sunflower (2.30) proved to be most profitable. Batari and gram came next (Table 4.6).

Table 4.6 Per hectare output values, input cost, net profit and input output ratio

(Figures – Rupees per Hectare)

Crops	Input Output	Andhra Pradesh			Assam		Bihar		Gujarat		Haryana		Madhya Pradesh		
		Guntur	Ananta-pur	Khammam	Jorhat	Nagaon	Bhagal-pur	God da	Vado-dara	Panch-Mahals	Bhi-wani	Am-bala	Durg	Jhabua	Narsingh-pur
Paddy (Kharif)	Input Cost	7,397.31	8,880.95	5,130.24	3,282.00		--	--	--	7,123.00	--	--	7,297.00	3,692.00	5,500.00
	Output Value	23,028.79	20,778.38	18,115.80	6,048.00		--	--	--	12,130.00	--	--	16,540.00	4,733.00	7,625.00
	Profit/ Loss	15,631.48	11,897.43	12,985.56	2,766.00		--	--	--	5,007.00	--	--	9,243.00	1,041.00	2,125.00
	Output Input Ratio	3.11	2.34	3.53	1.84		--	--	--	1.70	--	--	2.27	1.28	1.39
Urad (Blackgram)	Input Cost	3,146.71	--	--	4,144.00	--	--	--	--	--	--	--	3,541.00	2,327.00	4,677.00
	Output Value	10,047.01	--	--	5,816.00	--	--	--	--	--	--	--	4,114.00	4,859.00	7,154.00
	Profit/ Loss	6,900.30	--	--	1,672.00	--	--	--	--	--	--	--	573.00	2,532.00	2,477.00
	Output Input Ratio	3.19	--	--	1.40	--	--	--	--	--	--	--	1.16	2.09	1.53
Groundnut + Redgram(K) (Tur)	Input Cost	--	6,852.39	--	--	--	--	--	--	--	--	--	--	--	--
	Output Value	--	12,446.76	--	--	--	--	--	--	--	--	--	--	--	--
	Profit/ Loss	--	5,594.37	--	--	--	--	--	--	--	--	--	--	--	--
	Output Input Ratio	--	1.82	--	--	--	--	--	--	--	--	--	--	--	--
Groundnut (K)	Input Cost	--	7,422.82	--	--	--	--	--	--	--	--	--	--	3,139.00	--
	Output Value	--	8,973.39	--	--	--	--	--	--	--	--	--	--	7,364.00	--
	Profit/ Loss	--	1,550.57	--	--	--	--	--	--	--	--	--	--	4,225.00	--
	Output Input Ratio	--	1.21	--	--	--	--	--	--	--	--	--	--	2.35	--
Onion	Input Cost	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Output Value	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Profit/ Loss	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Output Input Ratio	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table 4.6 Continued.....

(Figures – Rupees per Hectare)

Crops	Input / Output	Maharashtra				Orissa			Punjab		Rajasthan	
		Amravati	Yavatmal	Ahmed Nagar	Nasik	Ganjam	Cuttack	Kalahandi	Ludhiana	Firozpur	Nagaur	Hanuman-garh
Paddy (Kharif)	Input cost	--	--	--	--	7,496.00	3.419.00	4,646.00	--	--	--	--
	Output Value	--	--	--	--	11,764.00	6.511.00	7,085.00	--	--	--	--
	Profit/ Loss	--	--	--	--	4,268.00	3,092.00	2,439.00	--	--	--	--
	Output – Input Ratio	--	--	--	--	1.57	1.90	1.52	--	--	--	--
Urad (Blackgram)	Input Cost	--	--	--	--	--	1.000.00	--	--	--	--	--
	Output value	--	--	--	--	--	2.293.00	--	--	--	--	--
	Profit / Loss	--	--	--	--	--	1.293.00	--	--	--	--	--
	Output-Input Ratio	--	--	--	--	--	2.29	--	--	--	--	--
Groundnut + Redgram (K) (Tur)	Input Cost	--	--	--	--	--	--	--	--	--	--	--
	Output value	--	--	--	--	--	--	--	--	--	--	--
	Profit / Loss	--	--	--	--	--	--	--	--	--	--	--
	Output-Input Ratio	--	--	--	--	--	--	--	--	--	--	--
Groundnut (K)	Input Cost	--	10,791.00		--	3,874.00	--	--	--	--	--	--
	Output value	--	27,192.00		--	8.439.00	--	--	--	--	--	--
	Profit / Loss	--	16,401.00		--	4.565.00	--	--	--	--	--	--
	Output-Input Ratio	--	2.52		--	2.18	--	--	--	--	--	--
Onion	Input cost	--	16,310.00		--	--	--	--	--	--	--	--
	Output value	--	47,510.00		--	--	--	--	--	--	--	--
	Profit / Loss	--	31,200.00		--	--	--	--	--	--	--	--
	Output-Input Ratio	--	2.91		--	--	--	--	--	--	--	--

Table 4.6 Continued.....

(Figures – Rupees per Hectare)

Crops	Input / Output	Tamil Nadu				Uttar Pradesh				West Bengal					
		Salem		Tuticorin		Nainital	Aligarh	Bahraich	Lalit -pur	Purulia		Malda		Cooch-Behar	
Paddy (Kharif)	Input cost	--		---		---	--	--	--	8,426.00		8,513.00		7,896.00	
	Output Value	--		--		--	--	--	--	23,071.00		21,912.00		17,505.00	
	Profit/ Loss	--		--		--	--	--	--	14,645.00		13,399.00		9,610.00	
	Output- Input Ratio	--		--		---	---	--	---	2.74		2.57		2.21	
Urad (Blackgram)	Input cost	(Iri.) 6,408.0	Un-Irri. 3,197.0	(Iri.) 3,199.0	Un-Irri. 2,848.0	2,922.00	2,821.00	2,665.00	--	(K) 2969.0	R) 4214.0	(K) 3447.0	R) 4342.0	(K) 3348.0	R) 4286.0
	Output Value	8,061.0	3,818.0	5,126.0	4,379.0	7,523.00	14,375.00	6.042.00	--	5665.0	7706.0	7084.0	10364.0	5442.0	6932.0
	Profit/ Loss	1,653.0	621.0	1,927.0	1,531.0	4,601.00	11,554.00	3,377.00	--	2696.0	3492.0	3637.0	6022.0	2094.0	2646.0
	Output- Input Ratio	1.26	1.19	1.60	1.54	2.57	5.09	2.27	--	1.91	1.83	2.06	2.39	1.63	1.62
Groundnut + Redgram (Kh)	Input cost	--		--		--	--	--	--	--		--		--	
	Output Value	--		--		--	--	--	--	--		--		--	
	Profit/ Loss	---		--		--	--	--	--	--		--		--	
	Output- Input Ratio	---		--		--	--	--	--	--		--		--	
Groundnut (Kharif)	Input cost	--		--		--	--	--	--	--		--		--	
	Output Value	--		--		--	--	--	--	--		--		--	
	Profit/ Loss	--		--		--	--	--	--	--		--		--	
	Output- Input Ratio	--		--		--	--	--	--	--		--		--	
Onion	Input cost	--		--		--	--	--	--	--		--		--	
	Output Value	--		--		--	--	--	--	--		--		--	
	Profit/ Loss	--		--		--	--	--	--	--		--		--	
	Output- Input Ratio	--		--		--	--	--	--	--		--		--	

Table 4.6 Continued.....

(Figures – Rupees per Hectare)

Crops	Input Output	Andhra Pradesh			Assam		Bihar		Gujarat		Haryana		Madhya Pradesh		
		Guntur	Ananta-pur	Khammam	Jorhat	Nagaon	Bhagal-pur	God da	Vado-dara	Panch-Mahals	Bhi-wani	Am-bala	Durg	Jhabua	Narsingh-pur-
Greengram (moong)	Input Cost	–	–	2,313.12	4,397.00	–	–	–	–	–	–	–	–	3,087.00	–
	Output Value	–	–	6,055.39	8,020.00	–	–	–	–	–	–	–	–	1,893.00	–
	Profit/ Loss	–	–	3,742.27	3,623.00	–	–	–	–	–	–	–	–	(1194.00)	–
	Output Input Ratio	–	–	2.62	1.82	–	–	–	–	–	–	–	–	0.61	–
Cotton (K)	Input Cost	–	–	11,106.49	–	–	–	–	13,136.00	–	2,958.00	–	–	4,717.00	–
	Output Value	–	–	24,876.43	–	–	–	–	26,105.00	–	8,450.00	–	–	11,792.00	–
	Profit/ Loss	–	–	13,769.94	–	–	–	–	12,968.00	–	5,492.00	–	–	7,075.00	–
	Output Input Ratio	–	–	2.24	–	–	–	–	1.99	–	2.85	–	–	2.50	–
Chillies	Input Cost	–	–	12,318.38	–	–	–	–	–	–	–	–	–	–	–
	Output Value	–	–	31,600.79	–	–	–	–	–	–	–	–	–	–	–
	Profit/ Loss	–	–	19,282.41	–	–	–	–	–	–	–	–	–	–	–
	Output Input Ratio	–	–	2.56	–	–	–	–	–	–	–	–	–	–	–
Pea	Input Cost	–	–	–	2,041.00	–	–	–	–	–	–	–	–	–	5,546.00
	Output Value	–	–	–	4,995.00	–	–	–	–	–	–	–	–	–	7,373.00
	Profit/ Loss	–	–	–	2,954.00	–	–	–	–	–	–	–	–	–	1,827.00
	Output Input Ratio	–	–	–	2.44	–	–	–	–	–	–	–	–	–	1.33
Lentil (Masoor)	Input Cost	–	–	–	–	5,349.00	–	–	–	–	–	3,794.00	4,735.00	–	5,230.00
	Output Value	–	–	–	–	7,824.00	–	–	–	–	–	12,936.00	11,306.00	–	10,097.00
	Profit/ Loss	–	–	–	–	2,475.00	–	–	–	–	–	9,142.00	6,571.00	–	4,867.00
	Output Input Ratio	–	–	–	–	1.46	–	–	–	–	–	3.41	2.39	–	1.93

Table 4.6 Continued -------

(Figures – Rupees per Hectare)

Crops	Input / Output	Maharashtra				Orissa			Punjab		Rajasthan	
		Amravati	Yavatmal	Ahmed Nagar	Nasik	Ganjam	Cuttack	Kalahandi	Ludhiana	Firozpur	Nagaur	Hanuman-garh
Greengram (moong)	Input cost	–	–	–	–	(K) 2,277.00	(R) 1,472.00	–	3,858.00	–	2,891.00	1,820.00
	Output Value	–	–	–	–	1,118.00	2,703.00	–	11,662.00	–	13,297.00	8.990.00
	Profit/ Loss	–	–	–	–	(-) 1,159.00	1,231.00	–	7.804.00	–	10.406.00	7,170.00
	Output – Input Ratio	–	–	–	–	0.49	1.84	–	3.02	–	4.59	4.94
Cotton (K)	Input Cost	–	–	–	–	6,337.00	–	–	5,929.00	–	–	–
	Output value	–	–	–	–	23,669.00	–	–	18,794.00	–	–	–
	Profit / Loss	–	–	–	–	17,332.00	–	–	12.865.00	–	–	–
	Output-Input Ratio	–	–	–	–	3.73	–	–	3.17	–	–	–
Chillies	Input Cost	–	–	–	–	–	–	–	–	–	–	–
	Output value	–	–	–	–	–	–	–	–	–	–	–
	Profit / Loss	–	–	–	–	–	–	–	–	–	–	–
	Output-Input Ratio	–	–	–	–	–	–	–	–	–	–	–
Pea	Input Cost	–	–	–	–	–	–	–	–	–	–	–
	Output value	–	–	–	–	–	–	–	–	–	–	–
	Profit / Loss	–	–	–	–	–	–	–	–	–	–	–
	Output-Input Ratio	–	–	–	–	–	–	–	–	–	–	–
Lentil (Masoor)	Input cost	–	–	–	–	–	–	–	–	–	–	–
	Output value	–	–	–	–	–	–	–	–	–	–	–
	Profit / Loss	–	–	–	–	–	–	–	–	–	–	–
	Output-Input Ratio	–	–	–	–	–	–	–	–	–	–	–

Table 4.6 Continued.....

(Figures – Rupees per Hectare)

Crops	Input / Output	Tamil Nadu				Uttar Pradesh				West Bengal		
		Salem		Tuticorin		Nainital	Aligarh	Bahraich	Lalitpur	Purulia	Malda	Cooch-Behar
Greengram (moong)	Input cost	Irri. 6,515.00	Un-irri. 3279.00	Irri. 4,435.00	Un-irri. 3,948.00	2,964,00	3,866.00	–	–	4,959.00	4,884.00	–
	Output Value	8,209.00	4,072.00	6,059.00	4,730.00	9,382.00	12,411.00	–	–	9,973.00	10,106.00	–
	Profit/ Loss	1,694.00	793.00	1,624.00	782	6,418.00	8,545.00	–	–	5,014.00	5,222.00	–
	Output- Input Ratio	1.26	1.24	1.37	1.20	3.16	3.20	–	–	2.01	2.07	–
Cotton (K)	Input cost	–		–		–	–	–	–	–	–	–
	Output Value	–		–		–	–	–	–	–	–	–
	Profit/ Loss	–		–		–	–	–	–	–	–	–
	Output- Input Ratio	–		–		–	–	–	–	–	–	–
Chillies	Input cost	–		–		–	–	–	–	–	–	–
	Output Value	–		–		–	–	–	–	–	–	–
	Profit/ Loss	–		–		–	–	–	–	–	–	–
	Output- Input Ratio	–		–		–	–	–	–	–	–	–
Pea	Input cost	–		–		–	–	–	–	–	–	–
	Output Value	–		–		–	–	–	–	–	–	–
	Profit/ Loss	–		–		–	–	–	–	–	–	–
	Output- Input Ratio	–		–		–	–	–	–	–	–	–
Lentil (Masoor)	Input cost	–		–		4,305.00	4,686.00	4,191.00	5,470.00	3,440.00	3,967.00	3,750.00
	Output Value	–		–		15,738.00	13,332.00	14,770.00	15,656.00	6,528.00	8,485.00	6,841.00
	Profit/ Loss	–		–		11,433.00	8,646.00	10,579.00	10,186.00	3,088.00	4,518.00	3,091.00
	Output- Input Ratio	–		–		3.65	2.84	3.52	2.86	1.90	2.14	1.82

Table 4.6 Continued...

(Figures – Rupees per Hectare)

Crops	Input Output	Madhya Pradesh			Assam		Haryana		Punjab		West Bengal		
		Durg	Jhabua	Narsinghpur	Jorhat	Nagaon	Bhiwani	Ambala	Ludhiana	Firozpur	Purulia	Malda	Cooch Behar
Khesari (Lathyrus)	Input Cost	3,179.00	--	--	--	3,621.00	--	--	--	--	1,211.00	--	1,229.00
	Output Value	2,554.00	--	--	--	9,559.00	--	--	--	--	4,160.00	--	5,562.00
	Profit / Loss	(-) 625.00	--	--	--	5,938.00	--	--	--	--	2,949.00	--	4,333.00
	Output Input Ratio	0.80	--	--	--	2.64	--	--	--	--	3.43	--	4.52
Mustard	Input Cost	--	--	4.521.00	3,848.00		2.683.00	3,695.00	--	4,730.00	--	--	--
	Output Value	--	--	11.320.00	9,884.00		9.579.00	12.193.00	--	10,950.0	--	--	--
	Profit/ Loss	--	--	6.799.00	6,036.00		6.896.00	8,498.00	--	6,220.00	--	--	--
	Output Input Ratio	--	--	2.50	2.57		3.57	3.30	--	2.31	--	--	--
Potato	Input Cost	--	--	--	12,512.00		--	--	--	--	--	--	--
	Output Value	--	--	--	29,440.00		--	--	--	--	--	--	--
	Profit/ Loss	--	--	--	16,928.00		--	--	--	--	--	--	--
	Output Input Ratio	--	--	--	2.35		--	--	--	--	--	--	--
Vegetables	Input Cost	15,662.00	--	15.088.00	9,109.00		--	--	--	--	--	--	--
	Output Value	42.292.00	--	17.827.00	29,680.00		--	--	--	--	--	--	--
	Profit/ Loss	26,630.00	--	2.739.00	20,571.00		--	--	--	--	--	--	--
	Output Input Ratio	2.70	--	1.18	3.26		--	--	--	--	--	--	--
Sali / Ahu Tradi.Paddy	Input Cost	--	--	--	Sali 5.133.00	Ahu 3.961.00	--	--	--	--	--	--	--
	Output Value	--	--	--	10.012.00	6,180.00	--	--	--	--	--	--	--
	Profit/ Loss	--	--	--	4,879.00	2,219.00	--	--	--	--	--	--	--
	Output Input Ratio	--	--	--	1.95	1.56	--	--	--	--	-	--	--

Table 4.6 Continued.....

(Figures – Rupees per Hectare)

Crops	Input Output	Andhra Pradesh			Assam		Bihar		Gujarat		Haryana		Madhya Pradesh		
		Guntur	Ananta -pur	Kham- mam	Jorhat	Nagaon	Bhagal- pur	Godda	Vado- dara	Panch- Mahals	Bhiwani	Am- bala	Durg	Jhabua	Narsingh- pur-
Sali / Ahu HYV Paddy	Input Cost	–	–	–	Sali 7,403.0	Ahu 9,089.0	–	–	–	–	–	–	–	–	–
	Output Value	–	–	–	15,305.0	14,093.0	–	–	–	–	–	–	–	–	–
	Profit/ Loss	–	–	–	7,902.0	5,004.0	–	–	–	–	–	–	–	–	–
	Output Input Ratio	–	–	–	2.07	1.55	–	–	–	–	–	–	–	–	–
Gram	Input Cost	–	–	–	–	–	4,190.13	–	2,829.0	3,144.0	2,263.0	–	6,916.0	3,657.0	6,469.0
	Output Value	–	–	–	–	–	8,073.04	–	4,688.0	9,230.0	9,501.0	–	10,077.0	7,675.0	12,866.0
	Profit/ Loss	–	–	–	–	–	3,882.91	–	1,858.0	6,086.0	7,238.0	–	3,161.0	4,018.0	6,397.0
	Output Input Ratio	–	–	–	–	–	1.92	–	1.65	2.93	4.19	–	1.46	2.09	1.99
Arhar (Tur)	Input Cost	–	–	–	–	–	–	3,303.81	6,329.0	1,569.0	–	–	3,500.0	2,273.0	4,313.0
	Output Value	–	–	–	–	–	–	10,391.98	9,665.0	6,974.0	–	–	5,425.0	5,177.0	6,119.0
	Profit/ Loss	–	–	–	–	–	–	7,088.17	3,336.0	5,405.0	–	–	1,925.0	2,904.0	1,806.0
	Output Input Ratio	–	–	–	–	–	–	3.15	1.53	4.44	–	–	1.55	2.28	1.42
Wheat	Input Cost	–	–	–	–	–	–	–	7,037.0	4,528.0	–	4,898.0	6,683.00	3,316.0	6,382.0
	Output Value	–	–	–	–	–	–	–	23,000.0	11,200.0	–	18,455.0	7,704.0	6,385.0	12,252.0
	Profit/ Loss	–	–	–	–	–	–	–	15,963.0	6,672.0	–	13,557.0	1,021.0	3,069.0	5,870.0
	Output Input Ratio	–	–	–	–	–	–	–	3.27	2.47	–	3.76	1.15	1.90	1.92
Maize	Input Cost	–	–	–	–	–	–	–	–	4,617.0	–	3,213.0	–	2,864.0	–
	Output Value	–	–	–	–	–	–	–	–	6,493.0	–	11,143.0	–	6,792.0	–
	Profit/ Loss	–	–	–	–	–	–	–	–	1,876.0	–	7,930.0	–	3,928.0	–
	Output Input Ratio	–	–	–	–	–	–	–	–	1.40	–	3.49	–	2.37	–

Table 4.6 Continued.....

(Figures – Rupees per Hectare)

Crops	Input / Output	Maharashtra				Orissa			Punjab		Rajasthan	
		Amravati	Yavatmal	Ahmed Nagar	Nasik	Ganjam	Cuttack	Kalahandi	Ludhiana	Firozpur	Nagaur	Hanuman-garh
Sali / Ahu HYV Paddy	Input cost	--	--	--	--	--	--	--	--	--	--	--
	Output Value	--	--	--	--	--	--	--	--	--	--	--
	Profit/ Loss	--	--	--	--	--	--	--	--	--	--	--
	Output – Input Ratio	--	--	--	--	--	--	--	--	--	--	--
Gram	Input Cost	--	--	10,793.0	10,356.0	--	--	--	--	4,818.0	4,030.0	1,890.0
	Output value	--	--	16,386.0	16,628.0	--	--	--	--	9,486.0	14,714.0	7,131.0
	Profit / Loss	--	--	5,593.00	6,272.0	--	--	--	--	4,668.0	10,684.0	5,241.0
	Output-Input Ratio	--	--	1.52	1.60	--	--	--	--	1.97	3.65	3.77
Arhar (Tur)	Input Cost	7,048.0	6,320.0	--	--	--	--	2,347.0	--	--	--	--
	Output value	11,291.0	9,827.0	--	--	--	--	2,566.0	--	--	--	--
	Profit / Loss	4,243.0	3,507.0	--	--	--	--	219.0	--	--	--	--
	Output-Input Ratio	1.60	1.55	--	--	--	--	1.09	--	--	--	--
Wheat	Input Cost	--	4,898.0		--	--	--	--	--	5,077.0	--	--
	Output value	--	13,113.0		--	--	--	--	--	20,280.0	--	--
	Profit / Loss	--	8,215.0		--	--	--	--	--	15,203.0	--	--
	Output-Input Ratio	--	2.68		--	--	--	--	--	3.99	--	--
Maize	Input cost	--	--	--	--	--	--	--	3,807.0	--	--	--
	Output value	--	--	--	--	--	--	--	11,250.0	--	--	--
	Profit / Loss	--	--	--	--	--	--	--	7,443.0	--	--	--
	Output-Input Ratio	--	--	--	--	--	--	--	2.95	--	--	--

Table 4.6 Continued.....

(Figures – Rupees per Hectare)

Crops	Input / Output	Tamil Nadu		Uttar Pradesh				West Bengal		
		Salem	Tuticorin	Nainital	Aligarh	Bahraich	Lalitpur	Purulia	Malda	Cooch-Behar
Sali / Ahu HYV Paddy	Input cost	--	--	--	--	--	--	--	--	--
	Output Value	--	--	--	--	--	--	--	--	--
	Profit/ Loss	--	--	--	--	--	--	--	--	--
	Output- Input Ratio	--	--	--	--	--	--	--	--	--
Gram	Input cost	--	--	--	--	--	--	4,412.0	4,601.0	--
	Output Value	--	--	--	--	--	--	6,959.0	10,054.0	--
	Profit/ Loss	--	--	--	--	--	--	2,547.0	5,453.0	--
	Output- Input Ratio	--	--	--	--	--	--	1.58	2.18	--
Arhar (Tur)	Input cost	--	--	4,160.0	--	2,870.0	--	--	--	--
	Output Value	--	--	11,000.0	--	15,437.0	--	--	--	--
	Profit/ Loss	--	--	6,840.0	--	12,567.0	--	--	--	--
	Output- Input Ratio	--	--	2.64	--	5.38	--	--	--	--
Wheat	Input cost	--	--	--	--	--	--	7,580.0	7,693.0	7,605.0
	Output Value	--	--	--	--	--	--	11,577.0	13,203.0	12,527.0
	Profit/ Loss	--	--	--	--	--	--	3,997.0	5,510.0	4,922.0
	Output- Input Ratio	--	--	--	--	--	--	1.53	1.72	1.65
Maize	Input cost	--	--	--	--	--	--	--	--	--
	Output Value	--	--	--	--	--	--	--	--	--
	Profit/ Loss	--	--	--	--	--	--	--	--	--
	Output- Input Ratio	--	--	--	--	--	--	--	--	--

Table 4.6 Continued.....

(Figures – Rupees per Hectare)

Crops	Input Output	Madhya Pradesh			Haryana		Maharashtra			
		Durg	Jhabua	Narsinghpur	Bhiwani	Ambala	Amravati	Yavatmal	Ahmednagar	Nasik
Bajra	Input Cost	--	--	--	2,130.0	--	--	3,396.00		--
	Output Value	--	--	--	4,689.0	--	--	9,863.00		--
	Profit/ Loss	--	--	--	2,559.0	--	--	6,466.00		--
	Output Input Ratio	--	--	--	2.20	--	--	2.90		--
Soybean	Input Cost	6,741.0	3,543.0	7,414.0	--	--	--	8,786.00		--
	Output Value	13,909.0	6,303.0	10.800.0	--	--	--	20,501.00		--
	Profit/ Loss	7,168.0	2,760.0	3,386.0	--	--	--	11,715.00		--
	Output Input Ratio	2.06	1.78	1.46	--	--	--	2.33		--
Linseed	Input Cost	4,682.0	--	--	--	--	--	--	--	--
	Output Value	3,602.0	--	--	--	--	--	--	--	--
	Profit/ Loss	(-) 1,080.0	--	--	--	--	--	--	--	--
	Output Input Ratio	0.77	--	--	--	--	--	--	--	--
Kodo	Input Cost	3,474.0	--	--	--	--	--	--	--	--
	Output Value	3,611.0	--	--	--	--	--	--	--	--
	Profit/ Loss	137.0	--	--	--	--	--	--	--	--
	Output Input Ratio	1.04	--	--	--	--	--	--	--	--
Kulthi	Input Cost	--	2.308.0	--	--	--	--	--	--	--
	Output Value	--	1,906.0	--	--	--	--	--	--	--
	Profit/ Loss	--	(-) 402.0	--	--	--	--	--	--	--
	Output Input Ratio	--	0.83	--	--	--	--	--	--	--

Table 4.6 Continued.....

(Figures – Rupees per Hectare)

Crops	Input Output	Madhya Pradesh			Rajasthan		Tamil Nadu		
		Durg	Jhabua	Narsinghpur	Nagaur	Hanumangarh	Salem		Tuticorin
Castor	Input Cost	--	1.488.00	--	--	--	--		--
	Output Value	--	2.805.00	--	--	--	--		--
	Profit / Loss	--	1.317.00	--	--	--	--		--
	Output Input Ratio	--	1.89	--	--	--	--		--
Sunflower	Input Cost	--	--	5,871.00	--	--	--		--
	Output Value	--	--	13,500.00	--	--	--		--
	Profit/ Loss	--	--	7,629.00	--	--	--		--
	Output Input Ratio	--	--	2.30	--	--	--		--
Sugarcane	Input Cost	--	--	15,476.00	--	--	--		--
	Output Value	--	--	20,717.00	--	--	--		--
	Profit/ Loss	--	--	5,241.00	--	--	--		--
	Output Input Ratio	--	--	1.34	--	--	--		--
Batari (Small pea)	Input Cost	--	--	5,421.00	--	--	--		--
	Output Value	--	--	11.801.00	--	--	--		--
	Profit/ Loss	--	--	6,380.00	--	--	--		--
	Output Input Ratio	--	--	2.18	--	--	Irrigated	Un-irrigated	--
Cowpea	Input Cost	--	--	--	2,018.00	--	3,096.00	1,848.00	--
	Output Value	--	--	--	13,967.00	--	4,755.00	2,597.00	--
	Profit / Loss	--	--	--	11.949.00	--	1,659.00	749.00	--
	Output Input Ratio	--	--	--	6.92	--	1.53	1.40	--
Moth	Input Cost	--	--	--	2,119.00	1,401.00	--		--
	Output Value	--	--	--	5.826.00	7,607.00	--		--
	Profit / Loss	--	--	--	3,707.00	6.206.00	--		--
	Output Input Ratio	--	--	--	2.75	5.43	--		--

In Maharashtra, profit per hectare was observed high in the case of cereals (wheat and bajra), oilseeds (soybean and groundnut) and onion as compared to pulses (gram and arhar). Input output ratio in the case of pulses was less than 2. On the other hand, it was more than 2 in other crops.

In Orissa, the farmers derived negative income from moong in Ganjam district. The per hectare net income amounted to Rs. 1,293.00 for urad in Cuttack and Rs.219.00 for tur in Kalahandi district. In Ganjam district, input output ratio was highest in cotton (3.73) followed by groundnut (2.18) and paddy (1.57). In moong it was 0.49. In Cuttack net income per hectare was maximum (Rs.3,092.00) in paddy followed by urad (Rs.1,293.00) and moong (Rs.1,231.00). The input output ratio was highest (2.29) in urad followed by paddy (1.90) and moong (1.84). The farmers of Kalahandi have derived only meagre income from tur (Rs.219.00) (Table 4.6).

Moong, cotton and maize were the important crops of Ludhiana district in Punjab. The net income per hectare and input output ratio was highest in cotton followed by moong and maize. The input output ratio was near about 3 in all the cases. In Firozpur district, the profit per hectare was maximum in the case of wheat (Rs.15,203.00) followed by mustard (Rs.6,220.00) and gram (Rs. 4,668.00). The input output ratio was maximum in wheat (3.99) and minimum in gram (1.97) (Table 4.6).

In Rajasthan, moong and cowpea were the best rewarding pulses in the kharif season in terms of per hectare returns. Gram was the most rewarding crop in rabi season. The per hectare net return of all the pulses were very high. In Nagaur district, input output ratio was maximum in cowpea (6.92) followed by moong (4.59), gram (3.65) and moth (2.75). In Hanumangarh district it was maximum in moth (5.43) followed by moong (4.94) and gram (3.77) (Table 4.6).

In Tamil Nadu, urad, moong and cowpea were the important pulses. The input output ratio was very low in both the districts for all the pulse crops. Input output ratio was more in irrigated urad and moong as compared to unirrigated urad and moong in both Salem and Tuticorin districts. It was also similar in the case of cowpea in Salem district (Table 4.6).

In Uttar Pradesh, urad, moong, lentil and arhar were the important pulses grown in four districts. In Nainital district all the four pulses were grown. In Aligarh district only three pulses; namely, urad, moong and lentil were grown. In Bahraich district, urad, lentil and tur were grown. In Lalitpur district, only lentil was grown. Lentil was grown in all the four districts of the State. In Nainital district, profit per hectare was maximum in lentil (Rs. 11,433.00). It was lowest in urad (Rs.4,601.00). The input output ratio was also maximum in (3.65) in lentil and minimum (2.57) in urad. In Aligarh district, profit per hectare was maximum in urad (Rs.11,554.00) followed by lentil and moong. In the case of input output ratio, it was maximum in urad (5.09) followed by moong (3.20) and lentil (2.84). In Bahraich district, net income per hectare was highest

in the case of arhar (Rs.12,567.00) followed by lentil and urad. The trend in input output ratio was also same. In Lalitpur district, the profit per hectare and input output ratio was Rs.10,186.00 and 2.86 respectively (Table 4.6).

In West Bengal, among pulses summer moong yielded highest net return (Rs. 5,014.00) per hectare in the district of Purulia followed by rabi urad (Rs.3,492.00), lentil (Rs. 3,088.00), teora (Rs.2,949.00), kharif urad (Rs.2,696.00) and gram (Rs.2,547.00). The relative position somewhat changed if we go by output input ratio, where teora ranked first (3.43) followed by moong (2.01), kharif urad (1.91), lentil (1.90), rabi urad (1.83) and gram (1.58). In the district of Malda, among pulses rabi urad yielded highest net return (Rs.6,022.00) per hectare followed by gram (Rs.5,453.00), moong (Rs.5,222.00), lentil (Rs.4,518.00) and kharif urad (Rs.3,637.00). The position remains the same if we go by the output input ratio excepting the fact that lentil tended to occupy the rank held by summer moong and vice-versa. In the district of Cooch Behar, teora brought highest net return per hectare (Rs.4,333.00) followed by lentil (Rs.3,091.00), rabi urad (Rs.2,646.00) and kharif urad (Rs.2,094.00). A similar trend was observed in the case of output input ratio (Table 4.6).

4.5 Disposal of Pulses on Sample Farms

The pattern of disposal varied with the crop. Majority of the pulse growers preferred to sell the produce after the harvest. The sample farmers kept only small portion of output for consumption and seed and the rest was disposed to the traders. In the case of urad, the percentage of output sold in the market constituted about 80 per cent in Madhya Pradesh and Uttar Pradesh. In the States of Andhra Pradesh and W. Bengal, major portion of the produce was sold and consumed. The remaining portion was kept for seed. In Orissa about 73 per cent of the produce was kept for consumption purpose, 19.38 per cent for seed purpose and remaining 7.54 per cent was sold. In the state of Punjab, Rajasthan and Uttar Pradesh, the major portion of moong was sold. In Andhra Pradeh and Orissa, the percentage of consumption was more. In Madhya Pradesh and W. Bengal, about equal quantity of produce was consumed and sold. The states of Madhya Pradesh, Uttar Pradesh and W. Bengal are the major lentil producing States. In M.P. about 65 to 85 per cent of the total produce was sold. About 10 to 20 per cent quantity was kept for seed and remaining quantity was kept for consumption. In Uttar Pradesh, major portion of the produce (75 to 85 per cent) was sold. Another 15 to 25 per cent was kept for seed and consumption purposes. About 70 per cent of the produce was kept for consumption purpose in Purulia and Cooch-Behar districts of W.Bengal and about 38 per cent in Malda district. About 3 to 4 per cent produce was kept for seed purpose and remaining quantity was sold. Teora was mainly produced in Durg district of Madhya Pradesh and all the three districts in W.Bengal. In M.P. about 50 per cent of the produce was consumed, 33.33 per cent was sold and about 17 per cent was kept for seed purpose. Similarly in W. Bengal, major portion of the produce was used for consumption purpose. About 6 to 18 per cent produce was kept for seed purpose and the remaining quantity was

Table 4.7 Disposal of produce, sample farms

(Percentage to total production)

Crops	Disposal	Andhra Pradesh			Bihar		Madhya Pradesh			Maharashtra				Orissa		
		Gun-tur	Ananta-pur	Kham-mam	Bhagal-pur	God da	Durg	Jhabua	Narsingh-pur	Amra-vati	Yavat-mal	Ahmed-nagar	Nasik	Ganjam	Cuttack	Kala-hanci
Urad (Mash kalai)	Seed	9.09	--	--	--	--	10.24	9.65	9.04	--	--	--	--	--	19.38	--
	Consumption	49.15	--	--	--	--	10.24	12.50	6.72	--	--	--	--	--	73.08	--
	Sold	41.76	--	--	--	--	79.52	77.85	84.24	--	--	--	--	--	7.54	--
	Total Production	100.00	--	--	--	--	100.00	100.00	100.00	--	--	--	--	--	100.00	--
Moong	Seed	--	--	3.44	--	--	--	26.96	--	--	--	--	--	31.07	--	--
	Consumption	--	--	88.82	--	--	--	33.15	--	--	--	--	--	51.55	--	--
	Sold	--	--	7.74	--	--	--	39.89	--	--	--	--	--	17.38	--	--
	Total Production	--	--	100.00	--	--	--	100.00	--	--	--	--	--	100.00	--	--
Masoor (Lentil)	Seed	--	--	--	--	--	20.39	--	10.91	--	--	--	--	--	--	--
	Consumption	--	--	--	--	--	13.16	--	4.15	--	--	--	--	--	--	--
	Sold	--	--	--	--	--	66.45	--	84.94	--	--	--	--	--	--	--
	Total Production	--	--	--	--	--	100.00	--	100.00	--	--	--	--	--	--	--
Khesari (Lathyrus)	Seed	--	--	--	--	--	16.84	--	--	--	--	--	--	--	--	--
	Consumption	--	--	--	--	--	49.83	--	--	--	--	--	--	--	--	--
	Sold	--	--	--	--	--	33.33	--	--	--	--	--	--	--	--	--
	Total Production	--	--	--	--	--	100.00	--	--	--	--	--	--	--	--	--
Gram	Seed	--	--	--	7.82	--	17.22	--	10.29	--	--	7.12	6.32	--	--	--
	Consumption	--	--	--	44.32	--	9.15	--	7.67	--	--	6.18	10.40	--	--	--
	Sold	--	--	--	47.86	--	73.63	--	82.04	--	--	86.70	83.28	--	--	--
	Total Production	--	--	--	100.00	--	100.00	--	100.00	--	--	100.00	100.00	--	--	--

Table 4.7 Continued.....

(Percentage to total production)

Crops	Disposal	Punjab		Rajasthan		Uttar Pradesh					West Bengal					
		Firoz-pur	Ludhiana	Nagaur	Hanuman-garh	Nainital	Aligarh		Bahraich		Lalit-pur	Purulia		Malda		Cooch Behar	
Urad	Seed	--	--	--	--	--	Kh.	Sum.	Kh.	Sum.		K	R	K	R	K	R
(Mash kalai)												4.47	4.20	2.99	2.18	5.57	4.60
	Consumption	--	--	--	--	--	15.70	21.72	25.33	6.94	23.36	34.28	50.42	38.33	23.96	47.41	65.27
	Sold	--	--	--	--	--	84.30	78.28	74.67	93.06	76.64	61.25	45.38	58.68	73.86	47.02	30.13
	Total Production	--	--	--	--	--	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Moong	Seed	--	1.45	0.38	14.86	--					--	5.00		5.26		--	
	Consumption	--	5.72	3.88	24.32	--	15.30	15.87	9.69		--	54.00		47.37		--	
	Sold	--	92.83	95.74	60.82	--	84.70	84.13	90.31		--	41.00		47.37		--	
	Total Production	--	100.00	100.00	100.00	--	100.0	100.0	100.00		--	100.00		100.00		--	
Masoor	Seed	--	--	--	--							4.61		2.70		3.71	
(Lentil)	Consumption	--	--	--	--	25.47	16.83		21.67		17.07	70.15		38.56		72.49	
	Sold	--	--	--	--	74.53	83.17		78.33		82.93	25.24		50.74		23.80	
	Total Production	--	--	--	--	100.00	100.00		100.00		100.0	100.00		100.00		100.00	
Khesari	Seed	--	--	--	--	--	--		--		--	8.20		17.65		6.32	
(Lathyrus)	Consumption	--	--	--	--	--	--		--		--	49.82		56.47		38.05	
	Sold	--	--	--	--	--	--		--		--	41.98		25.88		55.63	
	Total Production	--	--	--	--	--	--		--		--	100.00		100.00		100.00	
Gram	Seed	5.98	--	1.23	9.84							9.13		6.53		--	
	Consumption	17.69	--	5.85	8.58	27.46	19.43		23.34		17.42	50.58		53.75		--	
	Sold	76.33	--	92.92	81.58	72.54	80.57		76.66		82.58	40.29		39.72		--	
	Total Production	100.0	--	100.00	100.00	100.00	100.00		100.00		100.0	100.00		100.00		--	

Table 4.7 Continued.....

(Percentage to total production)

Crops	Disposal	Andhra Pradesh			Bihar		Madhya Pradesh			Maharashtra				Orissa		
		Gun-tur	Ananta-pur	Kham-mam	Bhagal-pur	God-da	Durg	Jhabua	Narsingh-pur	Amra-vati	Yavat-mal	Ahmed-nagar	Nasik	Ganjam	Cuttack	Kala-handi
Arhar (Tur)	Seed	--	7.43	--	--	4.27	11.66	9.64	4.46	0.93	3.00	--	--	--	--	9.66
	Consumption	--	60.89	--	--	52.47	34.22	30.46	11.23	15.20	15.00	--	--	--	--	59.44
	Sold	--	31.68	--	--	43.26	54.12	59.90	84.31	83.87	82.00	--	--	--	--	30.90
	Total Production	--	100.00	--	--	100.00	100.00	100.00	100.00	100.00	100.00	--	--	--	--	100.00
Cowpea (Chawla)	Seed	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Consumption	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Sold	--	--	--	---	--	--	--	--	--	--	--	--	--	--	--
	Total Production	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Moth (Kidney bean)	Seed	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Consumption	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Sold	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Total Production	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Batari / pea	Seed	--	--	--	--	--	--	--	7.03 / 21.40	--	--	--	--	--	--	--
	Consumption	--	--	--	--	--	--	--	2.76 / 8.95	--	--	--	--	--	--	--
	Sold	--	--	--	--	--	--	--	90.21 / 69.65	--	--	--	--	--	--	--
	Total Production	--	--	--	--	--	--	--	100.00	--	--	--	--	--	--	--
Kulthi	Seed	--	--	--	--	--	--	9.78	--	--	--	--	--	--	--	--
	Consumption	--	--	--	--	--	--	34.67	--	--	--	--	--	--	--	--
	Sold	--	--	--	--	--	--	55.55	--	--	--	--	--	--	--	--
	Total Production	--	--	--	--	--	--	100.00	--	--	--	--	--	--	--	--

Table 4.7 Continued.....

(Percentage to total production)

Crops	Disposal	Punjab		Rajasthan		Uttar Pradesh				West Bengal		
		Firozpur	Ludhiana	Nagaur	Hanuman-garh	Nainital	Aligarh	Bahraich	Lalitpur	Purulia	Malda	Cooch Behar
Arhar	Seed	--	--	--	--					--	--	--
	Consumption	--	--	--	--	40.00	14.56	56.61	--	--	--	--
	Sold	--	--	--	--	60.00	85.44	43.39	--	--	--	--
	Total Production	--	--	--	--	100.00	100.00	100.00	--	--	--	--
Cowpea (Chawla)	Seed	--	--	0.07	--	--	--	--	--	--	--	--
	Consumption	--	--	2.10	--	--	--	--	--	--	--	--
	Sold	--	--	97.83	--	--	--	--	--	--	--	--
	Total Production	--	--	100.00	--	--	--	--	--	--	--	--
Moth (Kidney bean)	Seed	--	--	--	4.64	--	--	--	--	--	--	--
	Consumption	--	--	9.12	21.78	--	--	--	--	--	--	--
	Sold	--	--	90.88	73.58	--	--	--	--	--	--	--
	Total Production	--	--	100.00	100.00	--	--	--	--	--	--	--
Pea	Seed	--	--	--	--					--	--	--
	Consumption	--	--	--	--	11.75	20.82	72.93	2.78	--	--	--
	Sold	--	--	--	--	88.25	79.18	27.07	97.22	--	--	--
	Total Production	--	--	--	--	100.00	100.00	100.00	100.00	--	--	--
Kulthi	Seed	--	--	--	--	--	--	--	--	--	--	--
	Consumption	--	--	--	--	--	--	--	--	--	--	--
	Sold	--	--	--	--	--	--	--	--	--	--	--
	Total Production	--	--	--	--	--	--	--	--	--	--	--

sold. The major gram producing States were Madhya Pradesh, Uttar Pradesh, Maharashtra, Rajasthan, W.Bengal, Bihar and Punjab. More than 70 per cent of the produce was sold in the States of M.P., Maharashtra, Punjab, Rajasthan and U.P. The farmers of States of Bihar and W. Bengal sold about 40 to 48 per cent of the produce. About 45 to 50 per cent of the produce was consumed in Bihar and W. Bengal. Tur was mainly produced in Uttar Pradesh, Madhya Pradesh, Maharashtra, Bihar, A.P. and Orissa. In Madhya Pradesh, Maharashtra and Uttar Pradesh, the major portion of the produce was sold whereas in Andhra Pradesh, Bihar and Orissa the major portion of the produce was kept for consumption purpose. Cowpea and moth were mainly produced in Rajasthan. About 98 per cent of the cowpea produce was sold and remaining quantity was kept for seed and consumption purpose. In the case of moth 70 to 90 per cent of the produce was sold. Ten to 22 per cent produce was kept for consumption. Pea was mainly produced in Uttar Pradesh and Madhya Pradesh. About 80 to 97 per cent produce was sold except Bahraich district of Uttar Pradesh where major portion (73 per cent) of the produce was consumed (Table 4.7).

4.6 Marketing, Prices and Processing of Pulses

Marketing is a function through which a crop produce moves from cultivator to ultimate consumer. The pulses are marketed as grains by farmers. The ultimate product sold is dal.

In Andhra Pradesh, farmers usually kept the produce of pulse crops for their consumption. In case, they wanted to sell their produce, they did so to the commission agents who come to the villages from the nearest district headquarters.

In Assam, the sample villages of Nagaon and Jorhat districts were in the vicinity of townships. In the absence of processing units of pulses, the cultivators processed lentil and teora by indigenous methods. Therefore, polishing of dal is not good. Urd and moong, were sold as grains. Some petty traders in small townships procured urad and moong from farmers and converted into dal by indigenous method with the use of grinding stones. These pulses are usually sold in the local weekly market, nearest town and even in the villages itself. In the case of lentil and teora the producers sell these in local weekly markets.

In Bihar, the large farmers of both the districts kept the produce for sometime and sold it on price hike rather than selling at distress price. But it was not indicated in case of other categories of farmers, which was quite natural. In case of selling as reported local hats were rather more safe selling points for them instead of falling in the clutches of middlemen or traders or commission agents.

In Haryana, most of the farmers sold their marketable surplus of pulses within the village to commission agents. About 4 per cent producers in Bhiwani disposed their

produce to village shopkeepers / merchants. Some pulse producers sold their produce outside the village in big markets. It was observed that with the increase in the size of farms, the tendency to sell pulses outside the village increased. Out of the total pulse growers 14 per cent in Bhiwani and 18 per cent in Ambala withheld their produce for later sale. Agricultural prices had a seasonal behaviour. These declined immediately after harvest and then started rising. The gap between the prices received by the producers and paid by the consumers was significantly high in the case of pulses. For gram, the producer's share in the consumer's rupee was 62 paisa in Bhiwani while it was 61 paisa for lentil in Ambala. Price spread was high in the case of gram as well as in lentil.

Most of the dal mills of Haryana did not procure pulses directly from farmers because farmers were scattered over a large area. Therefore, the dal mills relied on commission agents for the supply of pulse grains. The mills paid commission to the agents on the basis of the quantity supplied. The sample dal mills indicated that the quantity processed varied from 25 qunitals to 150 quintals/day according to the capacity of dal mill, season and the demand for dal. It was estimated that in one quintal of pulse grain processed, 70-75 kg. of dal was obtained. The damaged dal weighed between 2-3 kgs. Among the by products, bran weighed 11-12 kg./qtl., shell 8-9 kg./qtl. and small pieces 2-3 kg./qtls.

In order to provide an alternative marketing system and to ensure remunerative prices to the farmers, the produce of the farmers should be procured by an integrated agency or cooperative society eliminating the system of middlemen. This would ensure reasonable returns to the farmers. The consumers too would get pulses at reasonable rates.

In Madhya Pradesh, farmers sold marketable surplus during the harvest season and a minimum quantity was retained till the pre-harvest season which fetched highest price. It was observed that the maximum price could be obtained by selling the product in mandis. The price received from traders outside the village was lower and the price received within the village was lowest.

In the case of gram and tur in all the three selected districts, the general rule of higher arrivals and lower prices and decreasing arrivals coupled by higher prices prevailed. However, no inverse relationship was noticed in the trends of arrivals and prices. The arrivals, depended on the 4 seasons of harvest, post harvest, sowing and pre harvest seasons. During the harvest season the arrivals were high and the prices were low. On the other hand during sowing and pre harvest seasons the arrivals were weak and the prices soared.

Processing of pulses was not done at the household or village level except for the needs of own consumption. The produce was sold in mandis, to agents of dal mills and traders. At the dal mills processing of all kinds of pulses was undertaken. The investigations of the sample dal mills indicated that the quantity processed varied from 25 quintals a day to 120 quintals per day. It varied with the capacity of the mill, season and

the demand for dal. It was estimated that in 1quintals of pulse grains processed, 70-75kg. of fine dal was obtained. The damaged dal weighed 2 kg. Among the by products bran weighed 12 kg. shell 8 kg. and small pieces 3 kg. According to mill owners the percentage of profit in the processing of pulses ranged between 25 to 30 per cent over the price of pulses. Hence, the real beneficiary of marketing and processing of pulses was the dal mill owner who purchased pulses at the lowest price, processed the pulses and got the value of every small product and by product. The only way to benefit the small and big farmers was to set up dal mills in the cooperative sector by the farmers cooperatives.

In Maharashtra, the monthwise purchase and sale price of tur and gram and the gap between purchase and sale price for all four districts showed that the purchase price of both tur and gram was substantially higher than the minimum support price (MSP) announced by the Government. Another interesting worth noting point was that the purchase price of tur was relatively higher in the peak supply period (November and December) in all four districts compared to other months. The main reason expressed for this by the mill owners was that although November and December were peak harvesting period, there was a huge demand for tur especially in these months as large number of buyers usually come from long distances to procure tur from these districts. As far as the gap between purchase and sale price, it varied from Rs.657 per quintal to Rs.1,205 per quintal for tur and the same varied from Rs.241 to Rs.460 per quintal in gram in the selected districts. Among four districts, the gap in price (especially in tur) was higher in Amravati district than the remaining three districts.

The dal mill owners gave many reasons for the wide gap in purchase and sale price of tur and gram. Firstly, the total processing expenditure for making dal from raw gram and raw tur came to Rs.250 to Rs.300 per quintal, secondly, the wage rate for labourers was increasing; thirdly, electricity and maintenance charges increased at a faster rate, fourthly, transport charges and taxes increased and finally, depreciation charges and interest on capital were borne.

In Orrisa State, the farmers usually kept the produce of pulse crops for the home consumption and also for the purpose of seed for the next year. Whenever they sold the produce, they sold it to the local traders and commission agents in the villages.

In Punjab, sample farmers produced 428 quintals of moong and 619 quintals of gram. Out of this, 5.72 per cent of moong and 17.69 per cent of gram was kept for consumption, feed and seed. The remaining 94.28 per cent of total moong production and 82.31 per cent of gram production was marketable surplus. Out of this, 92.83 per cent of moong and 76.33per cent of gram was marketed within two/three months after harvesting. Around 25 per cent pulse growers in Ludhiana and about 21 per cent in Firozpur sold their marketable surplus within the village to commission agents. Moong producers in Ludhiana (14.20 per cent) and around 8 per cent of gram growers in Firozpur district disposed their produce to village shopkeepers/merchants. In Firozpur, 2.7 per cent pulse producers sold their produce to neighbourers. It was observed that with the increase in the

size of farms, the tendency to sell pulse grain outside the village increased. Out of the total pulse growers 5 per cent in Ludhiana and 28 per cent in Firozpur withheld their produce for sale in lean months in expectation of price rise. It is generally observed that the gap between the prices received by the producers and paid by the consumers was significantly high. The benefit of price rise was not passed on either to producers or to consumers. Only traders enjoyed the benefits.

Pulses were processed by 'Dal Mills'. Most of the mills did not procure pulses directly from farmers because farmers were scattered over a large area. Therefore, dal mills relied on commission agents for the supply of pulse grain. The mills paid commission to the agents on the basis of the quantity supplied. The survey of dal mills in Ludhiana and Firozpur indicated that prices of pulses got influenced by the season. These declined immediately after harvesting in response to supply conditions and then started rising. This was also true for moong and gram in the selected districts. The data obtained from dal mills revealed that the quantity of processed pulse grains was between 25 qtls/day and 150 qtls/day. It varied according to the capacity of the mill, season and the demand for dal. In Punjab, the cost of processing dal was around Rs.2 per kg. There was no breakthrough in the processing technology. A large number of dal mills in Ludhiana and Firozpur in the recent past were closed down due to paucity of business. Production of pulses drastically came down in the state during the last three decades.

The marketing structure for pulses in Punjab was inadequate despite high demand the production environment for pulses being adverse in Punjab. There was great need to establish a large number of efficient markets for the sale of pulses.

In Nagaur district of Rajasthan, more than 90 per cent of the total pulses production was sold in the village itself. Village traders or private traders were the most important agencies to whom pulses were sold. The quantity of production retained for seed purpose was negligible accounting for less than one per cent of the total produce. The processing of pulses in the dal mill is carried out by old practice, which has not reached yet present scientific technique. Four to five dal mills out of 15 were operating with 30 to 35 qtls. capacity a day. In Hanumangarh district, majority of the farmers of the selected villages marketed their pulses production after harvesting to village traders or private traders because they had to repay their debt. There are 8 dal mills, but only 2 dal mills are processing 30 to 40 quintals per day during the peak period. Most of the dal mills were closed down in both the districts due to low recovery, high cost of milling and high cost of the maintenance of the machinery. The traders from Delhi and Punjab purchased gram in bulk quantity from Hanumangarh district and this was another important cause of local dal mill not getting enough quantity of raw material.

In Salem district of Tamil Nadu. urd, moong and cowpea were the important pulse crops. More than 90 per cent of the output was sold to the local traders and the agriculture department leaving a small quantity for self consumption and seed purpose. In Tuticorin district, urd and moong were the major pulse crops. In the case of urd, local traders approached the farmers after the harvest and purchased at the prevailing prices in

the market. All the farmers sold the produce immediately after keeping some output for self consumption and seed.

In Uttar Pradesh, among the kharif pulses moong was found to be marketed maximum and urad was minimum. Among the rabi pulses pea (green) was found to be marketed maximum. Gram and lentil were also marketed considerably. While the disposal of tur (early rabi) was lowest in the state as a whole, among summer crops urad was found to be marketed maximum. In summer season disposal of urad was found higher than moong.

The average marketing cost in the case of urad was Rs.63 per quintal against Rs.108 in the case of moong. While the milling cost per quintal was Rs.70 in the case of urad against Rs.67 in the case of moong. Among rabi pulses, gram, lentil and pea were milled in few of the selected zones. The marketing cost per quintal in the case of gram was R.106 against Rs.92 in lentil and Rs.102 in pea. The milling cost per quintal in gram was Rs.72 against Rs.56 in lentil as well as in pea. Thus, on the whole the marketing and milling of pulses were obviously poor in almost all the zones except in Central Plateau Zone of Uttar Pradeh.

In West Bengal, for all the pulses together, the percentage of pulses output sold in the market (marketed output) constituted 49.88 per cent in Purulia, 57.60 per cent in Malda and 43.52 per cent in Cooch-Behar. The proportion of output retained for seed accounted for 5.88 per cent in Purulia, 3.49 per cent in Malda and 5.35 per cent in Cooch-Behar. The rest of the produce (44.24 per cent in Purulia, 38.91 per cent in Malda and 51.13 per cent in Cooch-Behar) was retained for consumption. A lion's share of the marketed produce reached the market at the time of harvest. Farmers with surplus usually prefered to sell pulses in villages to the commission agents/representative of "dal" mill owners. There were 3 marketing channels.

1. Producer - commission agent – miller- retailer/ trader – consumer
2. Producer – miller – retailer/ trader – consumer
3. Producer – commission agent – miller – wholesaler – retailer/ trader- consumer

In surveyed area, it was the first channel which predominated. In the above marketing channels, miller was the principal intermediary who procured unprocessed pulses either through the commission agents or directly from the producer for being split at 'dal' mills and then pass on to the traders/retailer, either through wholesalers or directly. In order to understand the reasons for large gap between purchase price from producers and sale price to consumers, the information from mill owners in the districts of Malda and Cooch-Behar was gathered. The reported reasons were (i) greater amount of by products and wastage due to low quality of pulses (ii) shortage of supply of pulses (iii) mills did not operate for the year round (iv) unprocessed pulses are procured within 3-4 months and are sold the year round. (v) commission kept by the intermediaties (vi) Selling price of by product is low.

In Purulia district, there was no dal mill as such. In other two districts, viz Malda and Cooch Behar, dal mills existed earlier and also now exist but in a reduced number. Some of the dal mills have already been closed. The reasons for closure of dal mills were –

i) shortage of locally produced pulses
ii) low profit margin due to low quality of pulses
iii) better quality of dal coming from other states at lower prices and
iv) tough competitive market.

Of these shortage of supply of locally produced pulses came to be the most important reason for the decline of dal mill industry.

4.7 Constraints in Raising Pulses Production

Pulses production in the country as well as in the States remained stagnant. On the basis of the data collected at the farm level with regard to pulses and discussions with the farmers and State Government Officials following constraints were identified which hinder in the raising of production of pulses.

The most important constraints suggested by farmers of different states are mentioned in descending order of importance (Table 4.8).

1) Lack/non availability of high yielding (improved) and short duration varieties of pulses. Out of 13 States, 12 States pinpointed this reason.

2) Lack of extension, training and credit facilities - Low adoption of new technology by farmers was due to lack of proper extension services and poor resource base of the farmers. There was hardly any technological change in pulse farming. The farmers of 11 states complained this reason for slow growth of pulse crops.

3) a) Pulses were grown on marginal/sub marginal lands (inferior lands)

   b) Manuring and fertilisation of these crops was badly neglected. Inadequate/no use of fertilizer was also one reason.

   c) Due to non-availability of good and high yielding varieties of seed, majority of the farmers raised traditional varieties of pulses.

   The sample farmers of 10 States reported the above three mentioned reasons for slow growth of pulses.

Table 4.8 Constraints in raising the pulses production

S. No	Constraints / States	Andhra Pradesh	Assam	Bihar	Gujarat	Haryana	Madhya Pradesh	Mahara-shtra	Orissa	Punjab	Rajasthan	Tamil Nadu	Uttar Pradesh	West Bengal
1	Lack / non-availability of high yielding and short duration varieties. Subsidy is not provided on it.	---	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2	Lack of extension, training and credit facilities : Low adoption of new technology by farmers is due to lack of proper extension services and poor resource base of the farmers (Poor extension service).	---	Yes	Yes	Yes	Yes	Yes	Yes	---	Yes	Yes	Yes	Yes	Yes
3	Pulses are grown on marginal /sub marginal lands (inferior lands) characterised by moisture and fertility stress.	Yes	Yes	---	Yes	---	Yes	Yes	Yes	---	Yes	Yes	Yes	Yes
4	Manuring and fertilisation of these crops is badly neglected. Fertilizers account for less than 5 per cent of the total cost. (Inadequate use of fertilizers and other inputs)	Yes	Yes	Yes	Yes	---	Yes	---	Yes	---	Yes	Yes	Yes	Yes
5	Good and High Yielding varieties of seeds are not available in required quantity. Majority of the farmers raised "traditional varieties" only.	Yes	Yes	Yes	---	---	Yes	Yes	Yes	Yes	Yes	Yes	---	Yes
6	Pulses are susceptible to pests and diseases (Absence of proper plant protection measures)	Yes	Yes	Yes	---	---	Yes	---	Yes	---	Yes	Yes	Yes	Yes
7	Relative profitability of pulse crops is lower than the other cereal crops. In fact prices of whole pulses are not that attractive and the margin between prices of split and whole pulses is quite high which usually goes to the middlemen.	Yes	---	Yes	---	Yes	Yes	---	---	Yes	---	Yes	Yes	Yes
8	Major portion of the area under pulses is unirrigated (Lack of irrigation facilities)	Yes	---	Yes	---	Yes	Yes	---	---	---	Yes	Yes	---	Yes
9	Erratic weather, untimely rainfall, high humidity, cloudy weather at flowering are the climatic barriers in pulses cultivation. (Adverse Weather Conditions)	Yes	Yes	Yes	---	---	Yes	--	--	--	--	Yes	Yes	Yes
10	Damage by stored grain pests and unsatis-factory post harvest technology. (Processing and marketing)	Yes	---	---	Yes	---	Yes	---	---	---	---	Yes	Yes	---

Table 4.8 .....Continued

S. No	Constraints / States	Andhra Pradesh	Assam	Bihar	Gujarat	Haryana	Madhya Pradesh	Mahara-shtra	Orissa	Punjab	Rajasthan	Tamil Nadu	Uttar Pradesh	West Bengal
11	Agronomic Constraints: Improper sowing time, low seed rate, improper method of sowing, lack of interculture operation, no weeding, lack of irrigation at the time of drought condition.	---	Yes	Yes	---	---	Yes	---	Yes	--	Yes	---	---	---
12	New technologies have not reached the farmers in a meaningful way.	---	Yes	---	---	---	---	---	Yes	Yes	---	Yes	---	Yes
13	Land preparation and soil management are inadequate. (Lack of soil testing facilities)	Yes	---	Yes	---	---	Yes	---	Yes	---	---	---	---	---
14	Low productivity of pulses	---	---	Yes	---	---	---	---	---	Yes	Yes	Yes	---	---
15	Pulse farming is non-remunerative, costly and risky.	---	---	---	---	---	---	---	---	Yes	---	---	Yes	Yes
16	Social/ personal factors (like insecurity of pulse crop regarding its damage, theft, premature plucking, looting at the harvest-ing stage by the neighbours/passers-by, anti-social elements, cattle grazers and crop looters also affected the growth of area.	---	---	Yes	---	---	---	---	---	---	---	---	Yes	---
17	Farmers had meagre knowledge about diseases, insects and pests and chemical devices	---	---	---	---	---	---	---	---	---	Yes	---	---	`Yes
18	There was no provision of crop insurance in the cultivation of pulse crops	---	---	---	---	---	---	---	---	---	Yes	---	---	---
19	Pulses are energy rich crops but they are cultivated largely under conditions of energy starvation.	Yes	---	---	---	---	---	---	---	---	---	---	---	---
20	Marketing problems in selling their produce	---	---	---	---	---	---	Yes	---	---	---	---	---	---

4) The farmers of 9 States reported that the pulses were susceptible to pest and diseases. There was absence of proper plant protection measures.

5) Relative profitability of pulse crops was lower than other crops. In fact prices of whole pulses are not that attractive and the margin between prices of split and whole pulses was quite high which usually went to middlemen. This problem was quoted by the farmers of 8 States of the country.

6) a) Major portion of the area under pulses was unirrigated. Lack of irrigation facilities and dependence on rains were the reasons of low production.

b) Adverse weather conditions such as erratic and untimely rainfall, high humidity, cloudy weather at flowering were the climatic barriers in pulse cultivation.

These above two problems were reported by the sample farmers of 7 States.

7) a) Damaged by stored grain pests and unsatisfactory post- harvest technology

b) Agronomic Constraints- Improper sowing time, low seed rate, improper method of sowing, lack of interculture operations, no weeding, lack of irrigation at the time of moisture stress condition.

c) New technologies have not reached the farmers in a meaningful way.

The above constraints were faced by the farmers of 5 states.

8) Low productivity of pulses and inadequate land preparation and soil management, were the problems faced by farmers of 4 States. Lack of soil testing facilities was also one of the problems.

9) The farmers of three states opined that the farming of pulses was non-remunerative, costly and risky.

10) a) Social / personal factors like insecurity of pulse crop regarding its damage, theft, premature plucking, looting at the harvesting stage by the neighbours/passers- by, anti-social elements, cattle grazers and crop looters also affected the growth of pulse crops.

b) Farmers had meagre knowledge about diseases, insects and pests and chemical devices.

These two constraints were reported by the farmers of 2 States.

11) a) Marketing problems in selling their produce

b) There was no provision of crop insurance in the cultivation of pulse crops.

c) Pulses were energy rich crops but were cultivated largely under conditions of energy starvation.

The above constraints were reported by the farmers of one State out of 13 States under study (Table 4.8).

4.8 Strategy Suggested for Increasing Pulses Production for Different States

The following are some of the ways in which pulses production can be increased in selected States, as suggested by different AER Centres.

(1) Andhra Pradesh

A) Additional area should be brought by using fallow land after kharif rice. There are also possibilities of increasing area under pulses in the lean periods when the farmers generally do not grow any crop and keep the land fallow, e.g. short duration moong varieties can be grown as catch crop in summer wherever irrigation facilities are available. Popularisation of cultivation of urd and moong in rice fallows and inter- cropping of pulses with groundnut, cotton, jowar, bajra and maize should be done.

B) Good quality certified seeds should be made available to the farmers at reasonable prices.

C) Department of Agriculture should popularise short duration varieties of all pulse crops and application of fertilizers particularly phosphatic fertilizers should be done.

D) Adoption of plant protection measures to reduce crop losses due to insect pests and diseases be done.

E) Farmers should be encouraged to adopt a package of agronomic practices.

F) Efficient marketing facility be developed to ensure the benefit from the existing high prices of dal to the producers.

(2) Assam

A) For increasing coverage,intercropping of pulses with other crops be intensified. Relay inter- cropping of rabi pea and teora with paddy is feasible. Cultivation of urd, moong in rice fallows may also be viable.

B) Farmers should be encouraged to take up pulse production on commercial basis in potential areas of the State.

C) Production and productivity of most of the pulses can be increased through adoption of improved technology like use of HYVs and improved agronomic practices.

D) Extension services should be extended so that farmers get adequate training and experience for better production of pulses.

E) Timely supply of quality seeds to farmers be ensured.

F) Irrigation department should take appropriate measures to supply irrigation in drought area.

(3) Bihar

A) To reduce the gap between demand and supply of HYV seeds, there is need to increase the production of seeds through the components of NPDP like Seed Village Programme.

B) The organisation of pulse growers cooperative societies be promoted so that the pulse growers could be able to get the benefits of the cooperatives.

C) To compensate the losses due to natural calamities, crop insurance scheme should be introduced.

D) Soil testing facilities should be made available at village/panchayat levels and the inputs used in pulses cultivation be made available in time.

E) An efficient marketing system should be developed so that the pulse growers could be able to get the maximum share in consumer's rupee.

F) The government should help the pulse growers by way of making announcement of attractive prices.

(4) Gujarat

A) Efforts should be made to bring fertile and irrigable land under pulses.

B) The extension agencies should take more care and interest in the proper and efficient use of different components of inputs distributed to the farmers instead of only fulfilling the physical and financial targets.

C) To bring more area under pulses instead of concentrating on marginal and small farmers, efforts should be to encourage large farmers.

(5) Haryana

A) Pulse crops should be introduced as mixed crops/ rotational crops in the irrigated areas.

B) Improved varieties of pulses seeds should be made easily available to the growers.

C) Adequate investment should be made in research for evolving area specific disease resistant varieties.

D) The research results should be carried to the doors of cultivators and they should be convinced about the enhanced profitability of pulses grown through improved production technology.

(6) Madhya Pradesh

A) There is a need to intensify research efforts to evolve still higher yielding varieties of pulses for various agro-climatic regions.

B) Whatever quantity of new varieties seed of pulses was available should be distributed among all groups of farmers.

C) There is a necessity of evolving such varieties which can be grown under dry farming conditions and under moisture stress.

D) If the benefit of higher price of dal has to be given to the pulse growers, farmers cooperative marketing and processing societies should be organised.

E) Pulses are susceptible to pests and diseases. However, the farmers are reluctant to adopt plant protection measures.

F) In Chhattisgarh region, the farmers wanted late varieties of gram which could be sown after the harvest of rice crop. There was a strong demand for high yielding varieties of lentil and teora.

G) Efforts be made to increase percentage of irrigated area under pulses.

H) Pure certified seed, fertilisers and pesticides should be available to the farmers at proper time.

(7) Maharashtra

A) Since Maharashtra is one of the important States in the cultivation and production of pulses, a separate agency for pulses development can be established to procure pulses from the farmers as well as to provide extension services for promoting the cultivation of pulses in the State.

B) Government should make adequate arrangements for providing improved seed and other inputs in time.

C) As the pulse crops are not remunerative, government can reduce the price of improved seeds.

D) Farmer are reluctant to cultivate tur crop mainly because of its long duration. Therefore, steps should be taken to reduce the maturity period of tur by promoting research and developmental activities.

E) Efforts should be made to explain the importance of seed treatment to the pulses growing farmers.

F) Steps should be taken to explain why pulses crops do not require more nitrogenous fertilizers by conducting frequent demonstrations in the intensive pulse growing districts.

G) Steps should be taken urgently to provide quality extension services for increasing the adoption of micro- nutrients.

H) As many crops have been facing pest related problems in the recent years, government can think of establishing a separate agency called "Pest and Diseases Control Squad" for providing advice to the extension officials and also to the pulse growing farmers.

I) Department of agriculture of the State can advise the farmers to cultivate pulse crops as an inter crop with other irrigated crops.

J) As the production of pulses is very essential for nutritional security of the poor section of population, government can reduce the rate of interest of 'crop loan' given for the pulse crops.

K) Since pulse crops are cultivated predominantly in the rainfed areas, to remove the fear among the pulse growing farmers, government can introduce 'crop insurance scheme' for pulse crops with low rate of premium.

(8) Orissa

A) Seed village approach is desirable for providing good seed.

B) Reduction in rhizobium population in the medium and low lands after kharif paddy can be remedied by giving a starter dose of nitrogen for pulse cultivation in paddy fallows.

C) Short duration, cold resistant varieties must be evolved.

D) Majority of the soils of Orissa are acidic and have high phosphorus fixation capacity. Therefore, application of phosphatic fertilisers is a must.

E) Area approach should be adopted for increasing pulse production and in irrigated command areas three crop sequence be followed.

F) After short duration paddy, short duration urd should be grown in the rainfed high lands. In the rainfed medium land a summer crop of moong/urd has great potential.

G) Baisakhi moong can be grown between June and August preceding sesamum, as the monsoon breaks. A short duration moong can be grown as a kharif crop preceding niger in the eastern ghat region.

H) As pulses are very much susceptible to insect-pests and diseases adequate plant protection measures is a must.

I) Efficient marketing facility for pulse crops is essential.

(9) Punjab

A) High yielding disease resistant varieties of pulses need to be developed.

B) Adequate quantity of certified seeds should be made available well before the time of sowing. In addition, support services like fertilisers, rhizobium culture and insecticides should be provided at concessional rates.

C) There is an urgent need to evolve disease resistant, area specific varieties of gram against gram blight and grey mould diseases.

D) It is essential to introduce pulses in crop-rotation /mixed crops/ additional summer crops.

E) To achieve maximum production, an effective link between Technology Mission, State Department of Agriculture, extension staff, pulse producers, marketing and processing is essential.

(10) Rajasthan

A) Improved varieties of pulses seed should be distributed according to the agro-climatic conditions.

B) Farmers should be convinced to use high yielding short duration improved varieties on fertile land during kharif season.

C) Improved varieties should be resistant to pests and diseases.

D) It is necessary to bring pulse crops under crop insurance scheme because the cultivation of pulses is full of risk.

E) Improved package of practices with specific bacterial culture is important to increase the production of pulses in traditional areas.

F) Massive training programmes and extension efforts are needed to educate the farmers about the use of chemical fertilizers and plant protection measures.

G) Adopting mixed cropping should be advised.

H) Efficient marketing and storage facilities should be developed to ensure that the benefits go to the farmers.

I) There is an urgent need of higher yielding pulses varieties to keep pace with the demand of increasing population.

(11) Tamil Nadu

A) Improved seeds of pulses should be supplied in time.

B) Drought resistant and disease resistant varieties of seeds suitable for different climatic conditions should be developed.

C) Effective pesticides should be evolved and recommended to the farmers to contain the pest menace which was a major problem in the pulses cultivation.

D) Mixed cropping and inter cropping of pulses in the irrigated areas could be encouraged as the scope of increasing the area under pulses as a single crop was limited.

E) Inputs like fertilizers, seeds and pesticides should be supplied at subsidised rates.

F) Traditional harvest and post harvest technology should be reoriented to save the loss in these processes.

G) Pulses should be procured from the farmers at support price at the time of harvest to mitigate the fluctuations in prices.

H) A package of all these measures in an integrated manner will be more effective to increase the production of pulses.

(12) Uttar Pradesh

A) Adequate supply of certified seeds of improved and high yielding varieties of pulses should be made available to farmers timely and at cheaper rates.

B) Phosphatic and potassie fertilizers should be made available to pulses growers as and when required at subsidised rates.

C) High yielding varieties of pulses resistant to diseases and pests, abnormal weather conditions and fluctuating marginal and sub marginal soils must be evolved for increasing the production.

D) Support prices of pulses should be declared before sowing.

E) Proper training facilities and more awareness about know-how of improved and modern technology of pulses should be extended by the present technical mission of pulses.

F) More and more marketing and milling infrastructure should be developed to encompass pulses growing remote rural areas in all the zones.

G) More subsidies and incentives must be given to the farmers for growing pulses in all the zones of the State.

(13) West Bengal

A) The available H.Y.Vs of pulses are not capable of generating higher yields. Therefore, there is an acute need to intensify research work to develop/evolve some new varieties appropriate to the agro-ecological conditions of the respective regions.

B) Field experience suggests that despite all these measures, farmers are still unaware of the viable HYVs in pulses which can compete well with HYVs of cereals. Therefore, much needs to be done to strengthen and intensify the extension work so that most of the researches done can reach the farmers and acquire popularity. Minikits should contain the most promising varieties suited to the agro-climatic conditions.

C) Special efforts should be made to generate and transfer appropriate technologies for dry farming and limited irrigational conditions of agriculture.

D) All round efforts have to be made on improving the efficiency of the marketing and processing system so that producer could get due share in consumer's rupee.

E) Marketing cooperatives by pooling the small and scattered producers can improve the bargaining strength of the pulses growers and can thus effectively eliminate the margin appropriated by the market intermediaries.

F) Pulses are susceptible to pests and diseases. Adoption of plant protection measures is a must.

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CHAPTER V

SUMMARY AND CONCLUSIONS

5.1.1 The New Agricultural Technology (NAT) introduced during the mid-sixties did not make uniform impact on all the crops. Production of rice & wheat increased substantially, while it was almost stagnant in pulses. As a result of stagnant production and continuous growth of population, the per capita availability of pulses fell drastically. Despite many promotional schemes for increasing pulses production during the different plan periods, the production of 1990s was almost the same as it was in the early 1960s.

India is the largest producer of pulses in the world, both in quantity and quality. It produces 40 to 80 per cent of the global production of pulses like gram, arhar (tur), lentil, pea, cowpea, moong and urad. The area under pulses in India in1995 was 24 million hectares or 35.45 per cent of the world area. The production of pulses was 14.8 million tonnes or 26.46 per cent of the world production. The yield was 595 kg. per hectare as against world average of 796 kg. per hectare. Thus India's yields of pulses lagged far behind that of world average.

Once a net exporter, India is presently one of the largest importers of pulses. The crisis of pulses is gradually firing up its grip on increase in demand, due to growth in population and introduction of protein based food industries. There is a need to check pulses import which drained much needed foreign exchange. To bridge the gap between demand and supply of pulses, India needs manifold increase in pulse production.

5.1.2 Pulses are the primary and cheapest sources of vegetable protein for the poor and vegetarians who constitute significant proportion of Indian population. From the agronomic point of view, pulse crops increase the soil fertility through the nitrogen fixing bacteria present in the root nodules. In India the per capita availability of pulses is declining from year to year due to increasing population and nearly stagnant production. The per capita net availability of foodgrains increased from 468.7 gm./day in 1961 to 510.1 gm./day in 1991. However, the availability of pulses declined from 69 gm./day in 1961 to 41.6 gm./day in 1991 and further to 34.8 gm./day in 1996. To meet the growing needs of the country, the pulse production programmes were initiated with different developmental strategies during various plan periods.

Unlike in rice and wheat, importance is not given to study the problems and constraints relating to pulses production by using field level data. Macro level data can be useful to understand the trends in area and production, but one can not understand the reasons for less adoption of yield increasing inputs and the problems in cultivating pulse crops. Lower productivity and lower use of inputs are field level problems and these can be studied only by field level information.

5.1.3 The main objectives of this study are :

1. To find out the socio-economic characteristics of the farmers who cultivate pulse crops.

2. To analyse the input use pattern of pulse crops.

3. To analyse the relationship between the use of inputs and output.

4. To find out the factors which affect the growth of pulses area and productivity.

5. To find out the economics of production of different pulse crops grown under irrigated and rainfed conditions as compared to other predominant crops of the area in different seasons.

6. To identify factors responsible for diversion of area from pulses to other crops and the extent of diversion and its result.

7. To study possibilities and extent of diversification and expansion of area under pulses by way of multiple cropping, intercropping, etc. both under rainfed and irrigated systems.

8. To identify reasons for non/partial adoption of improved production technology and sub-optimal use of inputs like improved seeds, phosphatic and sulphur rich fertilisers and other micro-nutrients, plant protection chemicals and other inputs.

9. To suggest various measures (financial and non financial) for increasing production and productivity of pulses.

10. Factors responsible for large gap between purchase price from farmers (very low) and sale price to consumers (very high) of pulses.

11. To explore the possibility of contract cultivation of pulses within the country and suggest most suitable areas to undertake this for different pulse crops.

Some A.E.R. Centres also analysed the trends in area, production and productivity of major pulses in the respective states.

Due to non-availability of data on some of the above objectives no observations could be made/conclusions drawn.

5.1.4 Thirteen states under the 10 Agro-Economic Research Centres of the country were included in this study. It was proposed that in the state sample, districts/blocks should be so selected so as to represent all the agro-climatic zones/regions. The district selected for field work among the districts of respective zones was representing the highest area under pulse crop. From each of the selected districts 5 blocks were selected and from each block one village was selected. A sample of 10 pulse growers from each village was randomly selected. In this way, 50 farmers from each of the districts, were selected. The farmers have been divided into five size groups according to the size of land holdings viz., marginal (upto 1.00 ha.), small (1.01 to 2.00 ha.), semi-medium (2.01 to 4.00 ha.), medium (4.01 to 10.00 ha.) and large (above 10.00 ha.).

This study was based on both primary as well as secondary data. Primary data was collected from sample farmers and secondary data was collected from various Agricultural Statistics, published by Ministry of Agriculture, Government of India and Directorate of Agriculture of various State Governments. Besides these, the data from dal mill owners for the year 1996 (January to December) was collected. The reference year of the study was agricultural year 1996-97, viz. crop season rabi 1996, summer 1997 and kharif 1997. Cost means cost A_2. Cost was calculated with the help of standard cost concept. The items included in cost A_2 are Cost A_1 + rent paid for leased in land.

5.2.1 India is the largest grower and producer of pulses in the world as it ranks first in both area (35 per cent) and production (26 per cent) under pulses. Despite being the largest producer, the pulses productivity is one of the lowest (595 kg./ha) in the world. India grows a variety of pulse crops. No other country in the world grows such a large number of varieties. The area under pulses increased from 18,780 thousand hectares in 1951-52 to 23,920 thousand hectares in 1995-96 in the country. In relative terms, area under pulses has been hovering around 19 per cent of the total area under foodgrains.

5.2.2 So far as the pulses production scenario in the different states of the country is concerned, Madhya Pradesh is the largest producer of pulses. Madhya Pradesh accounted for 21.45 per cent of the total area under pulses and its share in total production was 23.50 per cent of the country's production. The average productivity level was also higher in Madhya Pradesh as compared to the national average. The other major pulse growing states were Rajasthan, Maharashtra, Uttar Pradesh, Orissa, Karnataka and Andhra Pradesh. Other states with considerable area were Tamil Nadu, Bihar, Gujarat, Haryana and West Bengal. Madhya Pradesh, Uttar Pradesh, Maharashtra, Rajasthan and Orissa are the major pulse producing States, accounting for about 72 per cent of pulses area in the country and 73 per cent of the total production. The highest productivity of pulses is in Haryana followed by Uttar Pradesh, West Bengal, Bihar, Madhya Pradesh, Gujarat, Orissa, Maharashtra and Karnataka. The coverage of pulse area under irrigation was highest in Haryana followed by Uttar Pradesh, Madhya Pradesh, Rajashthan and Gujarat.

5.2.3 The requirement for pulses for 1994-95 as per physiological norms set by ICMR (Normatic Demand Model) works out to 14.32 million tonnes for which production requirement is estimated at 17.66 million tonnes, but the projected supply comes to only 14.50 million tonnes indicating a huge gap of 3.16 million tonnes between demand and supply. By the turn of the century (2000-2001) production of 19.77 million tonnes would be required to meet the consumption requirement of 16.04 million tonnes, but the projected supply of pulses comes to only 16.30 million tonnes indicating a gap of 3.47 million tonnes between demand & supply.

5.2.4 Among different States, Madhya Pradesh has earned an important place as it ranked first both in terms of area and production of pulses. In Madhya Pradesh, the increase in production of pulses was mainly due to significant increase in the yield of pulses. The other important pulse growing states of the country in respect of area are Rajasthan, Maharashtra, Uttar Pradesh, Andhra Pradesh, Bihar, Orissa, Gujarat and Tamil Nadu. The trend for production were different in these states. The production of pulses was second highest in Uttar Pradesh followed by Rajasthan, Maharashtra, Bihar, Andhra Pradesh, Orissa, Gujarat and Haryana. The highest yield was observed in Haryana followed by Punjab, Uttar Pradesh, Bihar, Madhya Pradesh, West Bengal, Orissa and Gujarat. The high productivity of pulses in Haryana, Punjab, Uttar Pradesh and Madhya Pradesh was mainly due to higher percentage of area under irrigation in these states.

In India the growth rates of area and production of pea were observed to be highest and highly significant, whereas, in the case of yield it was highest in teora. Lentil was another important pulse crop which showed positive and highly significant growth in area, production and yield.

In Andhra Pradesh, arhar, urad and moong were the main pulse crops. Urad reported significant and positive growth rates in area, production and yield. The production and yield of arhar showed neither acceleration nor deceleration.

In the state of Assam, the total pulses area had a negative growth rate. As in the area, the production also showed downward trend. The yield of total pulses is irregular and unstable. The area under urad was almost static. The growth rates of production and yield were 4.73 per cent and 4.61 per cent per annum respectively. The area of pea decreased year after year but the production and productivity have increased at a comparatively better growth rate.

In Bihar, the area and production of gram showed negative growth of 4.49 and 1.91 per cent per annum respectively, while the productivity showed a positive rate of growth of 2.58 per cent. In the case of arhar and pea declining trends in area, production and productivity were observed. In the case of teora, the area and production showed negative growth, which was statistically significant, whereas, the productivity had

a positive growth rate. In the case of area, all selected pulse crops (except lentil) witnessed negative growth rates. The reduction in area might be due to shifting of cropping pattern.

In Haryana during 1967-1996, area and production of total pulses showed negative growth, while the productivity showed a positive rate of growth.

In Madhya Pradesh, the growth rate of area was highest in the case of lentil followed by pea, gram and teora. Moong-moth, urad, kulthi and arhar registered negative growth rates in area. In the case of production, very high growth rate was observed in teora followed by lentil, pea and gram. It was negative in the case of moong-moth, arhar, kulthi and urad. In the case of yield, all the pulse crops registered positive growth rates. The growth rates of production and yield of total pulses in Madhya Pradesh were positive and highly significant, whereas, it was very low and insignificant in the case of area.

Gram and arhar were the most important pulse crops of Maharashtra. Arhar occupied the first place among the pulse crops in the state. The growth rates of area and production of arhar were 3.94 and 3.53 per cent respectively. It was significant. But in the case of yield, the growth rate was negative. The growth rate for total pulses was 1.88, 5.22 and 3.30 per cent per annum for area, production and productivity respectively, which was also highly significant.

In Orissa, the growth rates of area and production of total pulses were statistically significant. But this effect is not reflected in the case of yield. In the case of moong and urad, area and production showed positive growth rates but there was negative growth in the case of yield. The area and production of arhar showed neither acceleration nor deceleration. But the yield has a growth rate which is significant.

In Rajasthan, among kharif pulses, moong showed positive and significant growth in respect of area and production. Cowpea showed a negative growth rate of area but it has positive and significant growth rate in respect of yield. Out of the three rabi pulses (gram, lentil and pea), only pea showed negative growth rate in the case of area but it has positive and significant increase in growth rate of production. In the case of lentil, the growth rate of area and production both declined but in the case of yield, it showed positive and significant increase. All the pulses taken together showed negative growth rates in the case of area and production but positive (insignificant) growth rate in yield.

The growth rates of area, production and yield of major pulses in Uttar Pradesh and Tamil Nadu were not estimated by the respective AER Centres.

In West Bengal, gram, arhar and moong showed negative growth rates in area, production and yield, whereas, urad showed positive growth rate in area, production and yield. Lentil showed positive growth rate in production and yield, and negative growth rate in area.

5.2.5 In order to increase the area and production of pulses, a centrally sponsored National Pulses Development Programme (NPDP) was launched in different states in mid eighties with the financial aid of the Government of India. The programme was designed to supplement the efforts of the State Governments for increasing the production and productivity of various pulse crops. The programme includes enhancing production and productivity of six major pulse crops i.e., gram, arhar, moong, urad, pea and lentil. Primarily, the National Pulse Development Programme is considered a district oriented Mission Programme and is expected to achieve the increased level of productivity and production within a time schedule. The main objective of NPDP is to increase the production by adopting location-specific technology. Under NPDP emphasis is laid on all components which will help in increasing the production and yield of pulses.

The NPDP is being implemented in 25 states including Union Territory of Andaman and Nicobar Islands. A Technology Mission on Oilseeds and Pulses for the formulation of the policy is duly funded by UNDP and having the technical support of FAO has also been attempting to deal in areas like credit, extension work, marketing, processing, storage etc. without much gains.

The share of the subsidy between the Central Government and State Governments is in the ratio of 75: 25 for all the items of the programme.

5.3.1 Guntur, Anantapur and Khammam districts were selected from the state of Andhra Pradesh. The normal rainfall for these three districts was 890 mm., 521 mm. and 1,045 mm. respectively. The irrigation intensity was higher in Anantapur (120.03 per cent) as compared to Khammam (109.22 per cent) and Guntur (106.56 per cent). Food crops accounted for 78 per cent of the total cropped area in Khammam, 66 per cent in Guntur and only 21 per cent in Anantapur. Among the pulses, urad accounted for 81 per cent of the total area under pulses in Guntur, arhar occupied 46 per cent in Anantapur and moong accounted for 61 per cent in Khammam. The cropping intensity was highest in Guntur (133 per cent) followed by Khammam (96.0 per cent) and Anantapur (85 per cent). The average size of land holding was highest in Anantapur followed by Khammam and Guntur. The three selected districts were predominantly rural in character with more than 70 per cent of work force engaged in agriculture. The percentage of cultivators was high in Anantapur district as compared to other two districts. The percentage of agricultural labourers was highest in Guntur district. The consumption of fertilisers was higher in Guntur district as compared to other two districts.

Jorhat and Nagaon districts were selected from Assam. Pea was the leading pulse crop of these two districts followed by urad. There was no evidence of significant development of pulse crops in both the districts.

Bhagalpur and Godda districts were selected from Bihar. Gram was most suitable rabi pulse crop of Bhagalpur district and arhar was main pulse crop of Godda district in kharif season.

The proportion of people engaged in agriculture and allied activities was slightly higher in Godda district as compared to Bhagalpur district. The gross irrigated area as percentage of gross cropped area in Bhagalpur district (46.40) was much higher as compared to Godda district (14.21). The consumption of fertiliser per hectare was very high in Bhagalpur district (85 kg.) as compared to Godda district (10 kg.). Bhagalpur district was much bigger than Godda district.

Gram was the most dominant pulse crop in Panchmahals district and tur in Vadodara district of Gujarat State.

Bhiwani and Ambala districts were selected from Haryana. The average annual rainfall in Bhiwani district was 350 mm. The canals were the main sources of irrigation. The dry crops like bajra, gram, mustard and cotton dominated the cropping pattern. Wheat was grown in irrigated areas. The average rainfall of Ambala district was 1,200 mm. The main sources of irrigation were tubewells which were supplemented by canals. The important crops of the district were wheat, paddy, maize, sugarcane and pulses.

Durg, Jhabua and Narsinghpur districts were selected from Madhya Pradesh. Agriculture was mainly dependent on rainfall. The consumptions of fertilisers was 32.25 kg./ha. The cropping intensity and irrigation intensity was 144.43 and 109.86 per cent respectively. Only 28.7 per cent of the gross cropped area was irrigated. Cereals dominated the cropping pattern occupying 57.23 per cent followed by pulses, oilseeds and fruits and vegetables.

Jhabua was a tribal district. The fields were undulating, slopy, light and stoney in most parts. Soils were poor and water retention capacity of soil was very low. The main source of income was agriculture. Of the total population 85.67 per cent belonged to scheduled tribes. The district was rural in character. The literacy percentage was 14.54. The fertiliser consumption was very low. The cropping intensity was 127.50 per cent and irrigation intensity was 102.07 per cent. Maize was the single important crop occupying 22.81 per cent followed by urad, gram and kulthi of the gross cropped area. Cereals dominated the cropping pattern followed by pulses and oilseeds.

Narsinghpur district lay almost in the Central part of the State. The literacy percentage was 45.33. The average rainfall was 1,300.8 m.m. The consumption of fertilisers was 33.73 kg./ha. Nearly 58 per cent area of the district area was under cultivation. The intensity of cropping and irrigation was 135.44 and 102.15 per cent respectively. Of the gross cropped area 36.09 per cent was irrigated. Pulses dominated the cropping pattern occupying 44.94 per cent of the gross cropped area.

Nasik and Ahmednagar were selected for gram and Amravati and Yavatmal were selected for arhar in Maharashtra State.

The percentage of area under gram in Nasik and Ahmednagar districts to total Maharashtra in T.E. 1992-93 was 7.93 and 4.92 respectively. Similarly in the case of arhar, the percentage of area in Amravati and Yavatmal districts to total Maharashtra was 8.26 and 9.20 respectively.

Ganjam, Cuttack and Kalahandi districts were selected from Orissa. The normal rainfall for the three districts was 1,296, 1,501 and 1,378 mm. respectively. The percentage of irrigated area in total potential area was highest in Kalahandi district (92 per cent) followed by Ganjam (78 per cent) and Cuttack (68 per cent). Among the food crops, area under pulses accounted for 35 to 45 per cent in the selected districts. The cropping intensity was highest (187 per cent) in Ganjam followed by Cuttack (181 per cent) and Kalahandi (160 per cent). The average size of land holding in Ganjam was 1.04 ha. It was 1.94 ha. and 0.94 ha. in Kalahandi and Cuttack districts respectively. The percentage of small farmers was more in Cuttack district as compared to the other two selected districts. The three selected districts were rural with more than 75 per cent of work force engaged in agriculture. The consumption of fertilisers was highest in Cuttack district followed by Ganjam and Kalahandi.

Ludhiana & Firozpur districts were selected from Punjab. Ludhiana is one of the central districts of Punjab. The district experiences extremes of climate i.e. intensely hot and cold. The proportion of rural population to total population was 48.78 per cent. High proportion of urban population accounted for higher incidence of literacy. Agricultural workers formed 36.21 per cent of the total workers. The cultivated area was entirely irrigated. Tubewells were the main sources of irrigation and wheat and paddy were the major crops. In Firozpur district proportion of rural population to total population was 76.05 per cent. The literacy percentage was 48.03. The workers constituted 30.30 per cent to the total population. The economy of the district was agriculture based. The cultivated area was fully irrigated. Canals and tubewells were the major sources of irrigation. Wheat, paddy, cotton, sugarcane and gram were the main crops.

Nagaur and Hanumangarh districts were selected from Rajasthan. The climate is dry and healthy. The normal rainfall is 388.6 mm. The density of population was 121 persons per sq.km. Literacy percentage was 31.80. The area under forest constituted only 0.7 per cent. The net irrigated area was 14.5 per cent of the net sown area. Wells and tubewells were the main sources of irrigation. The cropping intensity and irrigation intensity of the district was 107.51and 134.17 per cent respectively. Food crops accounted for 66.4 per cent of the gross cropped area. Bajra is the main crop. Hanumangarh is newly formed district. Normal rainfall was 273.5 mm. The net sown area was82.0 per cent of the geographical area. The net irrigated area was 37.9 per cent of the net sown area. The cropping intensity and irrigation intensity was 120.8 per cent and 153.4 per cent respectively. Food crops constituted 60 per cent of the gross cropped area. Gram was the main pulse crop and occupied 32.5 per cent of the gross cropped area. Moth was popular among kharif pulses.

Salem and Tuticorin districts were selected from Tamil Nadu. Salem is an inland district. The normal rainfall was 841.5 mm. The prominent soils were red loam, black and saline. Area under forest was 20.50 per cent. Net area sown was 53.69 per cent. The cropping intensity and irrigation intensity of the district was 142.46 per cent and 123.59 per cent respectively. The area under food crops was 58.26 per cent. Paddy and cholam were important food crops. Groundnut was the most important non food crop. Tuticorin is a coastal district. The normal rainfall was 622.20 mm. Forest constituted only 2.40 per cent. Net area sown was 45.32 per cent of the total geographical area. The irrigation intensity was 122 per cent. Among cereals, paddy, chombu and cholam were the main crops. Urad was the most important pulse sharing 10.24 per cent of the total cropped area. The area under non food crops was 40.07 per cent. Urad and moong were the pulses largely cultivated in this district.

Purulia, Malda and Cooch Behar districts were selected from W. Bengal. The district of Malda is more densely populated, (717 persons per sq.km.) as against 641 and 355 in Cooch Behar and Purulia districts respectively. The geographical area of Purulia was highest followed by Malda and Cooch Behar. The area under forest was highest in Purulia followed by Cooch Behar and Malda. Irrigation in the district of Purulia was mainly done by tanks. In Malda district, lion's share was of tubewells. In Cooch Behar districts, the major sources of irrigation were wells and tubewells. The average rainfall in the district of Purulia was 1,361.4 mm. as against 1,593.8 mm. in Malda and 3,243.2 mm. in Cooch Behar. In Purulia 86 per cent of the gross cropped area was under rice. The crops grown in Malda were rice, wheat, pulses, rape and mustard, til, jute, sugarcane, potato and chilly. The principal crop was rice. The principal crops of Cooch Behar were rice, jute, wheat, pulses, potato, rape and mustard and chilly. The cropping intensity worked out to 102.13 per cent in Purulia, 169.35 per cent in Malda and 185.32 per cent in Cooch Behar. As regards the progress of mechanisation, the district of Purulia lagged behind other selected districts.

5.3.2 In Andhra Pradesh the area and production of total pulses in Guntur and Khammam districts showed an increasing trend. In Anantapur district it was decreasing. But the per hectare yield of Anantapur showed a significant increase while the remaining two districts reported more or less a stagnant yield. Urad in Guntur showed positive growth rates in area and production. Arhar in Anantapur and moong in Khammam district showed significant positive growth in area and production. But these two crops in the respective districts have exhibited neither acceleration nor deceleration of growth.

In Jorhat district of Assam, the area and production of total pulses decreased at an annual rate of 7.02 and 4.28 per cent respectively. The yield had a growth rate of 2.94 per cent per annum. Similarly, in Nagaon district, the area and production of total pulses decreased at an annual rate of 4.50 and 2.28 per cent respectively. In other words productivity of total pulses increased nominally inspite of shrinkage in area under total pulses in both Jorhat and Nagaon districts.

In Bhagalpur district of Bihar the analysis of change in respect of area, production and productivity of pulses indicated a positive change in area under lentil, arhar, teora and gram during the triennium ending 1986 to 1996. But in the case of pea, the area declined. Similar trend was observed in the case of production of all the selected pulse crops. The increase in the production of lentil, arhar, teora and gram was mainly due to increase in area under these crops. Further, in the case of gram, the increase in production was mainly due to an increase in the yield. In Godda district, negative changes in area and production were observed in the case of lentil, arhar, teora and gram.

In Gujarat among pulses, the area under arhar was highest in Vadodara and the area under gram was highest in Panchmahals.

In Bhiwani district of Haryana 33.10 per cent of gross cropped area was under pulses in 1985-86. Gram occupied 32.37 per cent of gross cropped area. After a decade (1995-96), the area under pulses declined and slipped down to 25.81 per cent of gross cropped area. Production of pulses increased in 1995-96. This increase in pulses production was mainly contributed by gram. The production of moong, lentil, mash and other pulses declined in this period. In the case of productivity, performance of pulses indicated a mixed trend. In Ambala district lentil and gram were the main pulse crops. The area under pulses came down to 2.27 per cent of gross cropped area in 1995-96. Gram suffered the most. Lentil, mash, moong and other pulses too suffered in terms of acreage. Lentil followed by gram contributed the largest share to the pulse production.

Teora (lathyrus) was the major pulse crop of Durg district (Madhya Pradesh) followed by gram, urad, lentil and arhar. Teora showed the highest absolute increase and arhar showed decrease in area, production and yield in both absolute and relative terms. Lentil showed positive change in area, production and yield. In Jhabua district, urad was the major pulse crop followed by kulthi, gram and arhar. Total pulses showed increasing trend in area, production and yield. Gram and urad showed increase in area, production and yield, whereas, arhar showed decrease in area, production and yield during two trienniums. In the case of kulthi the area decreased whereas the production and yield increased. Narsinghpur is the major pulse growing district of Madhya Pradesh. Gram ranked first followed by pea, arhar, lentil and moong-moth. Gram registered an increase in area, production and yield between two trienniums. Pea, arhar, and moong-moth showed decrease in area, production and yield. Except gram, the yield of all the pulses showed negative change. Overall picture showed that gram and total pulses registered positive growth rates in area, production and yield in all the three selected districts, whereas, arhar registered negative growth rates in all the three districts.

The percentage of area under gram to total Maharashtra in Nasik and Ahmednagar districts (T.E.1992-93) was 7.93 and 4.92 respectively. Similarly, in the case of arhar, the percentage of area in Amravati and Yavatmal was 8.26 and 9.20 respectively.

In Nasik and Ahmednagar districts gram occupied 42.45 per cent and 28.67 per cent area of the total pulses area. In the case of tur, it occupied 47.13 per cent and 51.07 per cent of the total pulse area in Amravati and Yavatmal districts respectively. The growth rate of area, production and productivity of gram was positive in Nasik and Ahmednagar districts. In Amravati district, the growth rate of area, production and yield of arhar was positive.

In Orissa the area and production of total pulses in three selected districts showed an increasing trend. But the yield in Kalahandi showed a significant increase while the remaining two districts hovered around 500 kg. per hectare. This was mainly due to non-adoption of improved seed and cultural practices. Moong in Ganjam district showed non-significant positive growth rate in area and production. Yield showed negative growth rate. Urad in Cuttack showed negative and significant growth rates in area, production and yield, arhar in Kalahandi showed positive growth rates in area and production. But the yield showed negative growth rate.

In Ludhiana district of Punjab 3.73 per cent of gross cropped area was under pulses in 1986-87. After a decade, area under pulses declined and slipped down to 2.03 per cent of gross cropped area. Irrigated area remained the same. In Firozpur district, 3.44 per cent of GCA was under pulse crops in 1986-87. Gram and moong were the main pulses. The area under pulses came down slightly to 3.23 per cent of GCA in 1996-97. In Ludhiana, production of pulses declined from 17.00 thousand tonnes in 1986-87 to 8.70 thousand tonnes in 1996-97. The decrease in production of pulses is mainly attributed to arhar. The overall performance of yields of pulses was found highly disappointing.

In Nagaur district of Rajasthan, kharif pulses (moong, moth and cowpea) are the predominant crops. These constituted 31 per cent area, but production and productivity were low. Gram is an important pulse crop of Hanumangarh district. It occupied 54 per cent of the total area under food crops in the district. In the case of kharif pulses moth is popular.

The main pulses grown in Salem district of Tamil Nadu were arhar, urad, moong, gram and cowpea. Gram was cultivated only on a minor scale. Urd and moong were the major pulses of Tuticorin district.

In Uttar Pradesh, arhar, moong, urad, pea, lentil and gram were the important pulse crops. In Udham Singh Nagar district the coverage under total pulses decreased from 9.38 thousand hectares in 1985-86 to 7.33 thousand hectares in 1994-95. The total production of pulses showed a declining trend. In Bahraich district, the trend in production of total pulses was quite erratic during the last decade. In Aligarh district, the total area under pulses decreased from 105.36 thousand hectares in 1985-86 to 61.28 thousand hectares in 1994-95. The production of pulses also declined. In Lalitpur district, the area under pulses increased from 72.65 thousand hectares in 1985-86 to 111.31 thousand hectares in 1994-95. Production of pulses also increased. In this district, the trends of area and production were increasing.

In West Bengal, rabi pulses constituted the important pulse crops in Malda and Cooch Behar districts. This is not so in Purulia district where kharif pulses dominated. In all the three districts, the relative share of rabi pulses declined during two periods. The selected pulse crops in the sample districts are kharif mashkalai, rabi mashkalai and summer moong. In respect of kharif mashkalai, the district of Cooch Behar and Purulia experienced positive growth rates in area, production and productivity. The district of Malda recorded negative growth rates in production accompanied by significantly high negative growth rate in productivity and a positive growth in area. In respect of rabi mashkalai, Cooch Behar district attained a significantly high positive growth rate in production and area. The district of Malda showed a positive growth rate in area, production and productivity. The district of Purulia showed negative growth rate in production and area but positive growth in yield. Summer moong was negligible in Purulia district. Malda experienced negative growth rates in area, production and productivity.

5.4.1 The districts namely Guntur, Anantapur and Khammam from Andhra Pradesh, Jorhat and Nagaon districts from Assam, Bhagalpur and Godda districts from Bihar, Vadodara and Panchmahals districts from Gujarat, Bhiwani and Ambala districts from Haryana, Durg, Jhabua and Narsinghpur districts from Madhya Pradesh, Yavatmal, Ahmednagar, Nasik and Amravati districts from Maharashtra, Kalahandi, Ganjam and Cuttack districts from Orissa, Ludhiana and Firozpur districts from Punjab, Nagaur and Hanumangarh districts from Rajasthan, Salem and Tuticorin districts from Tamil Nadu, Udhamsinghnagar, Lalitpur, Bahraich and Aligarh districts from Uttar Pradesh, Purulia, Malda and Cooch Behar districts from West Bengal were included in the study. Except the four selected districts of Maharashtra (25 farmers from each district), 50 farmers were selected from each selected districts of the selected states. The average size of family was highest (11 persons) in Ambala district of Haryana and lowest in Tuticorin district (5 persons) of Tamil Nadu. In most of the selected districts, it ranged between 6 and 9. The number of workers per family was highest (6 persons) in Udham singh nagar (Nainital) district of Uttar Pradesh and lowest in Tuticorin district (2 persons) of Tamil Nadu. In most of the selected districts, it ranged between 3 and 5.

5.4.2 Land details indicate the economic and social status of the farmers. Among all the selected districts, the average size of holding was highest (10.95 ha.) in Ludhiana district of Punjab followed by 9.04 ha. and 8.74 ha. in Hanumangarh and Nagaur districts of Rajasthan, 7.33 ha. in Nainital district of Uttar Pradesh and 7.14 ha. in Firozpur district of Punjab. In Bhiwani and Ambala district of Haryana it was around 6 hectares. It was lowest in Cuttack (1.48 ha.) district of Orissa. In maximum number of the districts, it ranged between 2 and 4 hectares. The area under irrigation was highest (547.50 ha.) in Ludhiana district of Punjab. The operated area was fully irrigated in Ludhiana district of Punjab and Nainital and Aligarh districts of Uttar Pradesh. More than 50 per cent of the operated area was irrigated in Guntur district of Andhra Pradesh, Vadodara and Panchmahals districts of Gujarat, Bhiwani and Ambala districts of Haryana, Narsinghpur districts of Madhya Pradesh, Ahmednagar and Nasik districts of Maharashtra, Firozpur district of Punjab, Salem district of Tamil Nadu, Bahraich and Lalitpur districts of Uttar Pradesh, and Malda district of West Bengal.

5.4.3 Cropping pattern indicates the proportion of cultivated area under different crops at a point of time. Cropping pattern of an area depends on the soil, water and temperature. Kharif dominated cropping pattern was observed in all the selected districts of Andhra Pradesh and Assam, Godda district of Bihar, Vadodara and Panchmahals districts of Gujarat, Durg and Jhabua districts of Madhya Pradesh, all the selected districts of Maharashtra and Orissa, Ludhiana district of Punjab, Nagaur district of Rajasthan, all the districts of Tamil Nadu and West Bengal and Udham Singh Nagar and Bahraich districts of Uttar Pradesh. Rabi urad in Guntur, arhar in Anantapur and moong and tur in Khammam districts were the major pulses of Andhra Pradesh. The main rabi pulses of Assam were urad, pea, lentil, teora and moong. In Bihar, gram was the major pulse crop of Bhagalpur district and arhar was the main pulse crop of Godda district. In Vadodara district of Gujarat, arhar (37.20 per cent) occupied highest percentage of area in the cropping pattern followed by cotton, jowar fodder, fodder, grass and wheat. In Panchmahals district, paddy occupied highest area followed by maize, gram, wheat, arhar and groundnut of the gross cropped area. In Haryana cropping pattern of Bhiwani was dominated by pulses (gram and moong 31.30 per cent) followed by mustard, bajra and wheat. Cropping pattern in Ambala was dominated by wheat followed by paddy, maize, lentil and gram. The major pulse crops in the cropping pattern of Durg district (Madhya Pradesh) were teora and gram. Kharif urad and gram were the main pulse crop of Jhabua district and gram and lentil were the major pulses in cropping pattern of Narsinghpur district. The area occupied by arhar in Amravati district of Maharashtra was 19.12 per cent followed by gram, moong and urad. Arhar (18.12 per cent) dominated the cropping pattern of Yavatmal district, gram occupied 13.17 per cent and 11.09 per cent of the gross cropped area in Ahmednagar and Nasik respectively. In Orissa, paddy was the major crop in kharif season occupying more than 50 per cent area of the total cropped area in Ganjam, Cuttack and Kalahandi districts. Moong in Ganjam district, urad in Cuttack district and arhar in Kalahandi district occupied 32.23 per cent, 30.91 per cent and 12.38 per cent area of the gross cropped area respectively. Cropping pattern in Ludhiana district of Punjab was dominated by paddy followed by wheat, vegetables, fodder, moong, maize, sunflower and sugarcane. Firozpur district was dominated by wheat followed by gram, cotton, fodder, paddy, moong and mustard. In Rajasthan, the main crops of Nagaur district were moong, bajra, mustard, jowar, wheat and gram. The major crops of Hanumangarh district were gram, guar, wheat, bajra, moong, cotton and mustard. The cropping pattern of Tamil Nadu was dominated by paddy. In Salem district, major crops were paddy, moong, urad, vegetables, groundnut and sugarcane. In Tuticorin district, urad formed 17.96 per cent followed by paddy, cotton, moong and vegetables. The cropping pattern of Uttar Pradesh was dominated by wheat. In Udhamsingh nagar district, sugarcane occupied highest area (24.55 per cent) followed by paddy, wheat, maize, guar, moong, lentil and pea. Wheat, maize, moong, sugarcane, pea and tur were the main crops of Aligarh district. Wheat, maize, paddy, sugarcane, vegetables, moong and lentil were the main crops of Bahraich district. Wheat dominated the cropping pattern of Lalitpur district followed by maize, paddy, gram, urad and pea. In West Bengal, paddy occupied the central place in the cropping pattern in all the selected districts. Urad was the main pulse crop of Purulia district. Lentil, urad and gram were the main pulses of Malda, whereas, teora, lentil and urad were the major pulses of Cooch Behar.

5.4.4 In Guntur district of Andhra Pradesh, urad was sown as single crop. Arhar in Anantapur district and moong in Khammam district were grown as mixed crops in lines. In Assam, pulses were raised (urad, moong, pea, lentil and teora) in rabi season only. Pea was grown as inter crop as well as single crop. Other pulses were grown as single crops by broadcasting method. In Bihar, gram was grown in rabi season in Bhagalpur district and arhar in kharif season in Godda district as single crop. Gram and arhar were grown in Panchmahals and Vadodara districts of Gujarat as single crops in lines respectively. Pulse economy of the Bhiwani district of Haryana was dominated by gram and Ambala district was dominated by lentil. In Madhya Pradesh, urad & arhar were the major kharif pulses of Durg district. In rabi, teora was the major pulse crop followed by gram & lentil. In Jhabua, urad and kulthi were the main kharif pulses and gram was the main pulse of rabi. In Narsinghpur district, arhar was grown as kharif pulses and gram, lentil and batari were grown as rabi pulses. Urad was also grown as summer pulse crop.

Arhar was grown as inter crop in kharif season in Amravati and Yavatmal districts and as a single crop in Ahmednagar and Nasik districts of Maharashtra. Gram was grown as single crop in rabi season in all the four districts of Maharashtra. Both the pulses were grown in line. In Orissa, arhar was grown as single crop as well as mixed crop in Kalahandi district. The other pulses were grown as single crop in line in three districts of Orissa. In Punjab, moong and arhar were grown in Ludhiana district in kharif season whereas, gram was grown as rabi crop in Firozpur district. In Rajasthan, moong, moth, gram and cowpea were the major pulses. In both Nagaur and Hanumangarh districts, moong and moth were grown as single or mixed crops. Only kharif pulses were grown in Salem and Tuticorin districts of Tamil Nadu. In Uttar Pradesh, all the pulses were grown as single crops in lines.

5.4.5 The total input value per hectare in the production of urad ranged between Rs.1,000.85 in Cuttack district of Orissa to Rs.4,802 in Salem district of Tamil Nadu. In the case of irrigated urad the cost per hectare was highest (Rs.6,408) in Salem district of Tamil Nadu and lowest (Rs.3,199) in Tuticorin district of the same state. In the case of unirrigated urad the cost per hectare was lowest (Rs.1,000.85) in Cuttack district of Orissa and highest (Rs.4,883.95) in Narsinghpur district of Madhya Pradesh.

Arhar was grown in the State of Madhya Pradesh and Maharashtra. In the case of irrigated arhar, the cost per hectare was highest in Yavatmal district of Maharashtra and lowest in Narsinghpur district of Madhya Pradesh. In the case of unirrigated tur, cost per hectare ranged between Rs.2,347.98 and Rs.7,048.00. For arhar as a whole, the cost per hectare was lowest ((Rs.1,569) in Panchmahals district of Gujarat and highest (Rs.6,852.39) in Anantapur district of Andhra Pradesh.

Moong was also grown as irrigated and unirrigated crop in Orissa and Tamil Nadu. In the case of total moong, value of inputs used per hectare was high in the States of W. Bengal, Tamil Nadu and Assam. It was highest (Rs.4,959.00) in Purulia district of W.Bengal and lowest (Rs.1,820.00) in Hanumangarh district of Rajasthan.

In the case of pea, the cost per hectare was highest (Rs.7,243.00) in Nainital district of Uttar Pradesh and lowest (Rs.2,041.00) in Jorhat district of Assam.

Lentil was mainly grown in Uttar Pradesh, Madhya Pradesh, W. Bengal, Assam and Haryana. The cost per hectare was high in the States of Uttar Pradesh, Madhya Pradesh and Assam and comparatively lower in W. Bengal and Haryana.

Teora was grown in Madhya Pradesh, W. Bengal and Assam. The cost of inputs per hectare was lowest (Rs. 1,211.00) in Purulia district of W. Bengal and highest (Rs. 3,621.00) in Nagaon district of Assam.

Gram was the important pulse crop grown in Madhya Pradesh, Maharashtra, Rajasthan, Uttar Pradesh, W. Bengal, Punjab, Bihar, Haryana and Gujarat. The cost per hectare was highest (Rs. 10,793.00) in Ahmednagar district of Maharashtra and lowest in Hanumangarh district of Rajasthan (Rs. 1,890.00).

Kulthi was grown in Jhabua district of Madhya Pradesh. The cost of inputs used per hectare was Rs. 2,308.07. Similarly, batari was grown in Narsinghpur district of Madhya Pradesh. The cost per hectare was Rs. 5,421.31.

In the case of cowpea, the cost of inputs per hectare was highest (Rs.2,472.00) in Salem district of Tamil Nadu and lowest (Rs.1,401.00) in Hanumangarh district of Rajasthan.

5.4.6 In Andhra Pradesh profit per hectare was found to be more in the case of non-pulse crops (chillies, cotton and paddy) as compared to pulse crops (urad, red gram and moong).

In Assam profit per hectare and input output ratio was maximum in the case of vegetables. Among pulses input output ratio was low and was minimum in the case of urad.

In Bihar, the input output ratio of gram in Bhagalpur district was 1.92. Similarly in the case of arhar in Godda, input output ratio was 3.15.

In Gujarat, input output ratio was maximum (4.44) in the case of arhar in Panchmahals district. The profit per hectare was maximum in the case of wheat in Vadodara district.

In Haryana, the input output ratio was more than two in all the crops grown. It was highest (4.19) in the case of gram in Bhiwani district and lowest (2.20) in the case of bajra in the same district.

In Durg district of Madhya Pradesh, input and output values per hectare were highest Rs. 15,662.00 and Rs. 42,292.00 respectively for vegetables. The input output ratio was highest (2.70) for vegetables. The input and output value per hectare was lowest for teora. The net profit per hectare was lowest for kodo. The input output ratio was lowest (0.77) for linseed. Among pulses lentil earned highest profit per hectare of Rs. 6,571. Except lentil and irrigated gram none of the pulses could compete with the other non- pulses crops on the criterion of profit per hectare. In Jhabua district, input value per hectare was highest for cotton followed by rice and gram. The value of output per hectare was highest for cotton followed by gram and groundnut. The profit per hectare was highest for cotton followed by groundnut and gram. On the criterion of profit per hectare only gram and arhar could compete with other crops. In Narsinghpur district, sunflower and mustard were most profitable crops. Gram and batari came next. Wheat, soybean and sugarcane were also competitive crops to pulses. Thus, pulses were not in a position to substitute oilseeds like soybean and mustard, even on profitability criterion. On the criterion of input-output ratio mustard (2.50) and sunflower (2.30) proved to be most profitable. Batari and gram came next.

In Maharashtra, profit per hectare was observed high in the case of cereals, oilseeds and onion as compared to pulses. Input output ratio in the case of pulses was less than 2. It was more than 2 in other crops.

In Orissa, the farmers derived negative income from moong in Ganjam district. The per hectare net income amounted to Rs. 1,293.00 for urad in Cuttack and Rs.219.00 for arhar in Kalahandi district. The input output ratio was highest (2.29) in urad followed by paddy (1.90) and moong (1.84) in Cuttack. The farmers of Kalahandi have derived only meagre income from arhar (Rs.219.00).

In Ludhiana district of Punjab, the net income per hectare and input output ratio was highest in cotton followed by moong and maize. The input output ratio was near about 3 in all the cases. In Firozpur district, the profit per hectare was maximum in the case of wheat followed by mustard and gram. The input output ratio was maximum in wheat (3.99) and minimum in gram (1.97).

In Rajasthan, moong and cowpea were the best rewarding pulses in the kharif season in terms of per hectare returns. Gram was the most rewarding crop in rabi season. In Nagaur district, input output ratio was maximum in cowpea (6.92) followed by moong (4.59), gram (3.65) and moth (2.75). In Hanumangarh district it was maximum in moth (5.43) followed by moong (4.94) and gram (3.77).

The input output ratio was very low in both the districts of Tamil Nadu for all the pulse crops. Input output ratio was more in irrigated urad and moong as compared to unirrigated urad and moong in both Salem and Tuticorin districts.

In Uttar Pradesh, urad, moong, lentil and arhar were the important pulses grown in four districts. In Nainital district, profit per hectare was maximum in lentil (Rs. 11,433.00) and lowest in urad (Rs.4,601.00). In Aligarh district, profit per hectare was maximum in urad (Rs.11,554.00) followed by lentil and moong. In Bahraich district, net income per hectare was highest in the case of arhar (Rs.12,567.00) followed by lentil and urad. In Lalitpur district, the profit per hectare and input output ratio for lentil was Rs.10,186.00 and 2.86 respectively.

In West Bengal, among pulses summer moong yielded highest net return (Rs. 5,014.00) per hectare in the district of Purulia followed by rabi urad, lentil, teora, kharif urad and gram. In the district of Malda, among pulses rabi urad yielded highest net return (Rs.6,022.00) per hectare followed by gram, moong, lentil and kharif urad. In the district of Cooch Behar, teora brought highest net return per hectare (Rs.4,333.00) followed by lentil (Rs.3,091.00), rabi urad (Rs.2,646.00) and kharif urad (Rs.2,094.00).

5.4.7 The pattern of disposal varied with the crop. Majority of the pulse growers preferred to sell the produce after the harvest. The sample farmers kept only small portion of output for consumption and seed and the rest was disposed to the traders. In the case of urad, the percentage of output sold in the market constituted about 80 per cent in Madhya Pradesh and Uttar Pradesh. In Orissa about 73 per cent of the produce was kept for consumption purpose, 19.38 per cent for seed purpose and remaining 7.54 per cent was sold. In the states of Punjab, Rajasthan and Uttar Pradesh, the major portion of moong was sold. In Andhra Pradeh and Orissa, the percentage of consumption was more. In Madhya Pradesh and W. Bengal, about equal quantity of produce was consumed and sold. In Uttar Pradesh and Madhya Pradesh major portion of lentil (75 to 85 per cent) was sold. Another 15 to 25 per cent was kept for seed and consumption purposes. About 70 per cent of the produce was kept for consumption purpose in Purulia and Cooch-Behar districts of W.Bengal and about 38 per cent in Malda district. Teora was mainly produced in Durg district of Madhya Pradesh and all the three districts in W.Bengal. In M.P. and W. Bengal, major portion of the produce was used for consumption purpose. About 6 to 18 per cent produce was kept for seed purpose and the remaining quantity was sold.

More than 70 per cent of gram was sold in the States of M.P., Maharashtra, Punjab, Rajasthan and U.P. The farmers of States of Bihar and W. Bengal sold about 40 to 48 per cent of the produce. About 45 to 50 per cent of the produce was consumed in Bihar and W. Bengal. In Madhya Pradesh, Maharashtra and Uttar Pradesh, the major portion of the produce (arhar) was sold whereas, in Andhra Pradesh, Bihar and Orissa the major portion of the produce was kept for consumption purpose. In Rajasthan about 98 per cent of the cowpea produce was sold and remaining quantity was kept for seed and consumption purpose. Pea was mainly produced in Uttar Pradesh and Madhya Pradesh. About 80 to 97 per cent produce was sold except Bahraich district of Uttar Pradesh where major portion (73 per cent) of the produce was consumed.

5.4.8 Marketing is a function through which a crop produce moves from cultivator to ultimate consumer. The pulses are marketed as grains by farmers. The ultimate product sold is dal.

In Andhra Pradesh, farmers usually kept the produce of pulse crops for consumption. In case, they wanted to sell the produce, they did so to the commission agents who come to the villages from the nearest district headquarters. In the absence of processing units of pulses in Assam, the cultivators processed lentil and teora by indigenous methods. Therefore, polishing of dal is not good. Urd and moong, were sold as grains. In Bihar, the large farmers of both the districts kept the produce for sometime and sold it on price hike rather than selling at distress price. In Haryana, most of the farmers sold their marketable surplus of pulses within the village to commission agents. About 4 per cent producers in Bhiwani disposed their produce to village shopkeepers / merchants. Some pulse producers sold their produce outside the village in big markets. It was observed that with the increase in the size of farms, the tendency to sell pulses outside the village increased. The gap between the prices received by the producers and paid by the consumers was significantly high in the case of pulses. Price spread was high in the case of gram as well as in lentil. Most of the dal mills of Haryana did not procure pulses directly from farmers because farmers were scattered over a large area. Therefore, the dal mills relied on commission agents for the supply of pulse grains. The sample dal mills indicated that the quantity processed varied from 25 quintals to 150 quintals/day according to the capacity of dal mill, season and the demand for dal. It was estimated that in one quintal of pulse grain processed, 70-75 kg. of dal was obtained. The damaged dal weighed between 2-3 kgs. Among the by products, bran weighed 11-12 kg./qtl., shell 8-9 kg./qtl. and small pieces 2-3 kg./qtls.

In Madhya Pradesh, farmers sold marketable surplus during the harvest season and a minimum quantity was retained till the pre-harvest season which fetched highest price. It was observed that the maximum price could be obtained by selling the product in mandis. In the case of gram and tur in all the three selected districts, the general rule of higher arrivals and lower prices and decreasing arrivals coupled by higher prices prevailed. Processing of pulses was not done at the household or village level. At the dal mills processing of all kinds of pulses was undertaken. According to mill owners the percentage of profit in the processing of pulses ranged between 25 to 30 per cent over the price of pulses. Hence, the real beneficiary of marketing and processing of pulses was the dal mill owner who purchased pulses at the lowest price, processed the pulses and got the value of every small product and by product. The only way to benefit the small and big farmers was to set up dal mills in the co-operative sector by the farmers co-operatives.

In Maharashtra, the monthwise purchase and sale price of tur and gram and the gap between purchase and sale price for all four districts showed that the purchase price of both tur and gram was substantially higher than the minimum support price (MSP) announced by the Government. Another interesting worth noting point was that the purchase price of tur was relatively higher in the peak supply period (November and December) in all four districts compared to other months.

In Orrisa State, the farmers usually kept the produce of pulse crops for the home consumption and also for the purpose of seed for the next year. Whenever they sold the produce, they sold it to the local traders and commission agents in the villages.

In Punjab, around 25 per cent pulse growers in Ludhiana and about 21 per cent in Firozpur sold their marketable surplus within the village to commission agents. Moong producers in Ludhiana and gram growers in Firozpur district disposed their produce to village shopkeepers/merchants. In Firozpur, 2.7 per cent pulse producers sold their produce to neighbourers. It was observed that with the increase in the size of farms, the tendency to sell pulse grain outside the village increased. Out of the total pulse growers 5 per cent in Ludhiana and 28 per cent in Firozpur withheld their produce for sale in lean months in expectation of price rise. Pulses were processed by 'Dal Mills'. Most of the mills did not procure pulses directly from farmers because farmers were scattered over a large area. Therefore, dal mills relied on commission agents for the supply of pulse grain. A large number of dal mills in Ludhiana and Firozpur in the recent past were closed down due to paucity of business. Production of pulses drastically came down in the state during the last three decades.

The marketing structure for pulses in Punjab was inadequate despite high demand the production environment for pulses being adverse in Punjab. There was great need to establish a large number of efficient markets for the sale of pulses.

In Nagaur district of Rajasthan, more than 90 per cent of the total pulses production was sold in the village itself. The quantity of production retained for seed purpose was negligible accounting for less than one per cent of the total produce. The processing of pulses in the dal mill is carried out by old practice, which has not reached yet present scientific technique. Four to five dal mills out of 15 were operating with 30 to 35 qtls. capacity a day. Most of the dal mills were closed down in both the districts due to low recovery, high cost of milling and high cost of the maintenance of the machinery. The traders from Delhi and Punjab purchased gram in bulk quantity from Hanumangarh district and this was another important cause of local dal mill not getting enough quantity of raw material.

In Salem and Tuticorin districts of Tamil Nadu, more than 90 per cent of the output was sold to the local traders and the agriculture department leaving a small quantity for self consumption and seed purpose.

In Uttar Pradesh, among the kharif pulses moong was found to be marketed maximum and urad was minimum. Among the rabi pulses pea (green) was found to be marketed maximum. Gram and lentil were also marketed considerably. While the disposal of arhar (early rabi) was lowest in the state as a whole, among summer crops urad was found to be marketed maximum. In summer season disposal of urad was found higher than moong.

In West Bengal, the percentage of pulses output sold in the market (marketed output) constituted 49.88 per cent in Purulia, 57.60 per cent in Malda and 43.52 per cent in Cooch-Behar. Ahlion's share of the marketed produce reached the market at the time of harvest. Farmers with surplus usually preferred to sell pulses in villages to the commission agents/representative of "dal" mill owners.

In Purulia district, there was no dal mill as such. In other two districts, viz Malda and Cooch Behar, dal mills existed earlier and also now exist but in a reduced number. Some of the dal mills have already been closed. The reasons for closure of dal mills were – i) shortage of locally produced pulses ii) low profit margin due to low quality of pulses. iii) better quality of dal coming from other states at lower prices and, iv) tough competitive market.

Of these shortage of supply of locally produced pulses came to be the most important reason for the decline of dal mill industry.

5.4.9 The most important constraints suggested by farmers of different states are mentioned in descending order of importance.

1) Lack/non availability of high yielding (improved) and short duration varieties of pulses. Out of 13 States, 12 States pinpointed this reason.

2) Lack of extension, training and credit facilities - Low adoption of new technology by farmers was due to lack of proper extension services and poor resource base of the farmers. There was hardly any technological change in pulse farming. The farmers of 11 states complained this reason for slow growth of pulse crops.

3) a) Pulses were grown on marginal/sub marginal lands (inferior lands)

   b) Manuring and fertilisation of these crops was badly neglected. Inadequate/no use of fertiliser was also one reason.

   c) Due to non-availability of good and high yielding varieties of seed, majority of the farmers raised traditional varieties of pulses.

   The sample farmers of 10 States reported the above three mentioned reasons for slow growth of pulses.

4) The farmers of 9 States reported that the pulses were susceptible to pests and diseases. There was absence of proper plant protection measures.

5) Relative profitability of pulse crops was lower than other crops. In fact prices of whole pulses are not that attractive and the margin between prices of split and whole pulses was quite high which usually went to middlemen. This problem was quoted by the farmers of 8 States of the country.

6) a) Major portion of the area under pulses was un - irrigated. Lack of irrigation facilities and dependence on rains were the reasons of low production.

b) Adverse weather conditions such as erratic and untimely rainfall, high humidity, cloudy weather at flowering were the climatic barriers in pulse cultivation.

The above two problems were reported by the sample farmers of 7 States.

7) a) Damaged by stored grain pests and unsatisfactory post- harvest technology

b) Agronomic Constraints- Improper sowing time, low seed rate, improper method of sowing, lack of interculture operations, no weeding, lack of irrigation at the time of moisture stress condition.

c) New technologies have not reached the farmers in a meaningful way.

The above constraints were faced by the farmers of 5 states.

8) Low productivity of pulses and inadequate land preparation and soil management, were the problems faced by farmers of 4 States. Lack of soil testing facilities was also one of the problems.

9) The farmers of three states opined that the farming of pulses was non-remunerative, costly and risky.

10) a) Social / personal factors like insecurity of pulse crop regarding its damage, theft, premature plucking, looting at the harvesting stage by the neighbours/passers- by, anti-social elements, cattle grazers and crop looters also affected the growth of pulse crops.

b) Farmers had meagre knowledge about diseases, insects and pests and chemical devices.

These two constraints were reported by the farmers of 2 States.

11) a) Marketing problems in selling their produce

b) There was no provision of crop insurance in the cultivation of pulse crops.

c) Pulses were energy rich crops but were cultivated largely under conditions of energy starvation.

The above constraints were reported by the farmers of one State out of 13 States under study.

5.4.10 The following are some of the ways in which pulses production can be increased in selected States.

Good quality certified seeds should be made available to the farmers at reasonable prices.

Department of Agriculture should popularise short duration varieties of all pulse crops and application of fertilisers particularly phosphatic fertilisers should be done.

Adoption of plant protection measures to reduce crop losses due to insect pests and diseases be done.

Farmers should be encouraged to adopt a package of agronomic practices.

Efficient marketing facility be developed to ensure the benefit from the existing high prices of dal to the producers.

For increasing coverage, intercropping of pulses with other crops be intensified.

Farmers should be encouraged to take up pulse production on commercial basis in potential areas of the State.

Extension services should be extended so that farmers get adequate training nd experience for better production of pulses.

The organisation of pulse growers cooperative societies be promoted so that the pulse growers could be able to get the benefits of the cooperatives.

To compensate the losses due to natural calamities, crop insurance scheme should be introduced.

Soil testing facilities should be made available at village/panchayat levels and the inputs used in pulses cultivation be made available in time.

An efficient marketing system should be developed so that the pulse growers could be able to get the maximum share in consumer's rupee.

The government should help the pulse growers by way of making announcement of attractive prices.

Efforts should be made to bring fertile and irrigable land under pulses.

Improved varieties of pulses seeds should be made easily available to the growers.

Adequate investment should be made in research for evolving area specific disease resistant varieties.

There is a need to intensify research efforts to evolve still higher yielding varieties of pulses for various agro-climatic regions.

Whatever quantity of new varieties seed of pulses was available should be distributed among all groups of farmers.

There is a necessity of evolving such varieties which can be grown under dry farming conditions and under moisture stress.

If the benefit of higher price of dal has to be given to the pulse growers, farmers cooperative marketing and processing societies should be organised.

Steps should be taken urgently to provide quality extension services for increasing the adoption of micro- nutrients.

As the production of pulses is very essential for nutritional security of the poor section of population, government can reduce the rate of interest of 'crop loan' given for the pulse crops.

Adequate quantity of certified seeds should be made available well before the time of sowing. In addition, support services like fertilisers, rhizobium culture and insecticides should be provided at concessional rates.

To achieve maximum production, an effective link between Technology Mission, State Department of Agriculture, extension staff, pulse producers, marketing and processing is essential.

Mixed cropping and inter cropping of pulses in the irrigated areas could be encouraged as the scope of increasing the area under pulses as a single crop was limited.

Traditional harvest and post harvest technology should be reoriented to save the loss in these processes.

Phosphatic and potassic fertilizers should be made available to pulses growers as and when required at subsidised rates.

More and more marketing and milling infrastructure should be developed to encompass pulses growing remote rural areas in all the zones.

5.4.11 Policy Implications and Action Points

On the basis of the findings, the following action points are recommended.

1) The impact of green revolution was localised to cereals especially rice and wheat. It had very little or negligible impact on the production of pulses. The production of pulses remained stagnant. The foremost reason for this was non-availability of good high yielding varieties of pulses. Therefore, there is an acute need to intensify research efforts to develop / evolve some new high yielding varieties for various agro - climatic / ecological conditions of the states.
Attention : Indian Council of Agricultural Research, Technology Mission on Oilseeds and Pulses (TMOP) and National Pulses Development Project, New Delhi.

2) The field investigation indicated that because of non-availability of HYVs farmers used own seed, untreated and of worn out varieties. Whatever quantity of new varieties seed was available was cornered by influential farmers and was distributed to scheduled tribes farmers. The seed was in short supply. Necessary steps be taken to see that adequate quantity of H.Y.Vs seed was available.
Attention : State Seed & Farm Development Corporation of different States

3. Most of the pulses have indeed been grown under rainfed conditions whether they are grown on marginal or in rich fields. As such their yields are much lower than those of superior cereals which are grown under favourable conditions. The necessity of supplying HYVs have been described in the above paragraphs. Here the point stressed is that of the necessity of evolving such varieties which can be grown under dry farming conditions and under moisture stress.
Attention : Indian Council of Agricultural Research, New Delhi and Agricultural Universities located in different States

4. Pulses are susceptible to pests and diseases as reported by maximum number of sample farmers. However, the farmers are reluctant to adopt plant protection measures. It is important that farmers be convinced of the plant protection measures and should be asked to adopt appropriate IPM measures.
Attention : Indian Council of Agricultural Research, New Delhi

5. The agricultural extension agencies at the centre as well as in the states are requested to disseminate information regarding incentives, support price and utility of pulses cultivation in improving soil health among the farmers. It may be done through organising training camps at regular intervals in each village to educate the farmers about improved technology of pulses cultivation so that farmers may attain the potential yield.
Attention : Technology Mission on Oilseeds and Pulses (TMOP) and State Department of Agriculture.

6. Adequate quantity of certified seeds alongwith rhizobium culture should be made available to the interested farmers well before the time of sowing.
Attention : Department of Agriculture of different states

7. The support prices of pulses should be declared much earlier before the sowing time, so that farmers may be encouraged to adopt pulses cultivation because of pulses being risky in nature.
Attention : Commission on Agricultural Costs and Prices.

8. For arresting the continuous decline in acreage under pulses, these crops should be introduced as inter-crop / mixed crop / rotational crop in the cropping system. Some financial incentive should be given to the farmers for bringing more area under pulses.
Attention : Ministry of Agriculture

9. Pulses are largely sown on unirrigated or low irrigated land. It is essential that efforts be made to increase area coverage under irrigation in the case of pulses.
Attention : Ministry of Agriulture and Department of Water Resources.

10. In order to provide an alternative marketing system and to ensure remunerative prices to the farmers, pulse produce should be procured by an integrated agency / cooperative society created for this purpose, eliminating the system of middlemen. This agency should also be entrusted with the task of processing and marketing of pulses. It is generally believed that although the prices of pulse (Dal) have been sky rocketing, the area, production and yield of pulses have not increased. The field investigation showed that the beneficiary of the increasing prices of dal was dal mill owners and not farmers. If the benefit has to be given to the farmers, farmers cooperative marketing and processing societies should be organised. Pulses should be procured at the minimum support prices. It would benefit both the producers and consumers.
Attention : Ministry of Marketing and Inspection, Govt. of India, New Delhi, Ministry of Food Processing, Govt. of India and State Cooperative Department and Cooperative Marketing Federation.

11. The cultivation of pulses is full of risk at every stage. With a view to combat the losses occurring due to natural calamities, the pulse growers should be assured to compensate the damages of the crops through the schemes like crop insurance.
Attention : State Government, Crop Insurance Scheme.

12. Generally pulse crops were grown without application of fertilisers. Whenever fertilisers were applied these were nitrogen dominated resulting in high vegetative growth and lower production. Farmers need to be convinced of the balanced use of fertilisers. Phosphatic and potasic fertilisers should also be made available to pulse growers as and when required and at cheaper rates.
Attention : Pest management staff of the Department of Agriculture, Department of State Government.

13. Since last few years the certified seed is found to contain admixture and spurious fertilisers and pesticides have found way in the markets affecting the demand for these from farmers and more importantly shaking the confidence of farmers in these essential inputs.

Attention : Staff of Quality Control Laboratories of the Govt of India and State Govt. and State Seed and Farm Development Corporation, Seed Certification Agencies.

14. Presently, Technology Mission on Oilseeds and pulses look after the development of oilseeds and pulses, but there is no organisation for pulses like OILFED (Oil Federation). It may be desirable to extend the operation of OILFED to production and processing of pulses also.

Attention : Technology Mission on Oilseeds and Pulses, Govt. of India.

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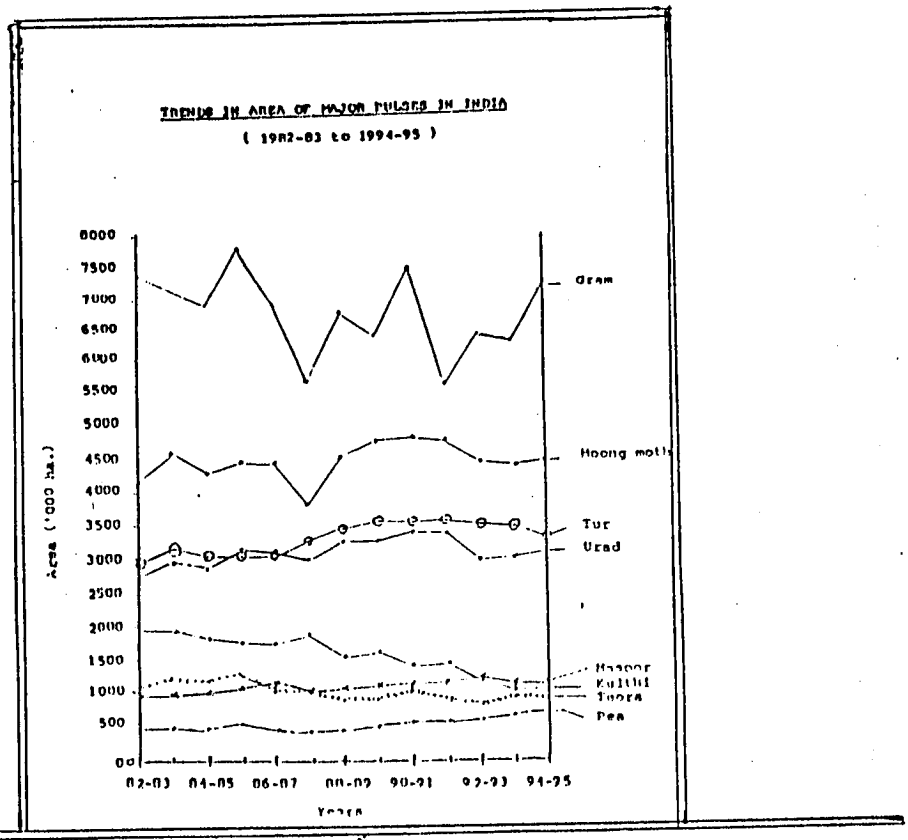
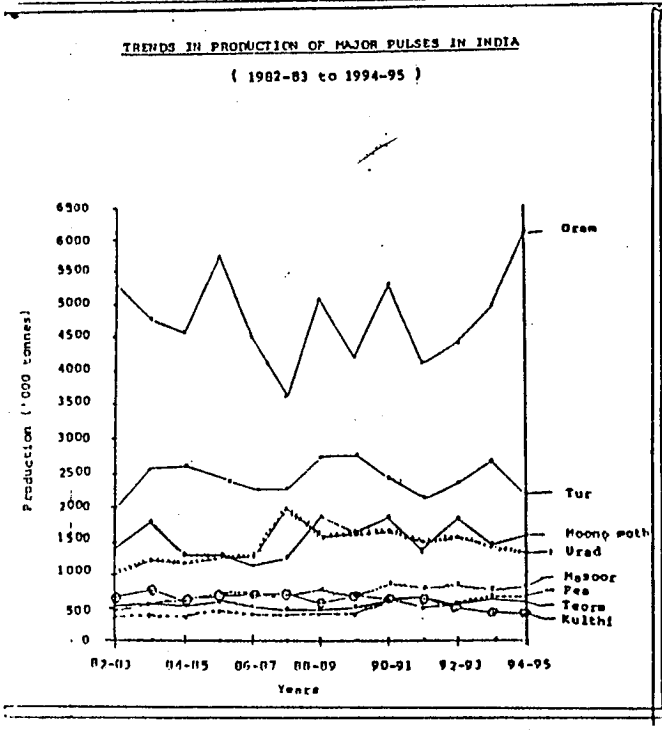
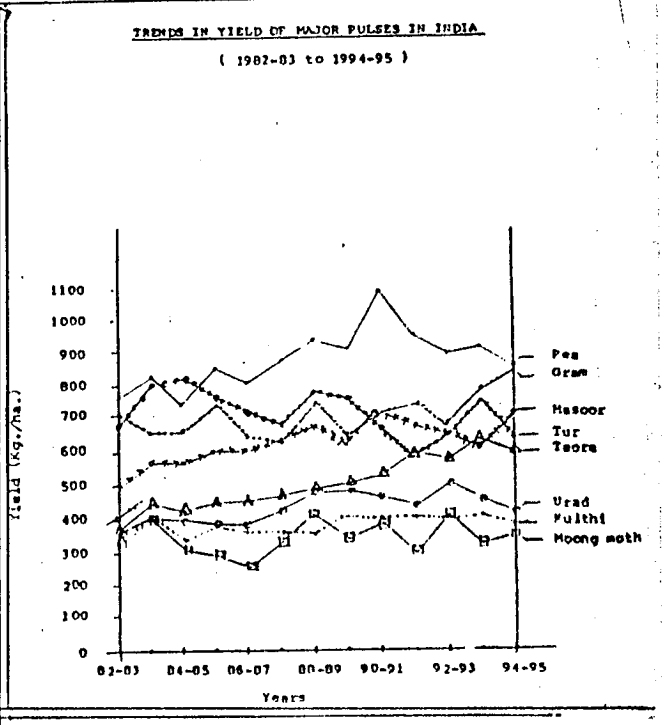
APPENDICES

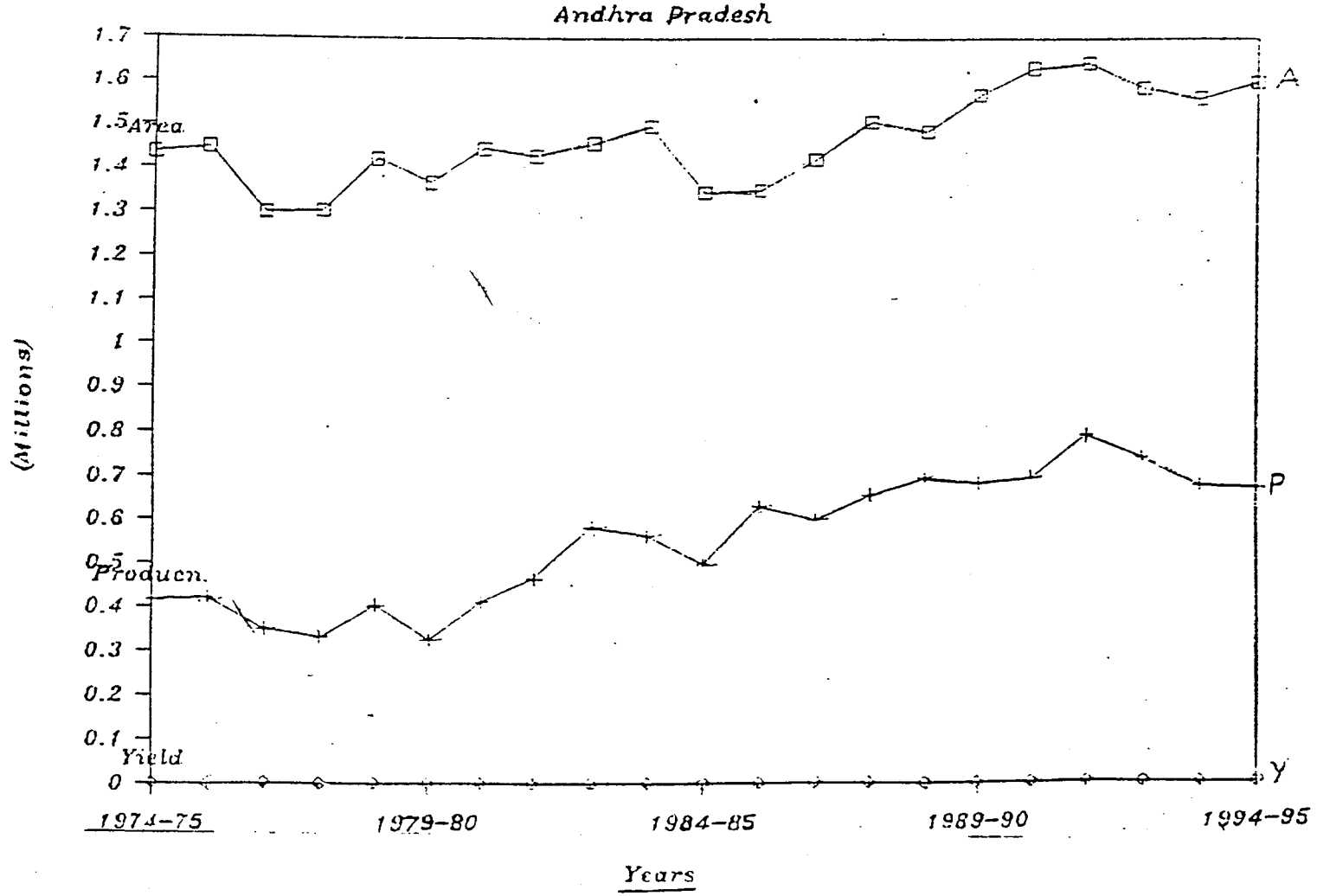
TRENDS OF MAJOR PULSES IN INDIA





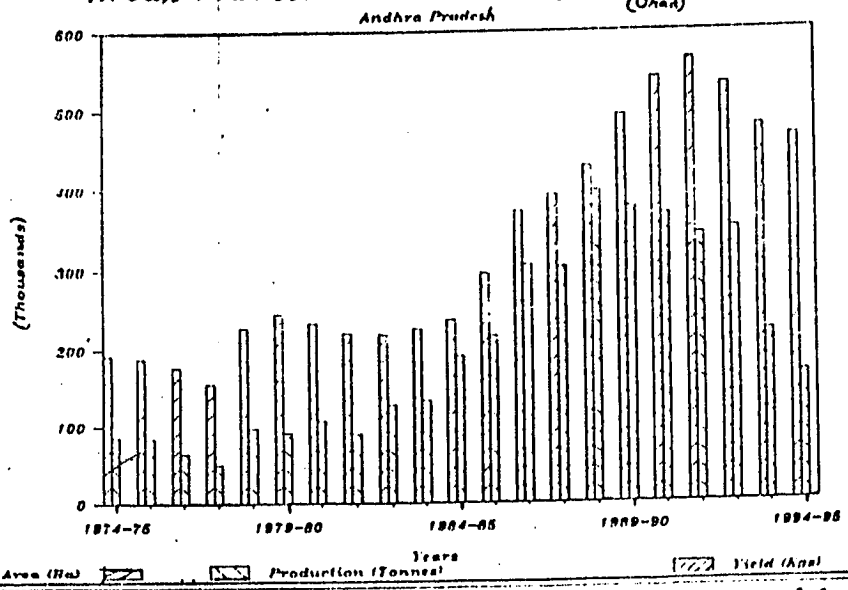


Area, Production and Yield of Pulses.

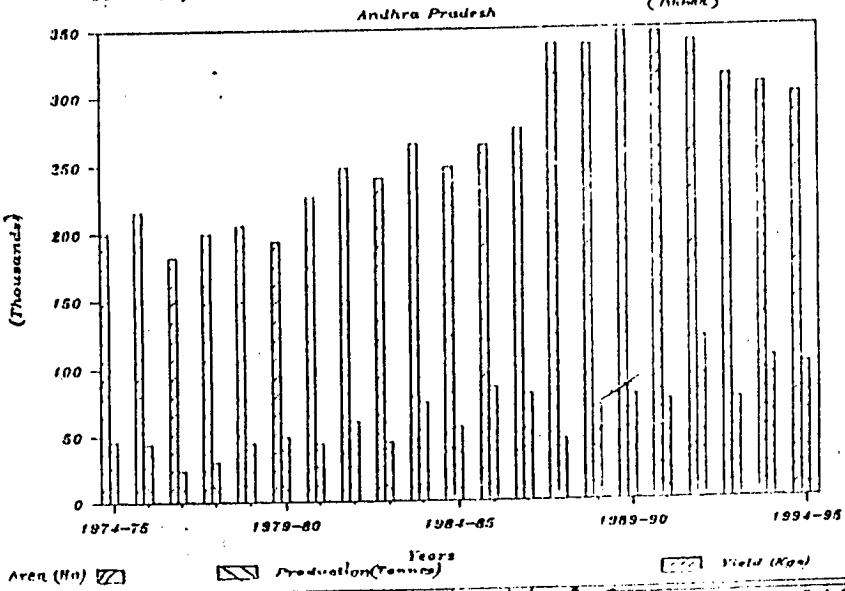


ANDHRA PRADESH

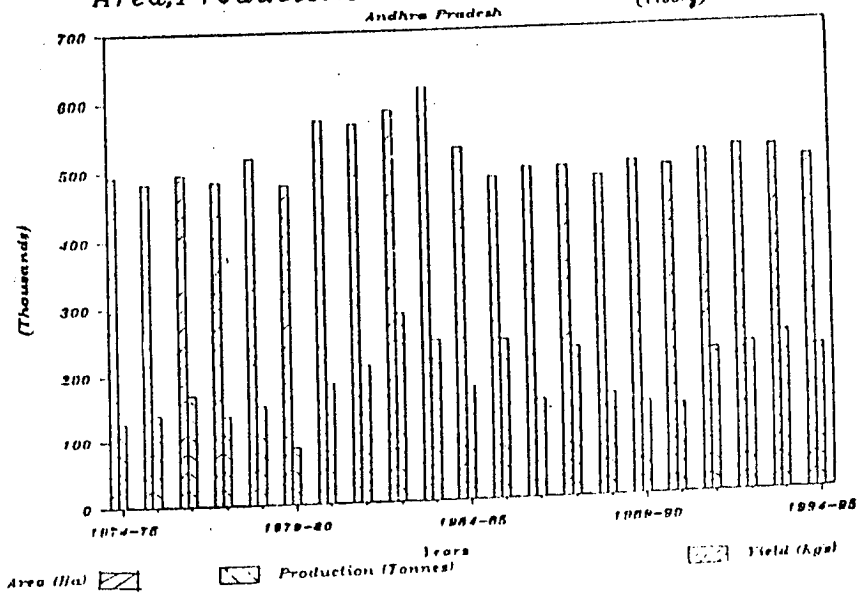
Area, Production and Yield of Blackgram (Urad)



Area, Production and Yield of Redgram (Arhar)

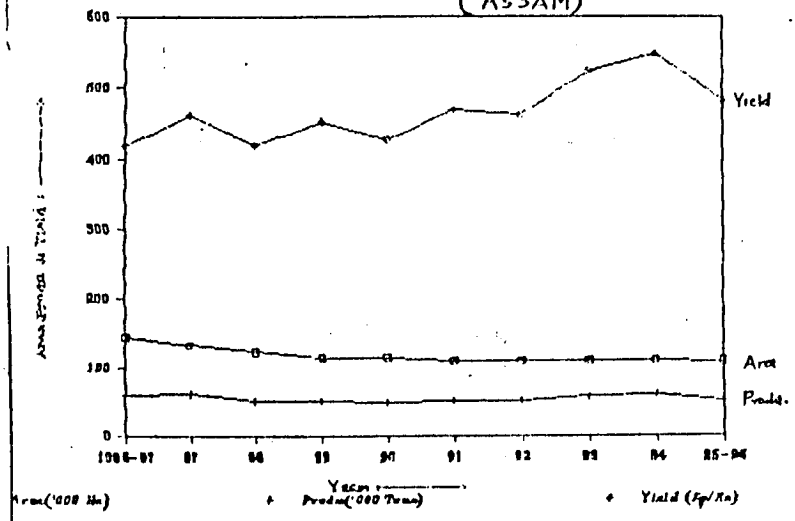


Area, Production and Yield of Greengram (Moong)

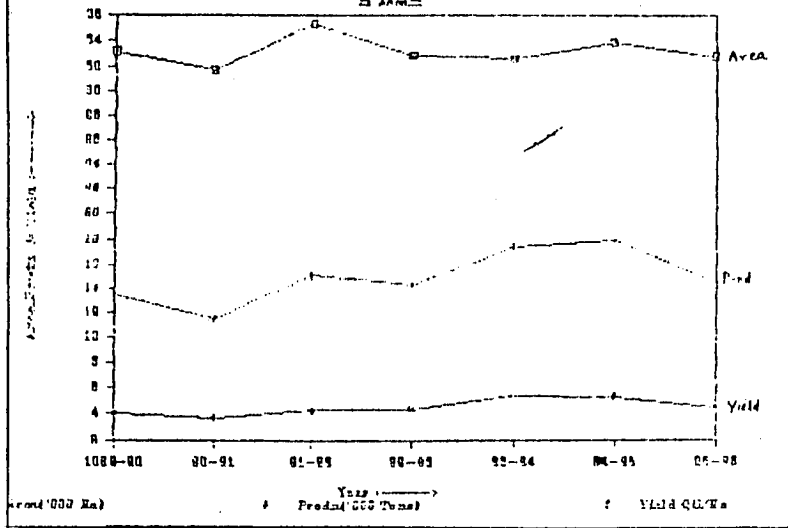


ASSAM

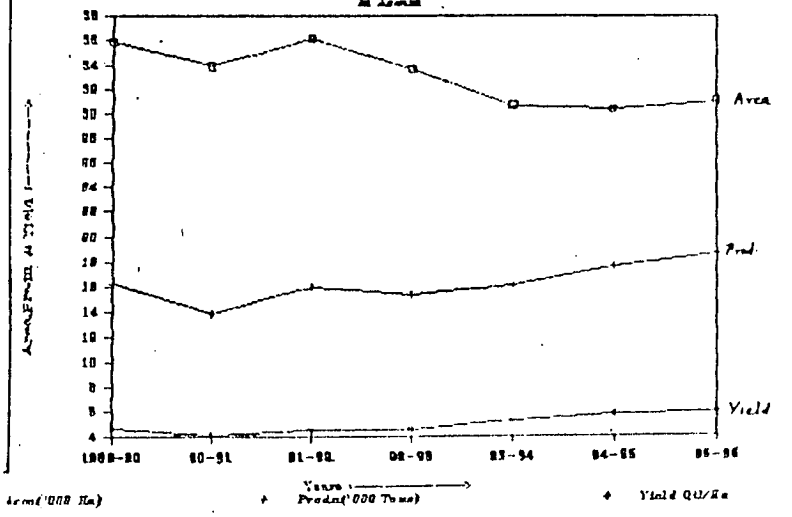
Area,Prodn & Yield of Total Pulses (ASSAM)



Area,Prodn & Yield of Blackgram (Urad)

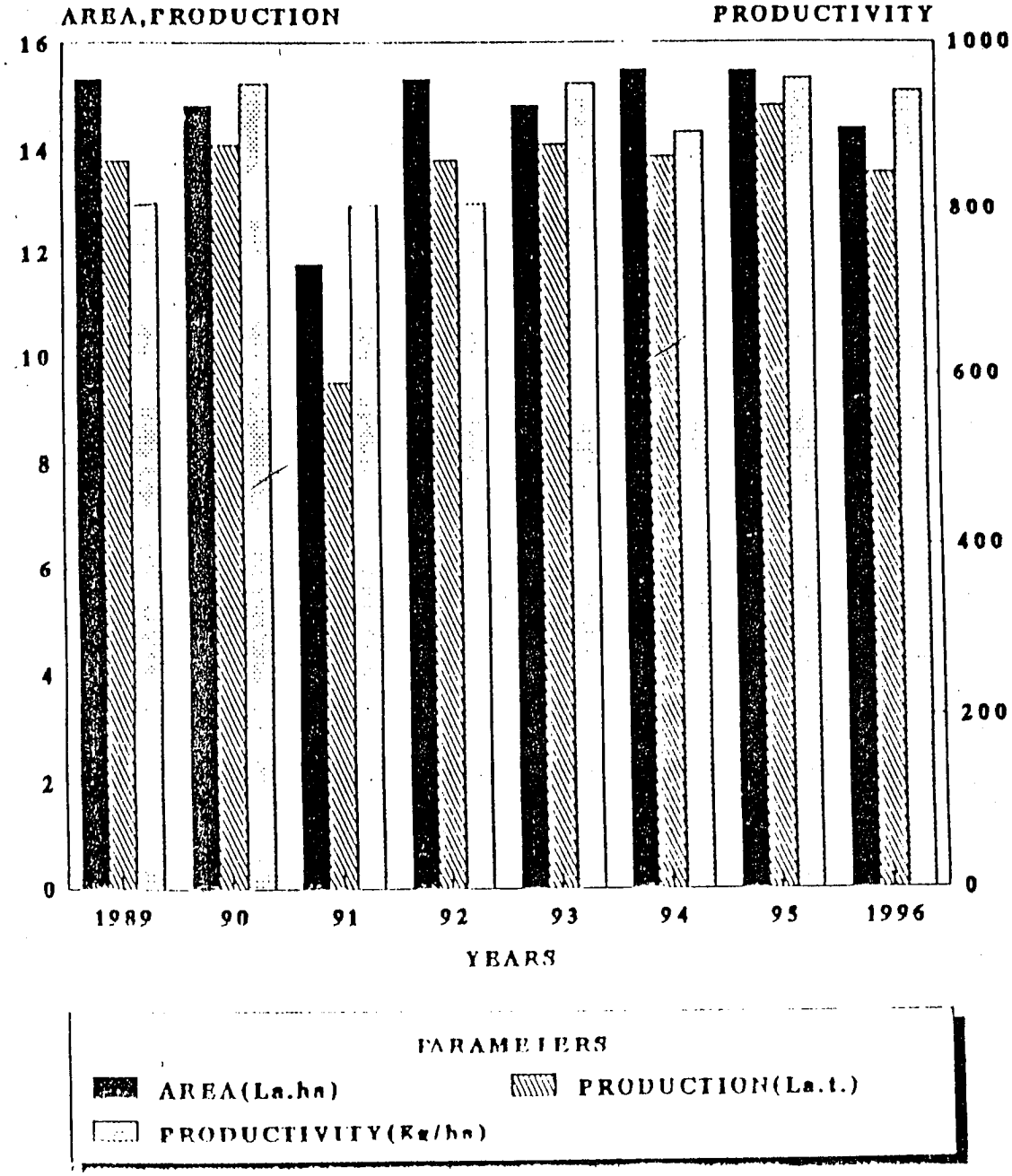


Area,Prodn & Yield Of Pea



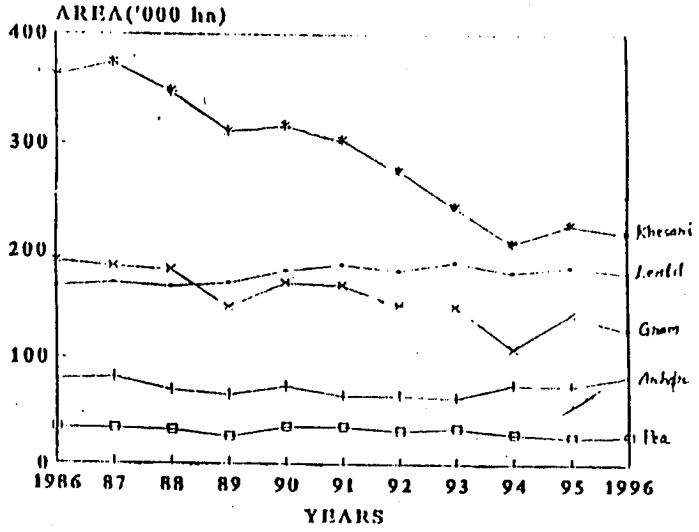
BIHAR

AREA, PRODUCTION AND PRODUCTIVITY OF TOTAL PULSES IN BIHAR(1988-89_1995-96)

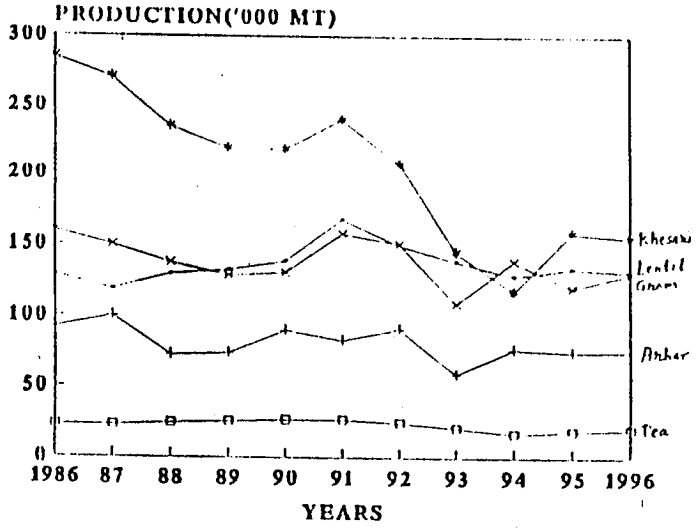


BIHAR

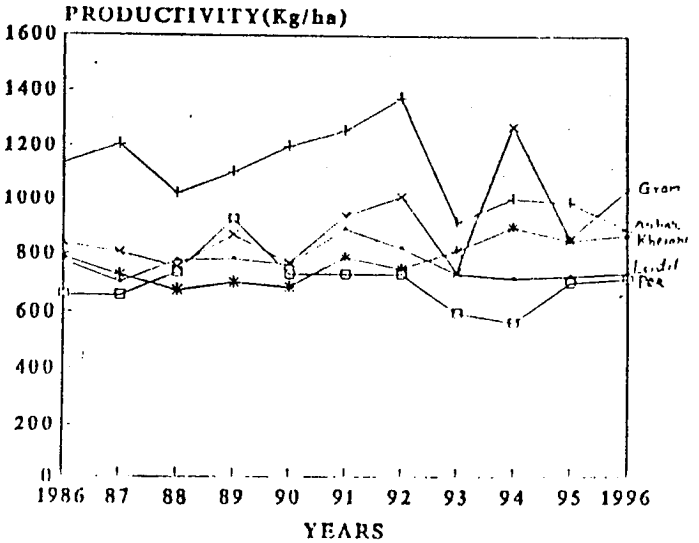
DECADAL CHANGES IN AREA OF MAJOR PULSE CROPS IN BIHAR.



DECADAL CHANGES IN PRODUCTION OF MAJOR PULSE CROPS IN BIHAR



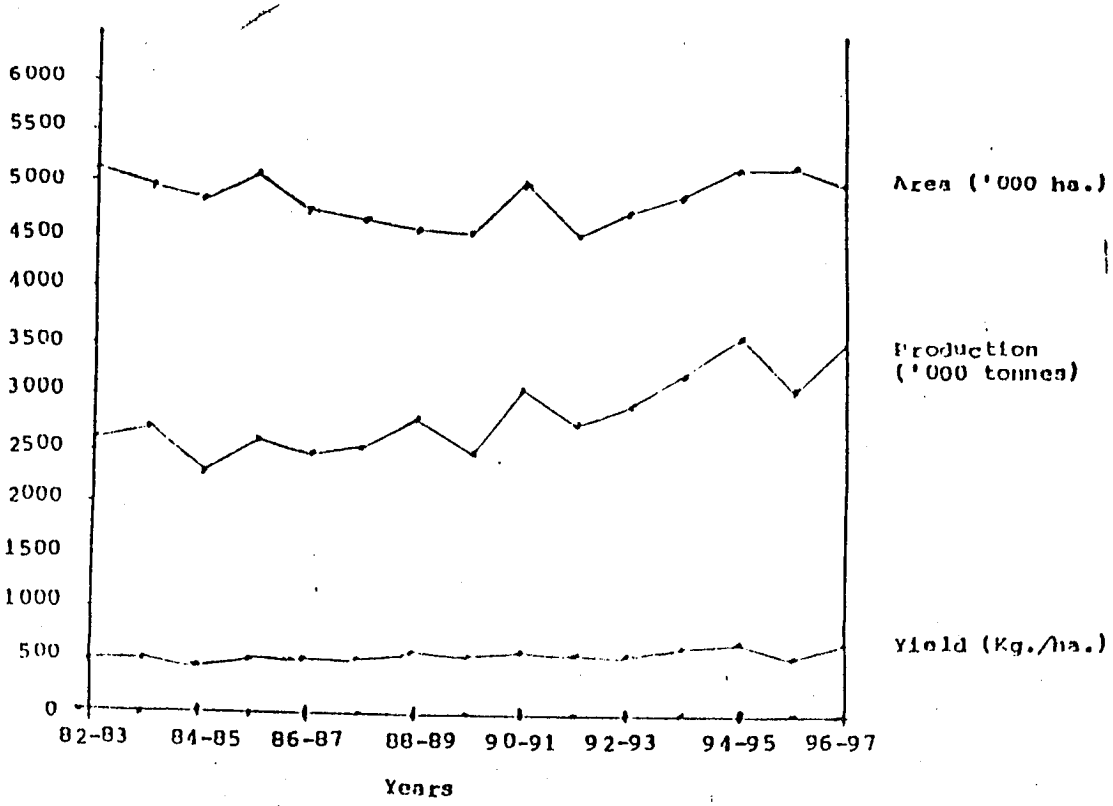
DECADAL CHANGES IN PRODUCTIVITY OF MAJOR PULSE CROPS IN BIHAR



MADHYA PRADESH

AREA, PRODUCTION AND YIELD OF TOTAL PULSES IN MADHYA PRADESH

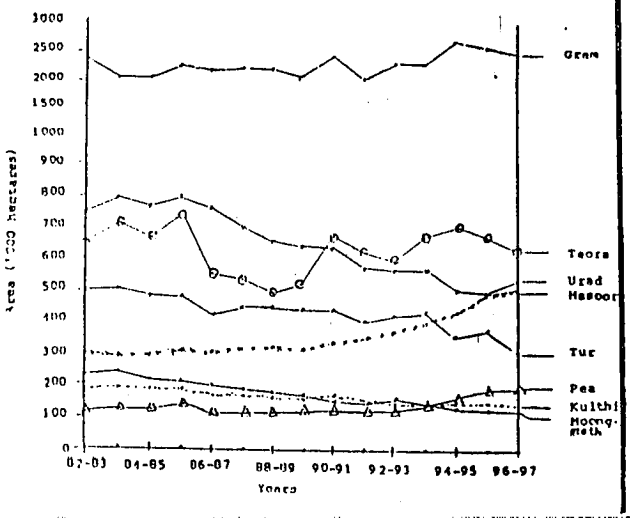
(1982-83 to 1996-97)



TRENDS IN AREA, PRODUCTION AND YIELD OF MAJOR PULSES IN MADHYA-PRADESH

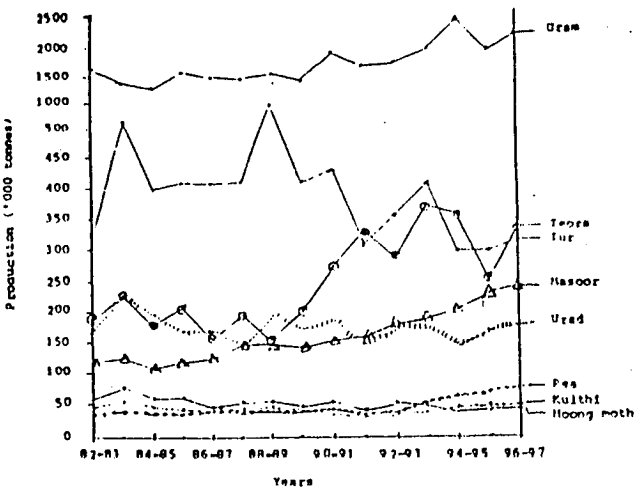
TRENDS IN AREA OF MAJOR PULSES IN MADHYA PRADESH

(1982-83 to 1996-97)



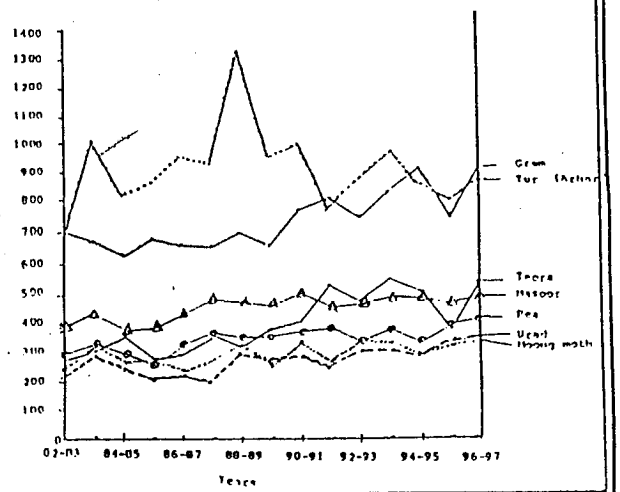
TRENDS IN PRODUCTION OF MAJOR PULSES IN MADHYA PRADESH

(1982-83 to 1996-97)

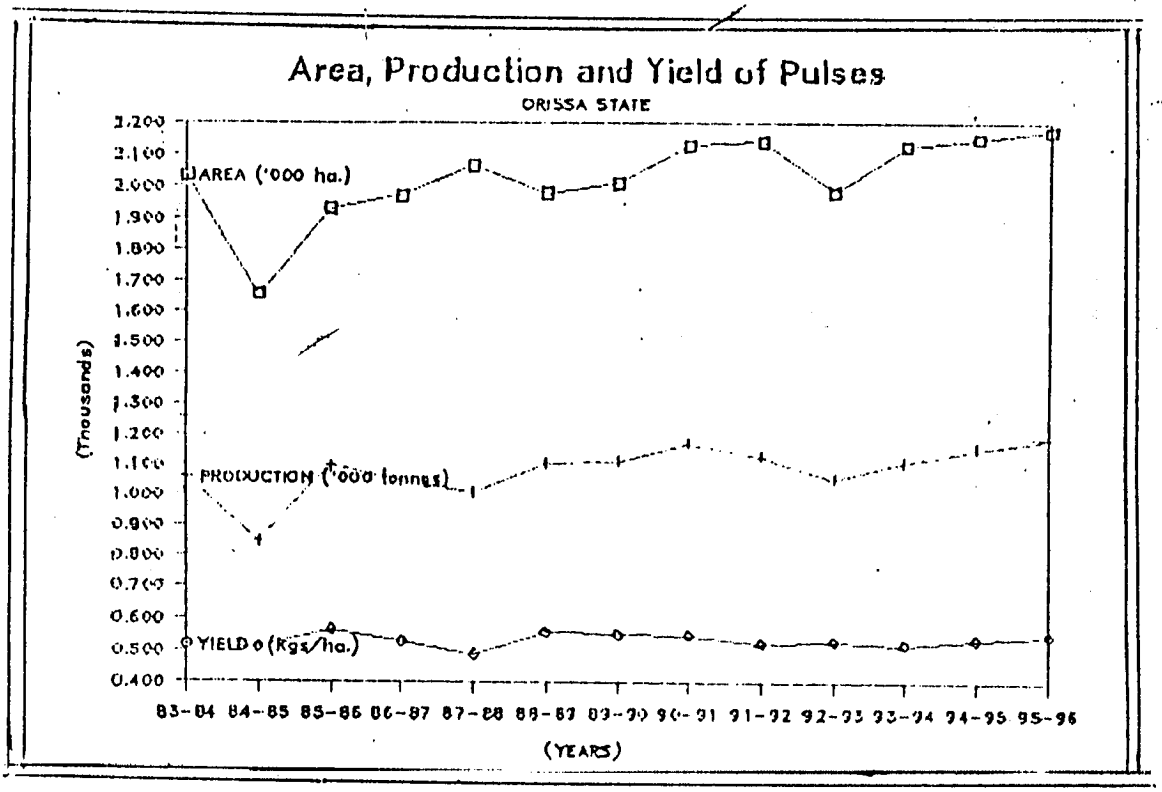


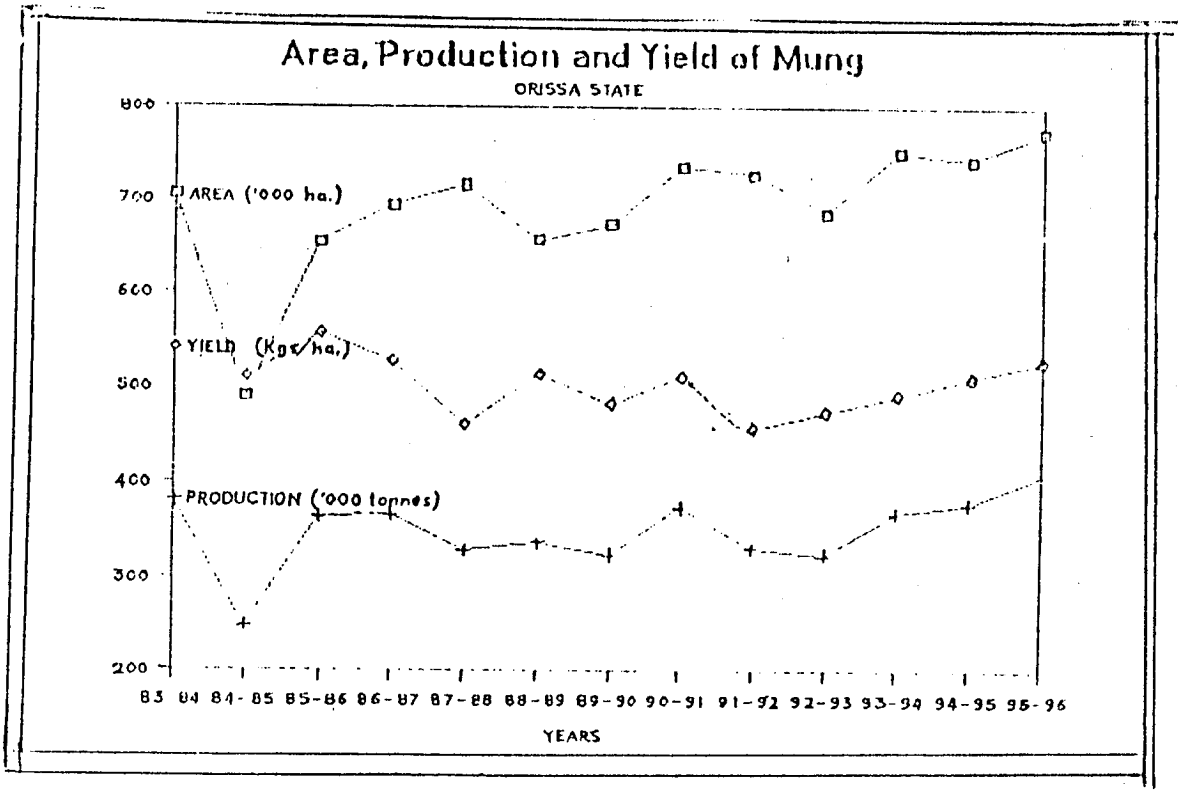
TRENDS IN YIELD OF MAJOR PULSES IN MADHYA PRADESH

(1982-83 to 1996-97)



ORISSA STATE





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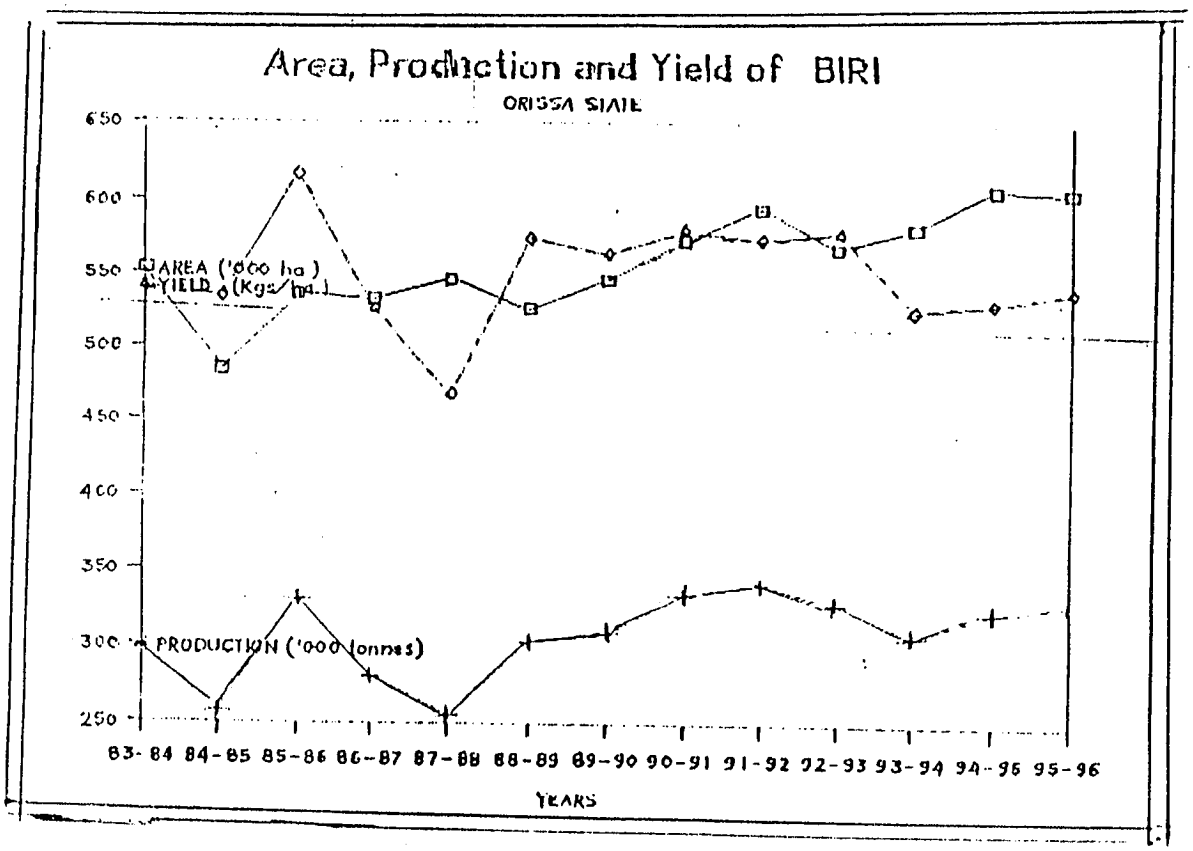
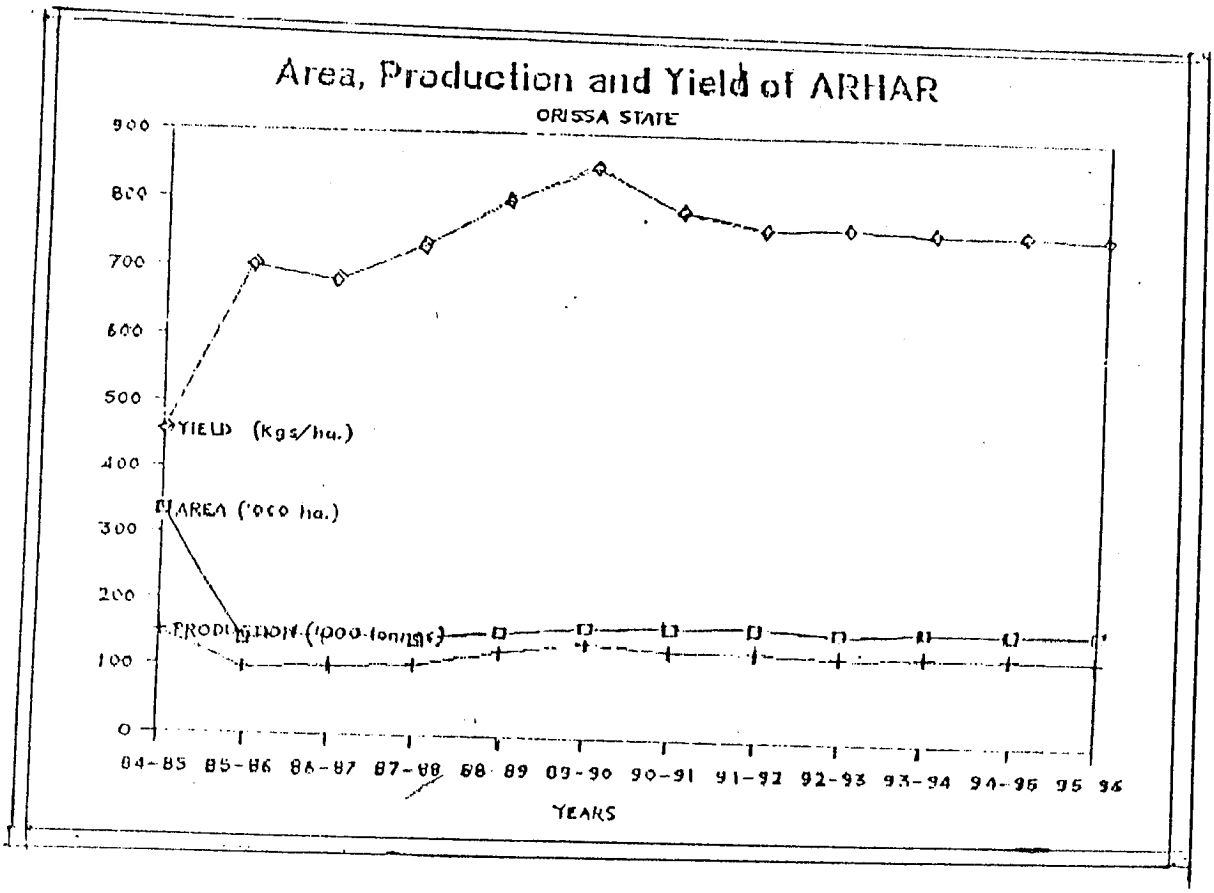
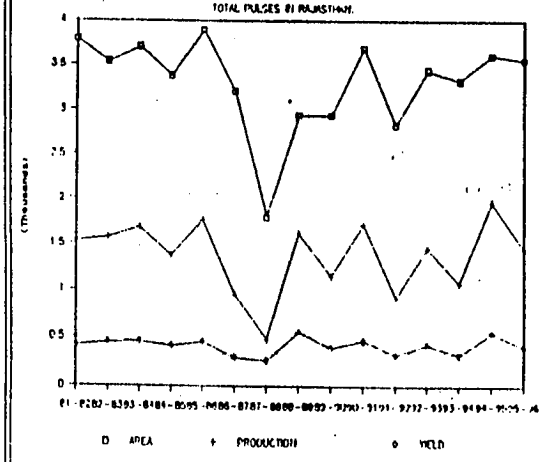


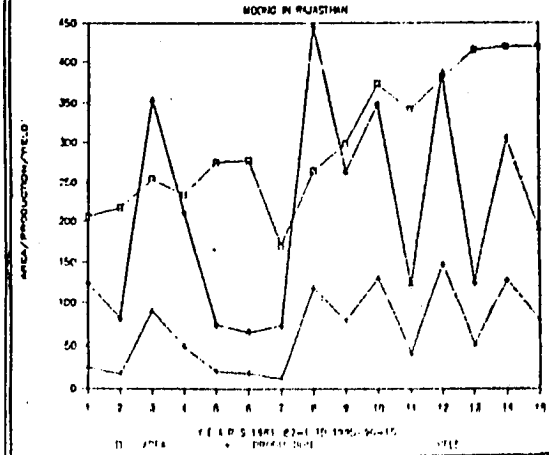


RAJASTHAN STATE

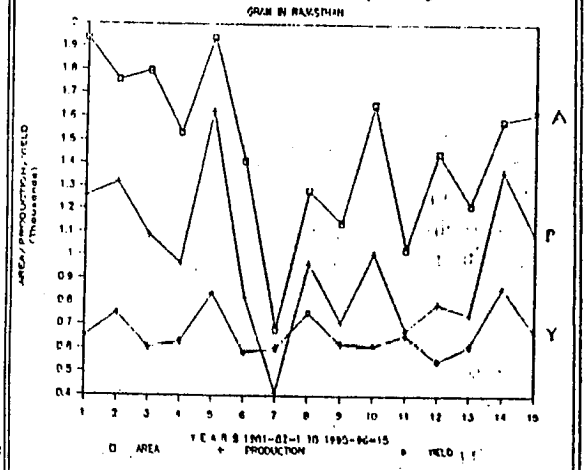
AREA , PRODUCTION AND YIELD OF



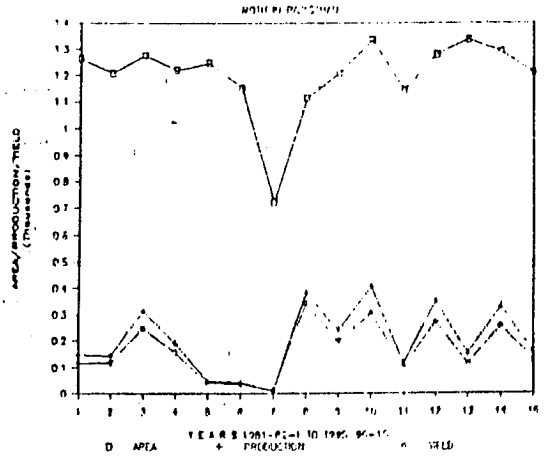
AREA, PRODUCTION AND YIELD OF



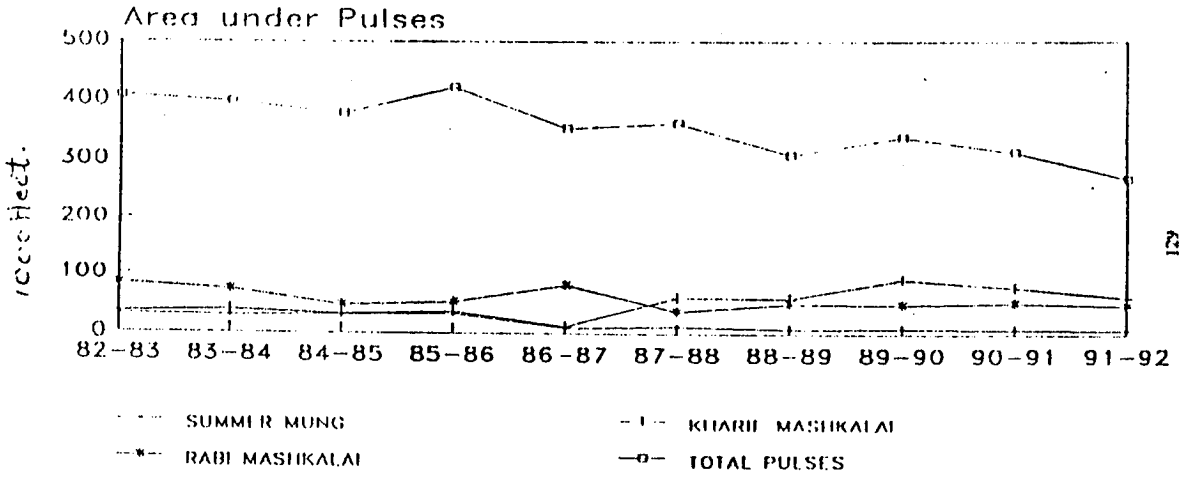
AREA, PRODUCTION AND YIELD OF



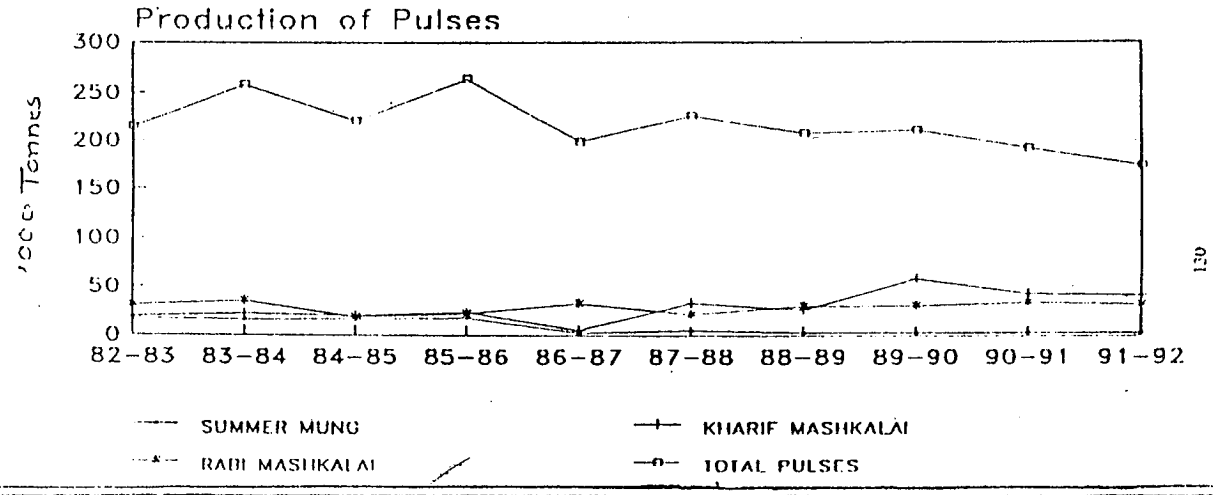
AREA, PRODUCTION AND YIELD OF



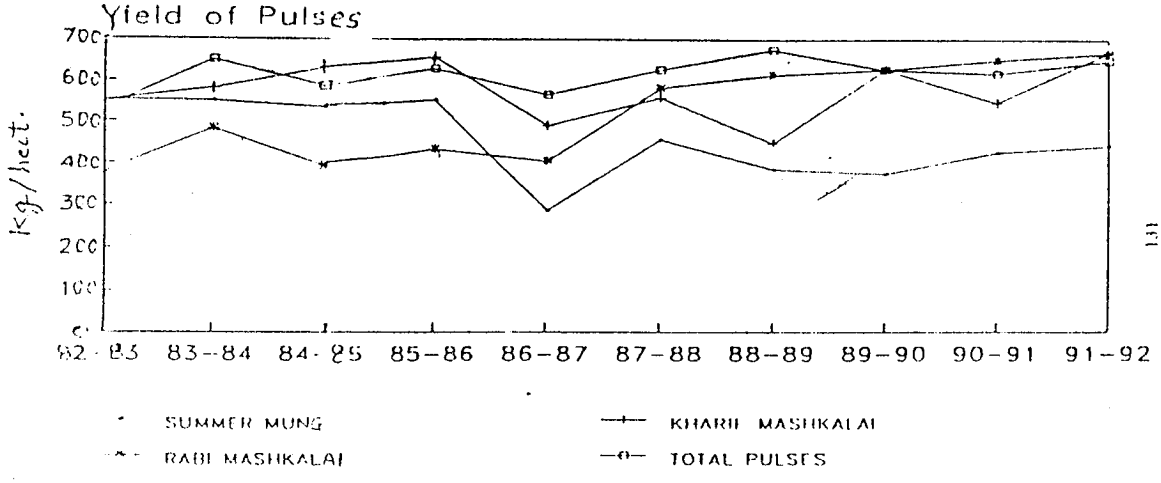
AREA UNDER SELECTED PULSES
(WEST BENGAL 1982–83 TO 1991–92)



PRODUCTION OF SELECTED PULSES
(WEST BENGAL 1982–83 TO 1991–92)



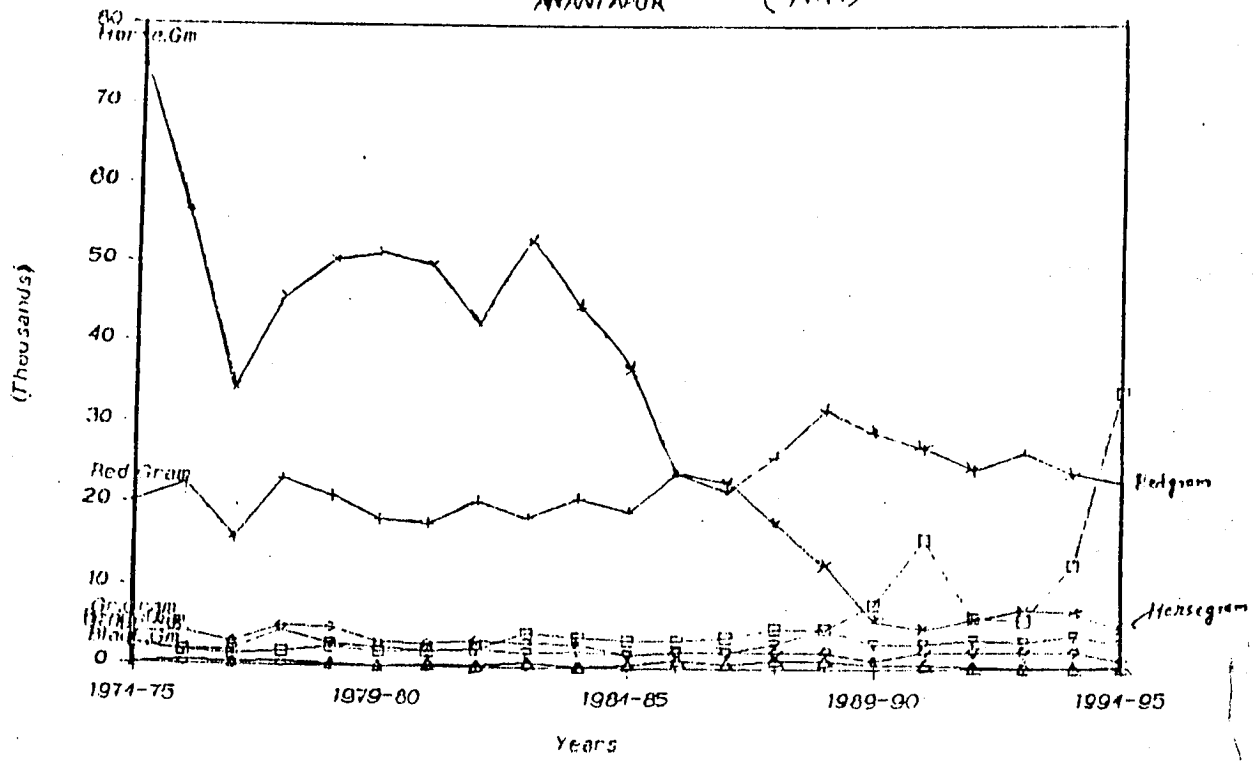
YIELD OF SELECTED PULSES
WEST BENGAL 1982–83 TO 1991–92)



ANANTAPUR DISTRICT (ANDHRA PRADESH)

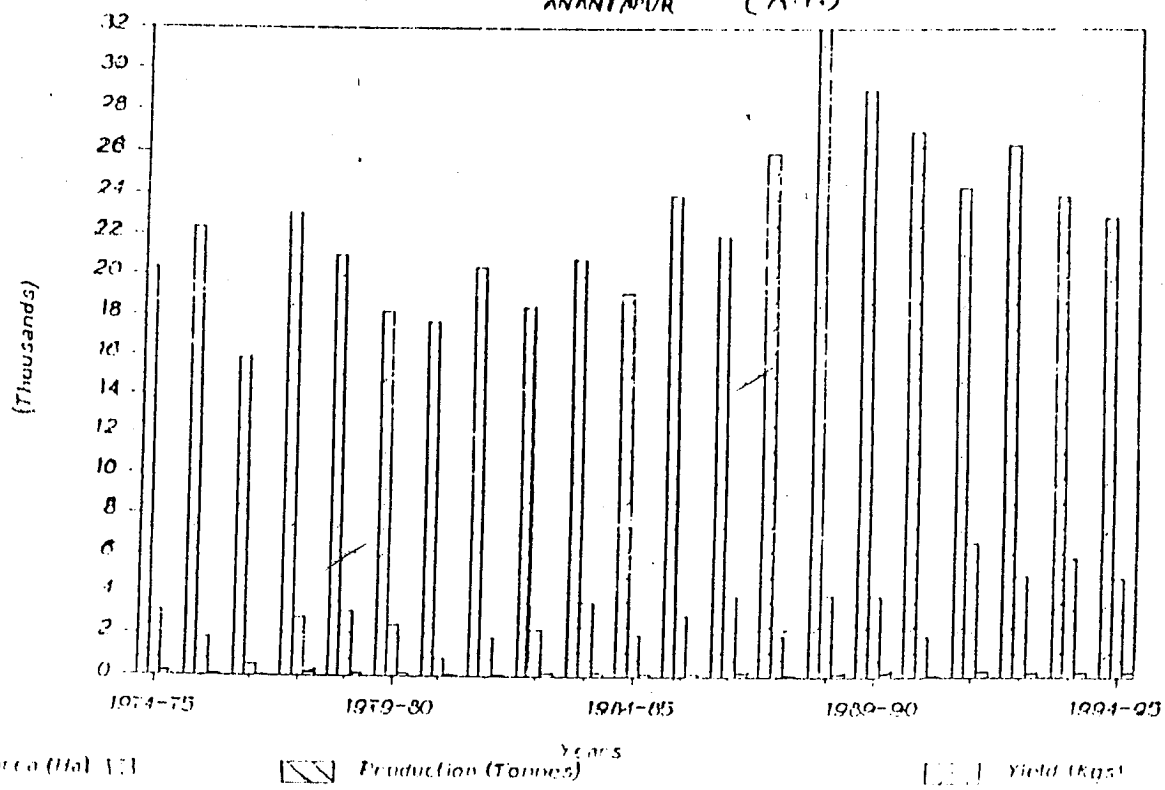
Area Under Pulse Crops

ANANTAPUR (A.P.)

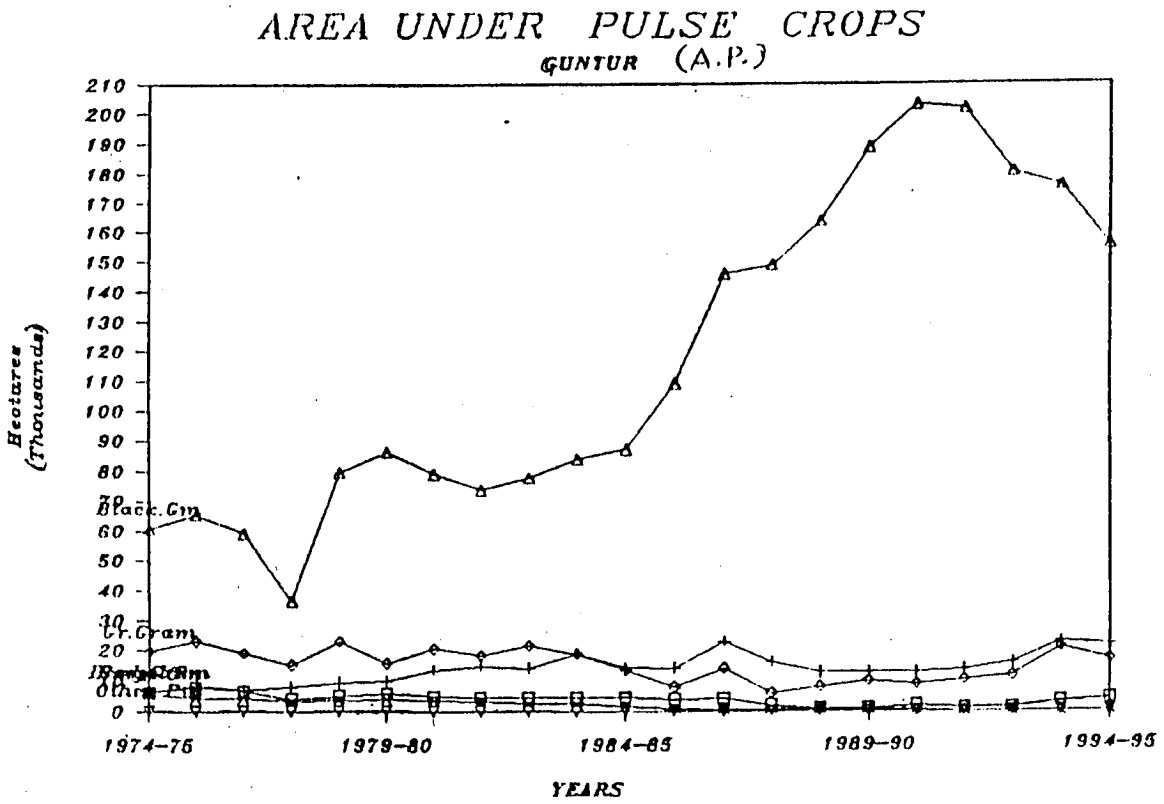


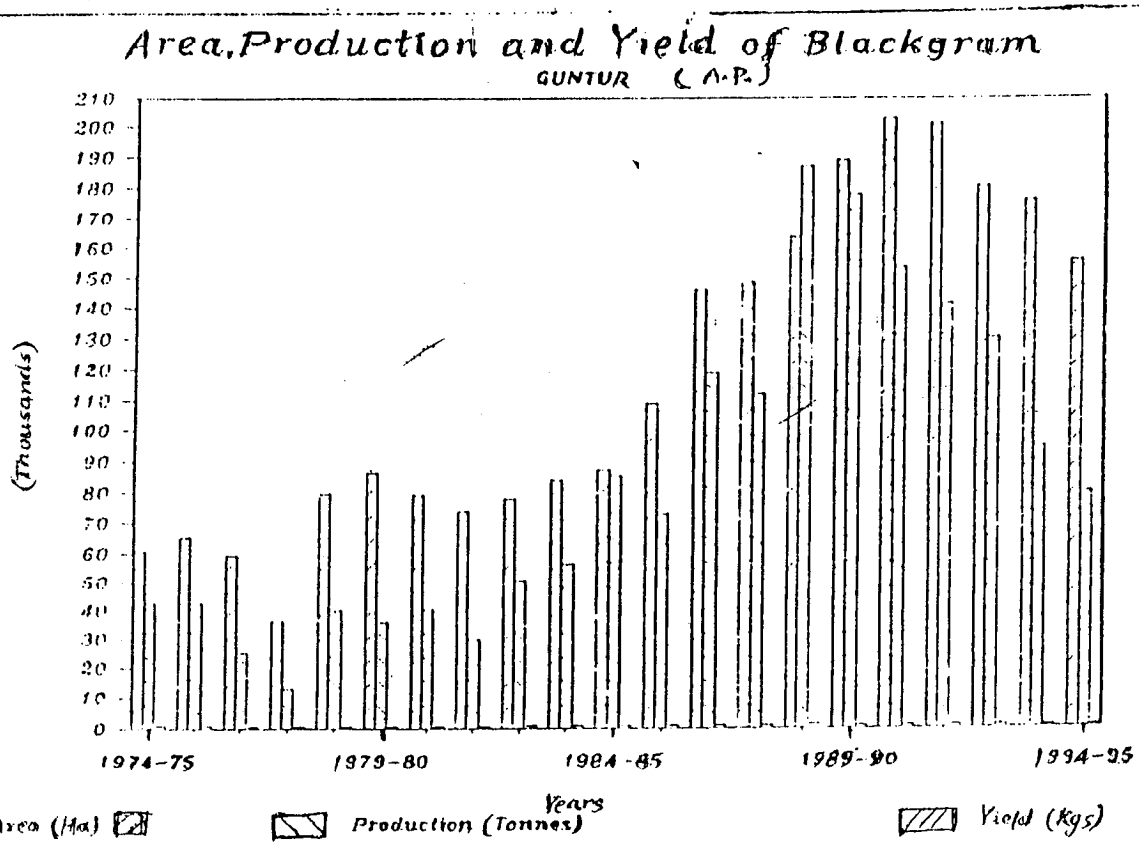
Area, Production and Yield of Redgram

ANANTAPUR (A.P.)



GUNTUR DISTRICT (ANDHRA PRADESH)

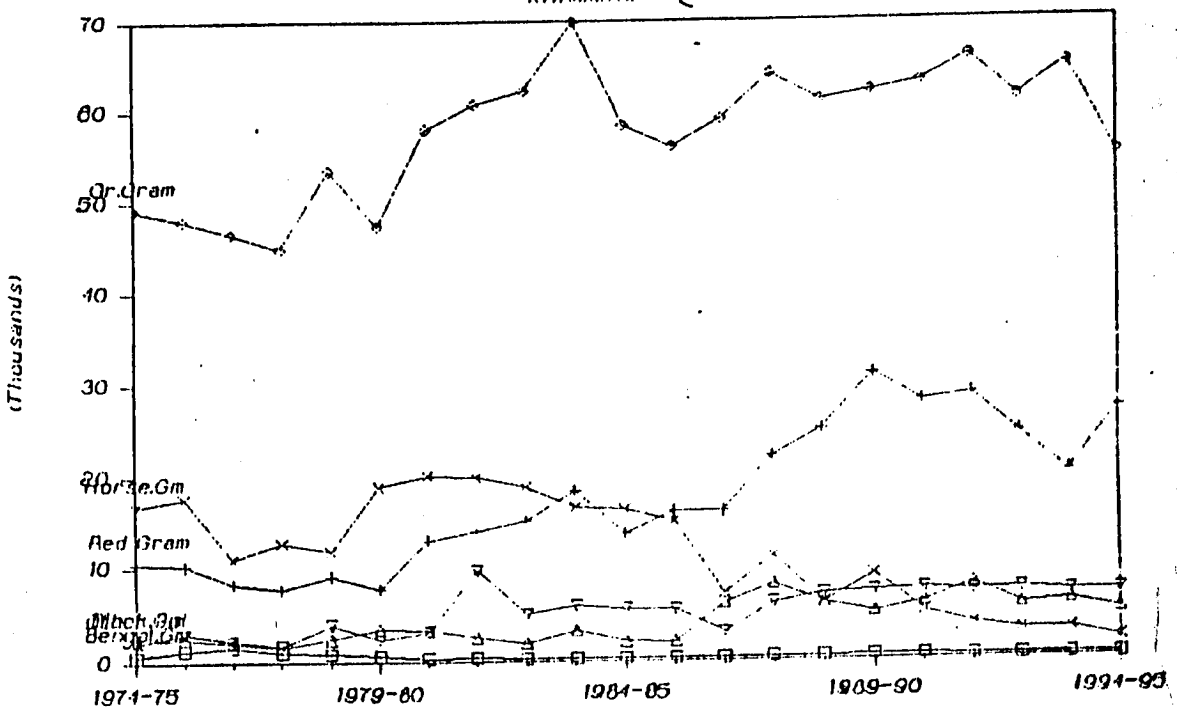




KHAMMAM DISTRICT (ANDHRA PRADESH)

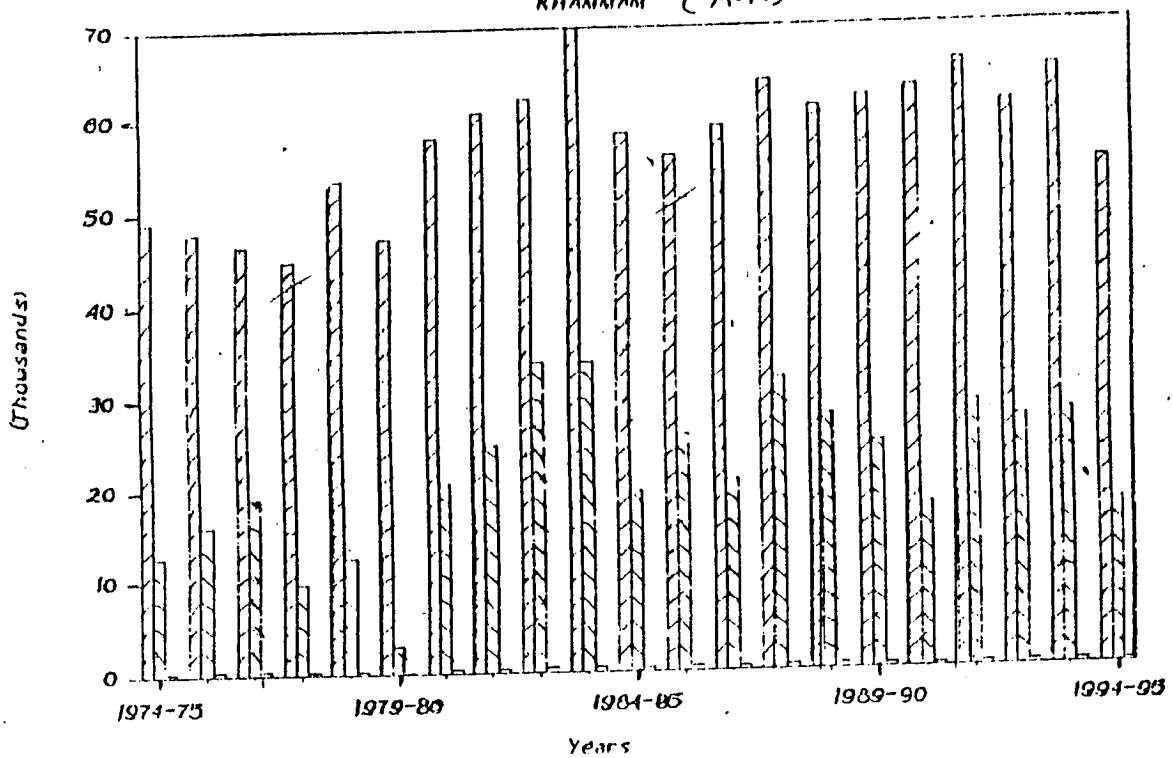
Area Under Pulse Crops

KHAMMAM (A.P.)



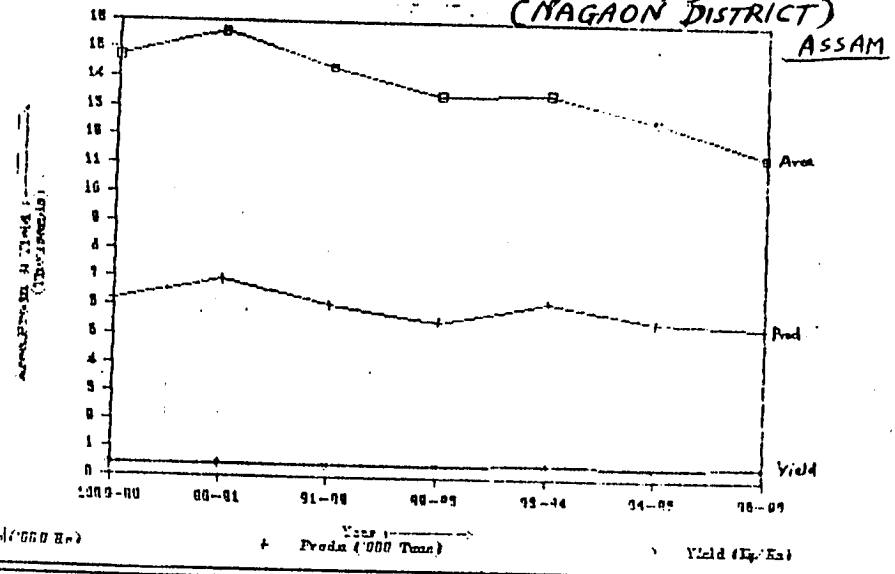
Area,Production and Yield of Greengram.

KHAMMAM (A.P.)

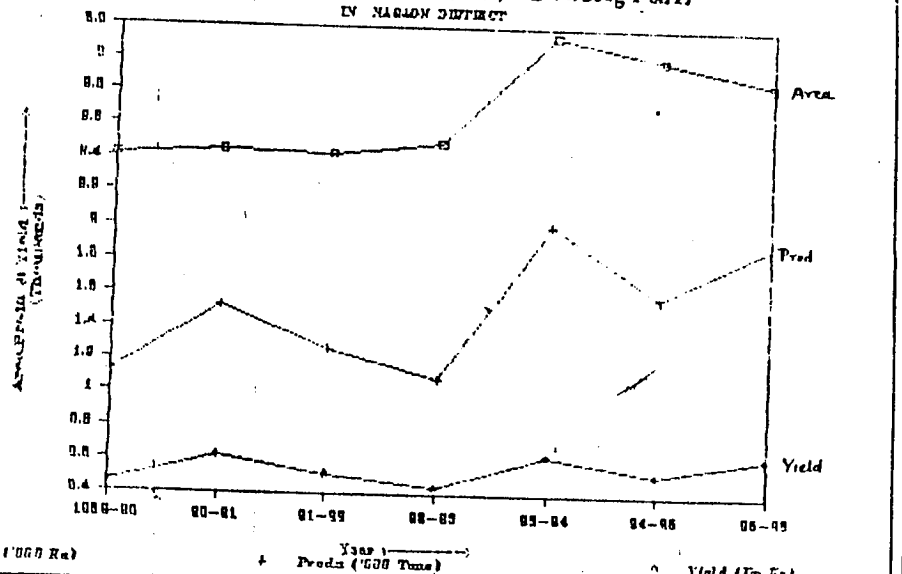


NAGAON DISTRICT (ASSAM)

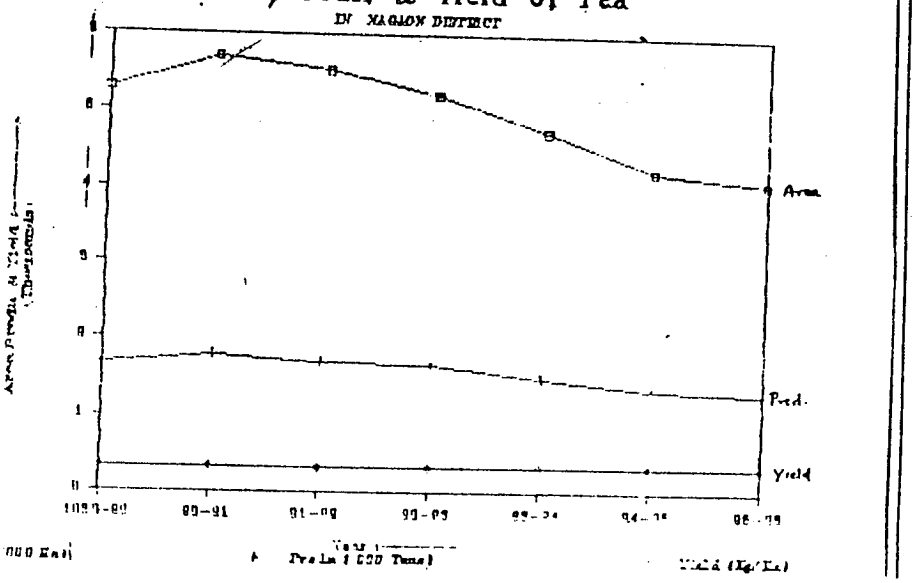
Area,Prodn & Yield of Total Pulses (NAGAON DISTRICT) ASSAM



Area,Prodn & Yield of Blackgram IN NAGAON DISTRICT



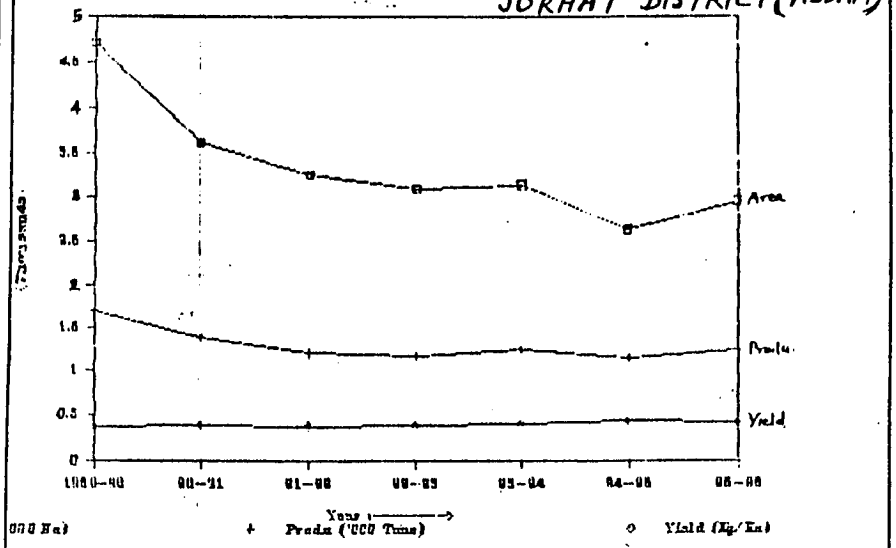
Area,Prodn & Yield of Pea IN NAGAON DISTRICT



JORHAT DISTRICT (ASSAM)

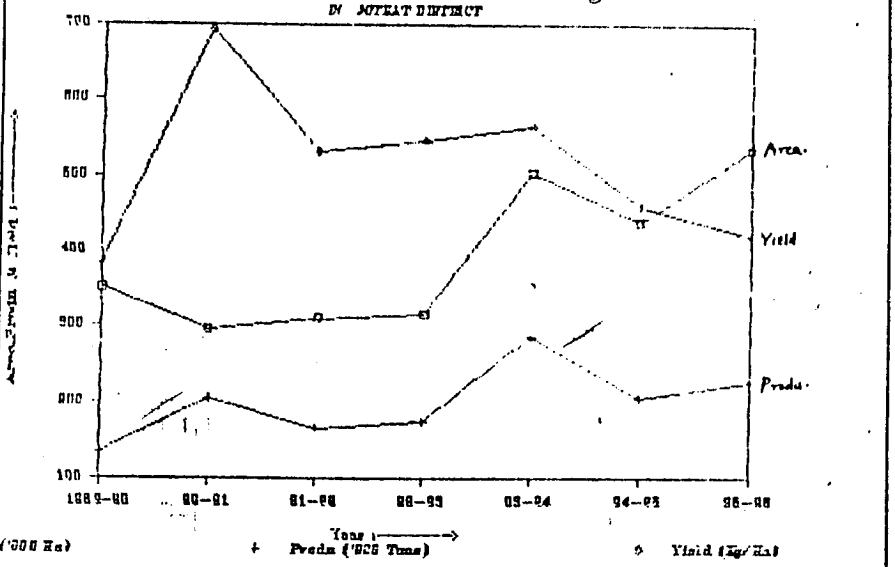
Area, Prodn & Yield of Pulses

JORHAT DISTRICT (ASSAM)



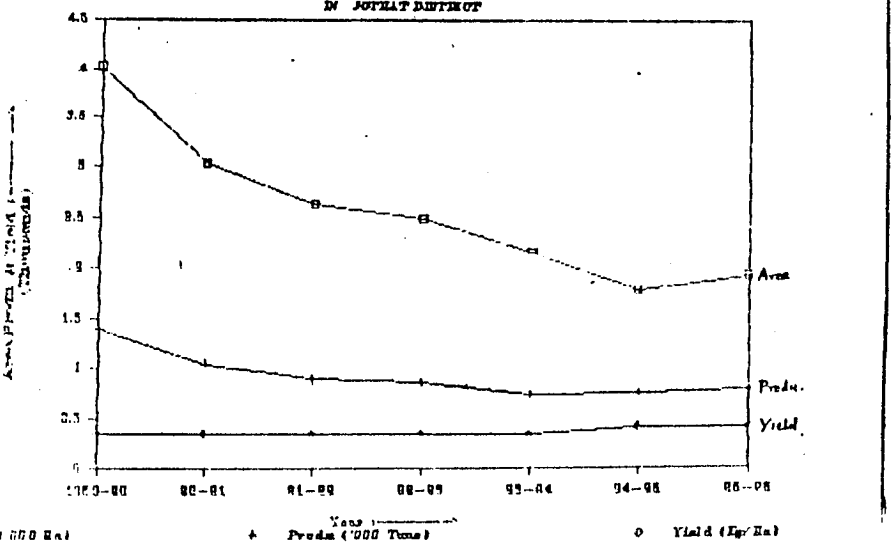
Area, Prodn & Yield of Blackgram

IN JORHAT DISTRICT

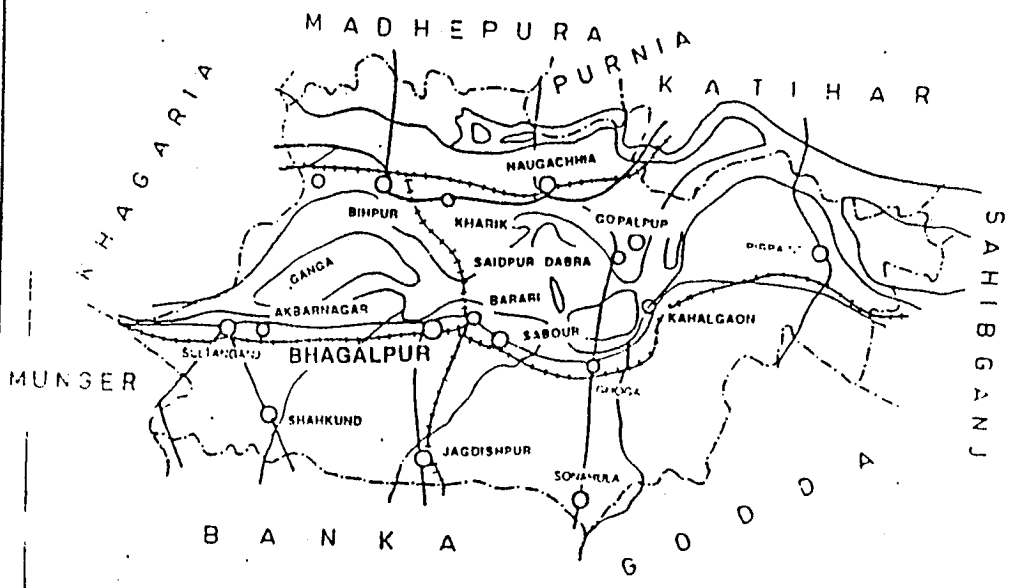


Area, Prodn & Yield of Pea

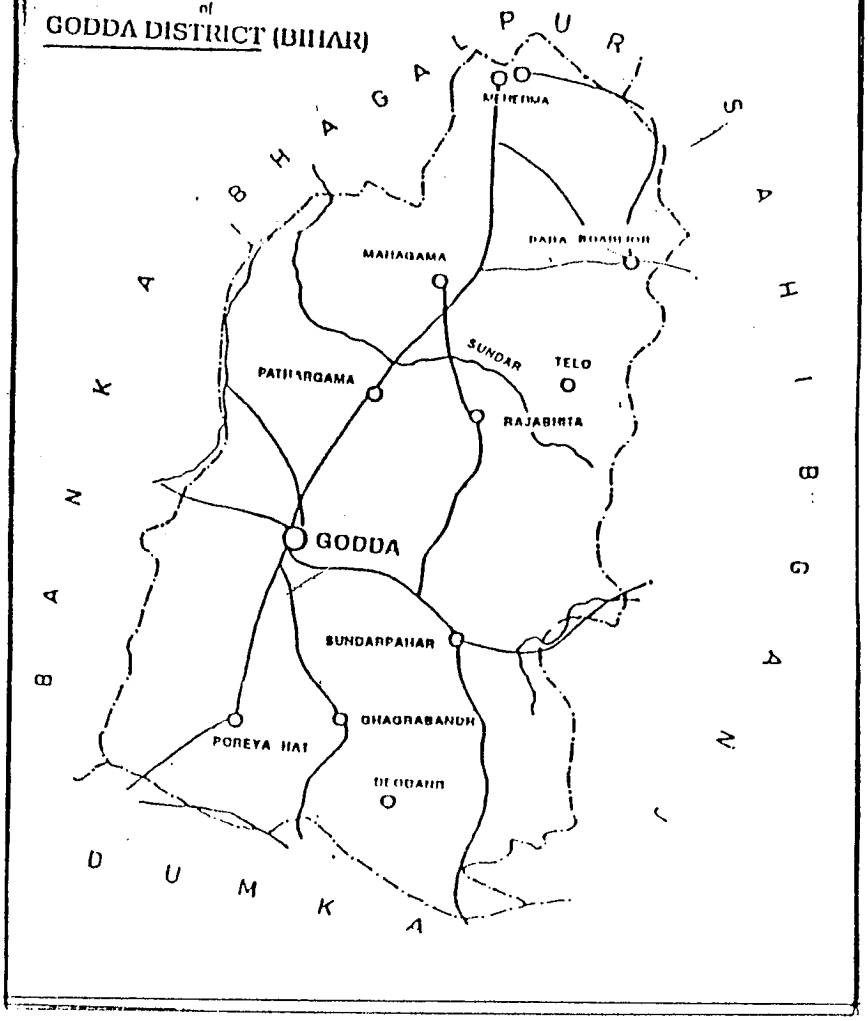
IN JORHAT DISTRICT



A Sketch Map
of
BHAGALPUR DISTRICT (BIHAR)

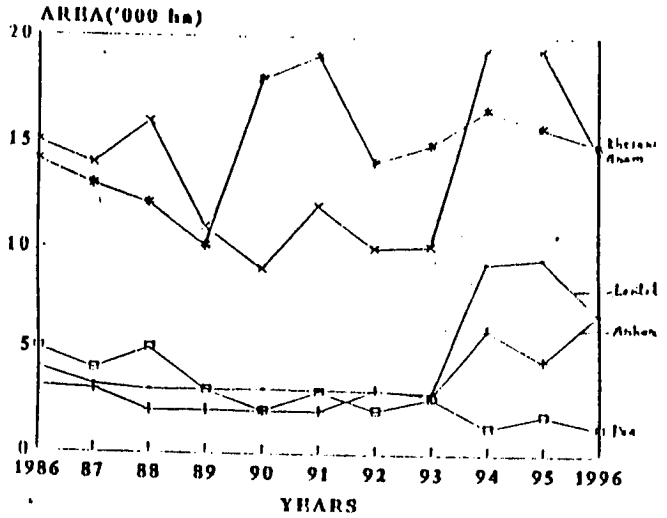


A Sketch Map
of
GODDA DISTRICT (BIHAR)

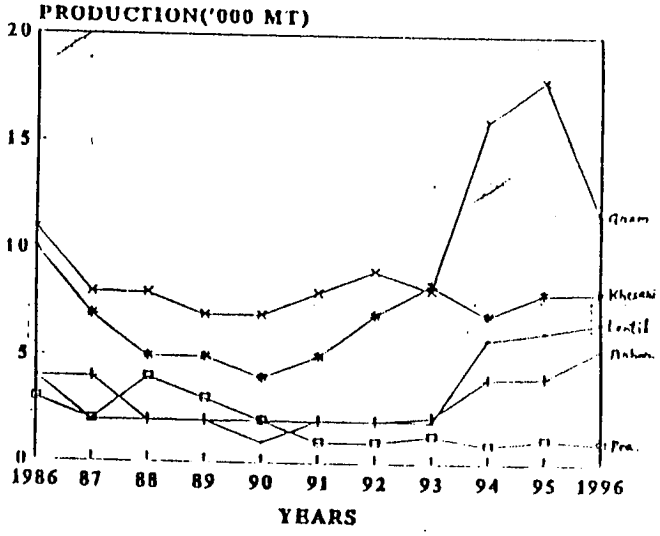


BHAGALPUR DISTRICT (BIHAR)

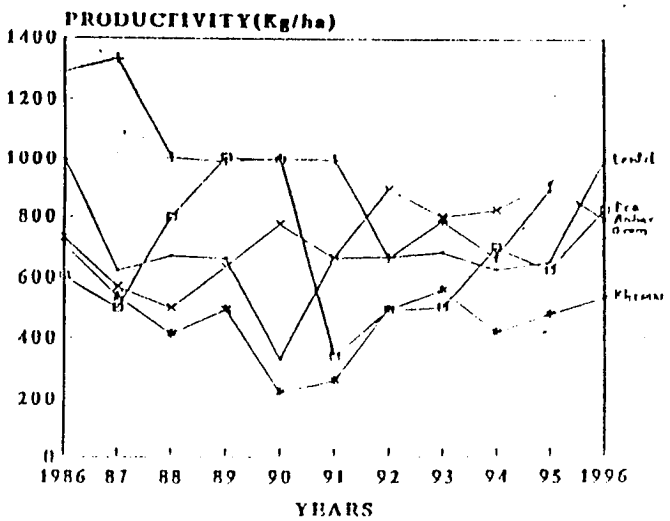
DECADAL CHANGES IN AREA OF MAJOR PULSES IN BHAGALPUR(1985-1996) BIHAR



DECADAL CHANGES IN PRODUCTION OF MAJOR PULSES IN BHAGALPUR(1985-1996)

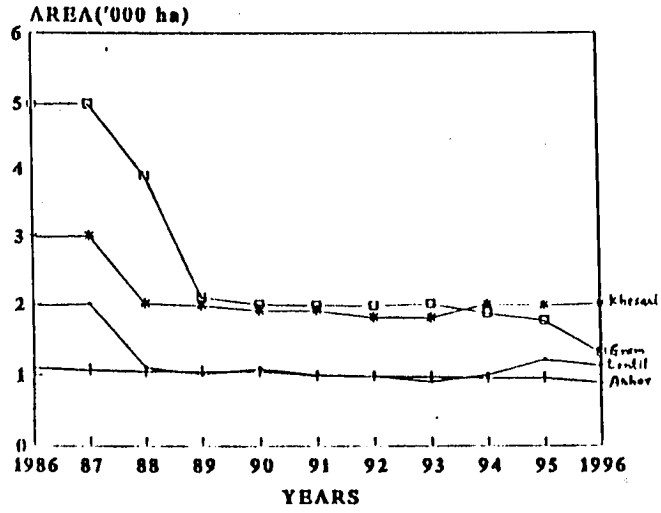


DECADAL CHANGES IN PRODUCTIVITY OF MAJOR PULSES IN BHAGALPUR(1985-1996)

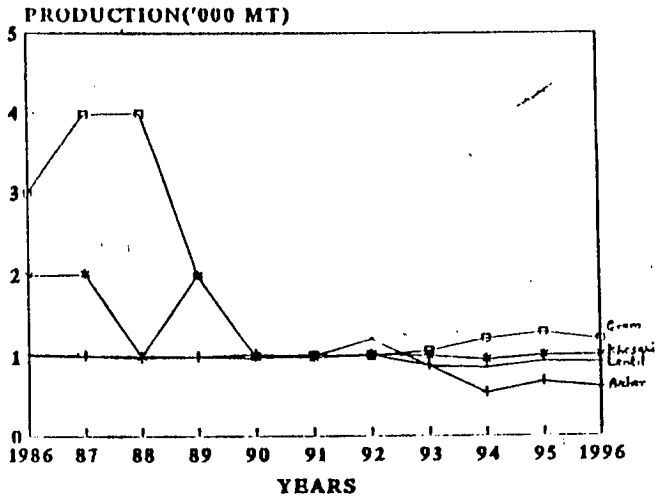


GODDA DISTRICT (BIHAR)

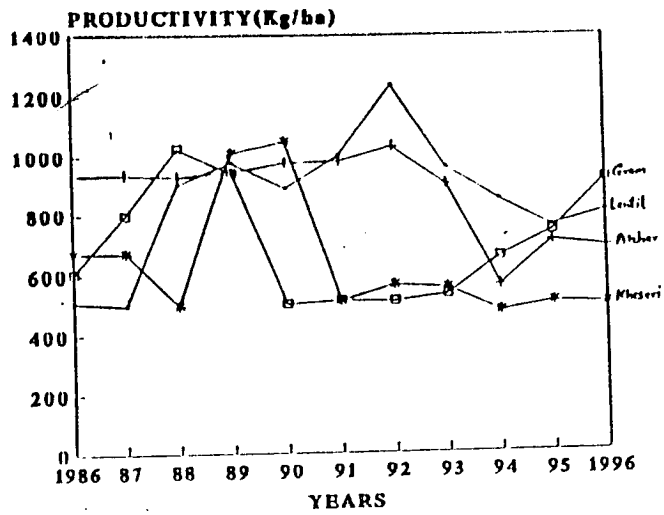
DECADAL CHANGES IN AREA OF MAJOR PULSES IN GODDA(1985-1996) BIHAR



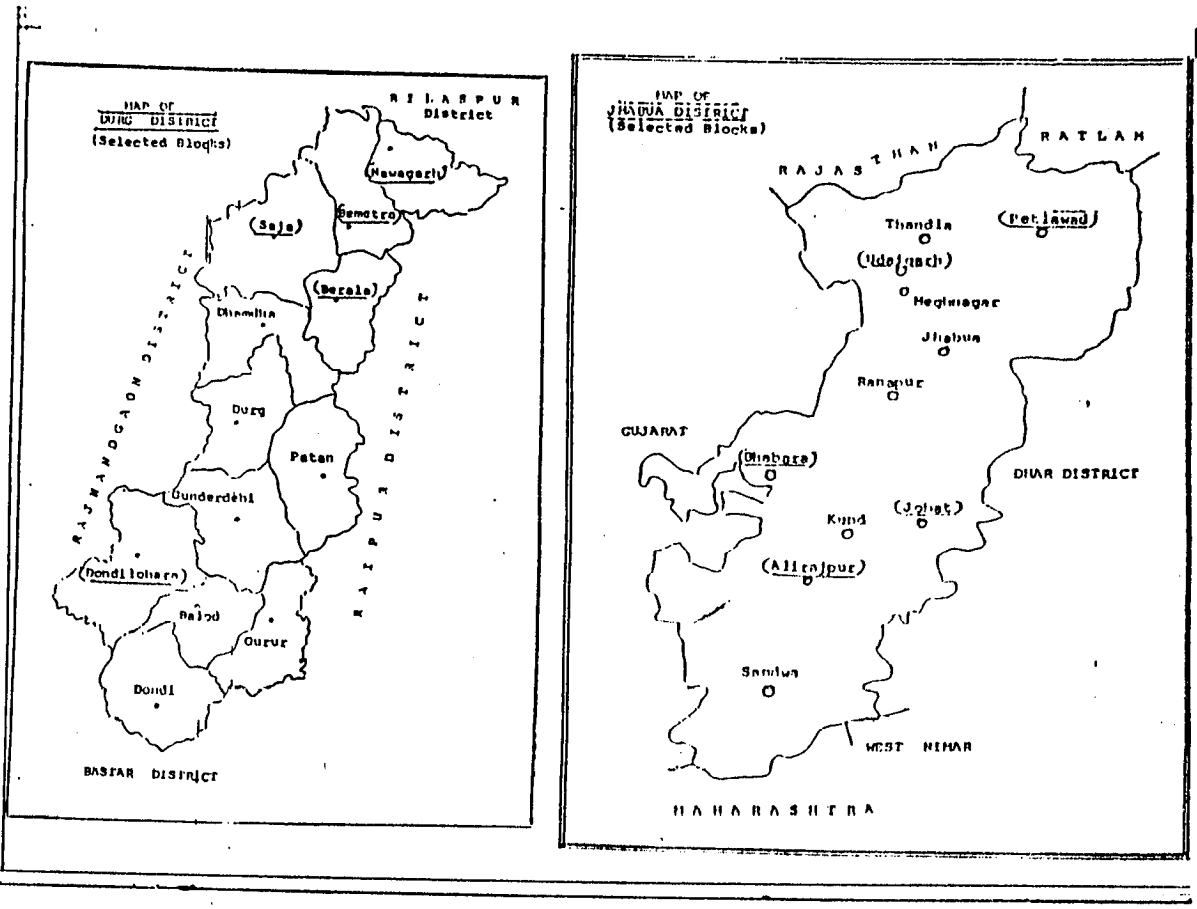
DECADAL CHANGES IN PRODUCTION OF MAJOR PULSES IN GODDA(1985-1996)

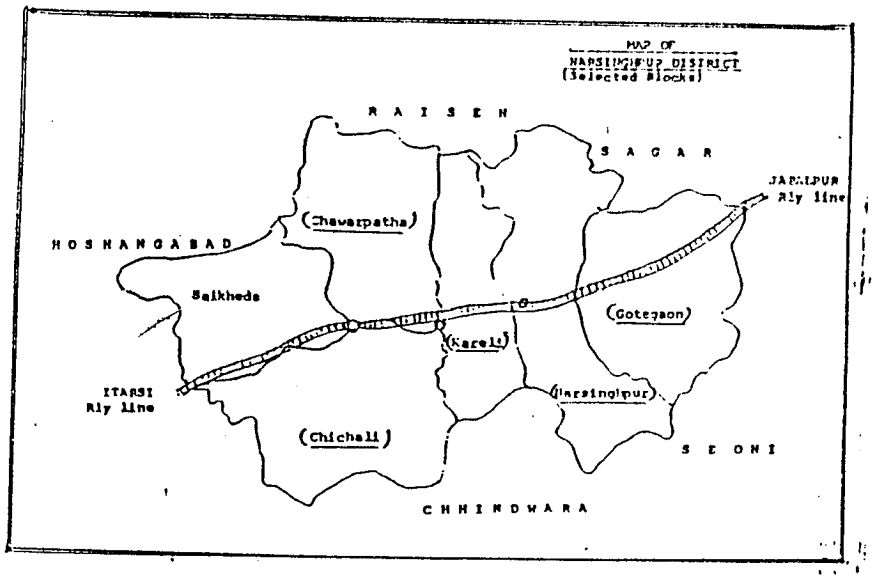


DECADAL CHANGES IN PRODUCTIVITY OF MAJOR PULSES IN GODDA(1985-1996)



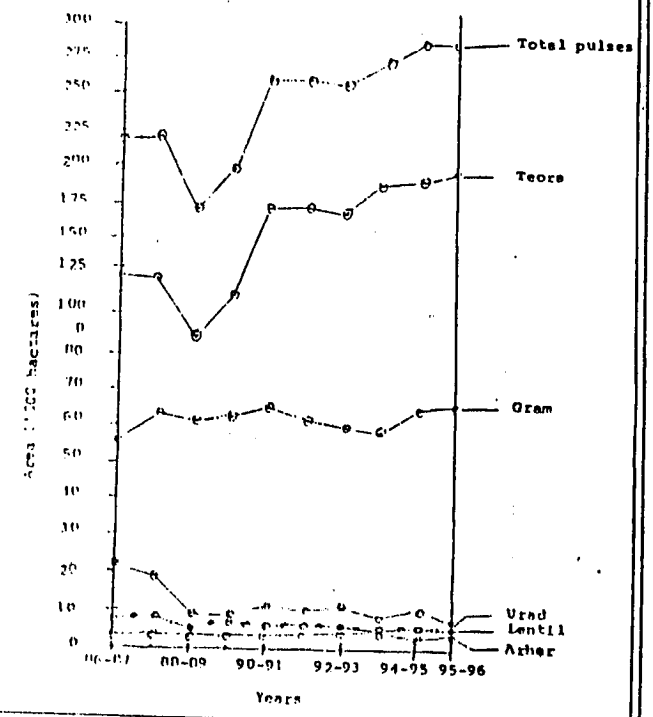
MAP OF DURG, JHABUA AND NARSINGHPUR DISTRICT MADHYA PRADESH



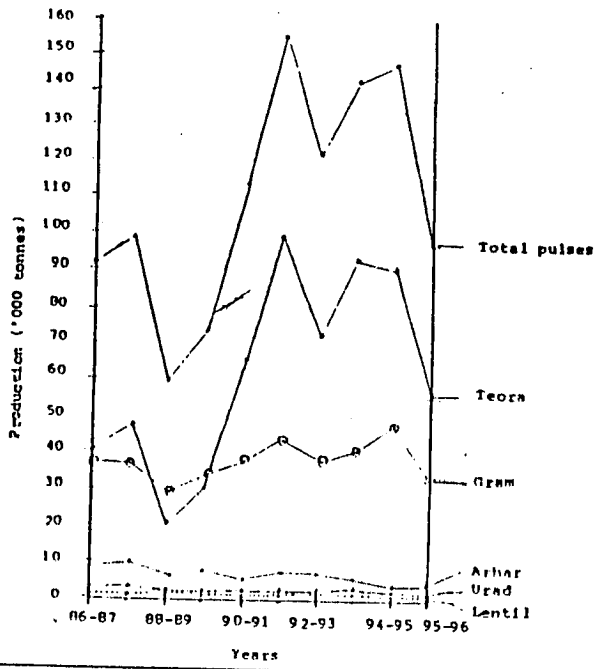


DURG DISTRICT, (MADHYA PRADESH)

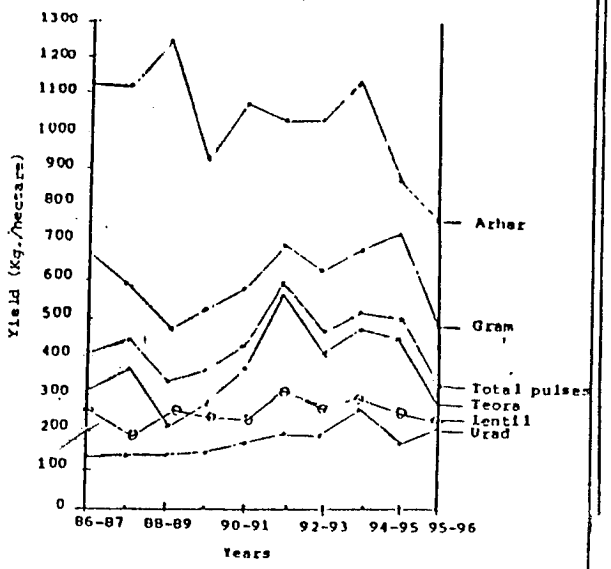
AREA OF PULSES IN DURG DISTRICT
(1986-87 to 1995-96)



PRODUCTION OF PULSES IN DURG DISTRICT
(1986-87 to 1995-96)

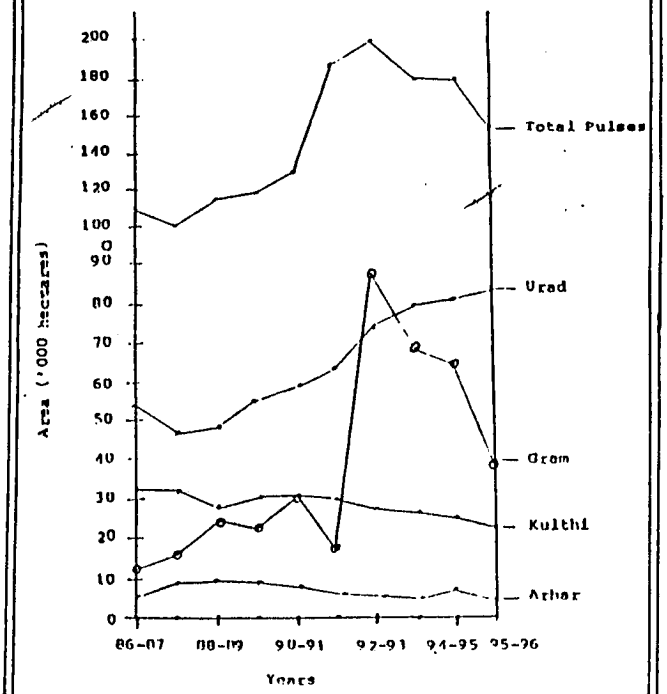


YIELD OF PULSES IN DURG DISTRICT
(1986-87 to 1995-96)

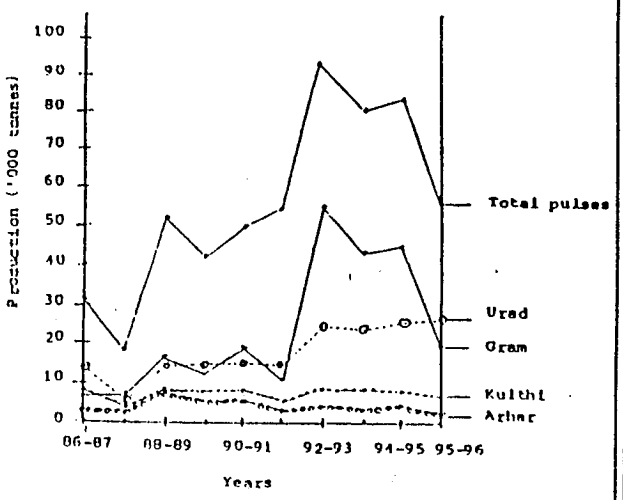


JHABUA DISTRICT, (MADHYA PRADESH)

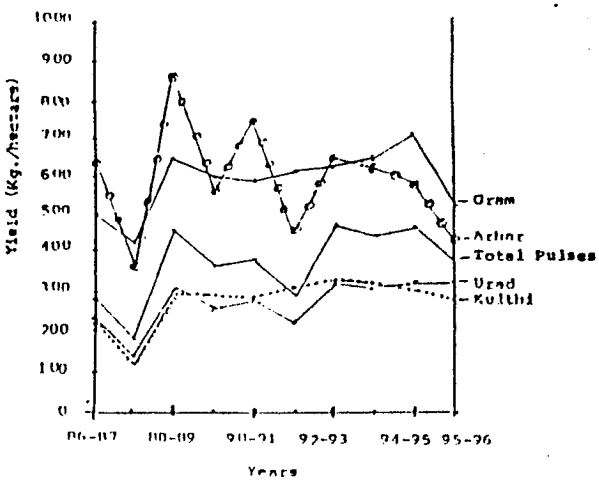
AREA OF PULSES IN JHABUA DISTRICT
(1986-87 to 1995-96)



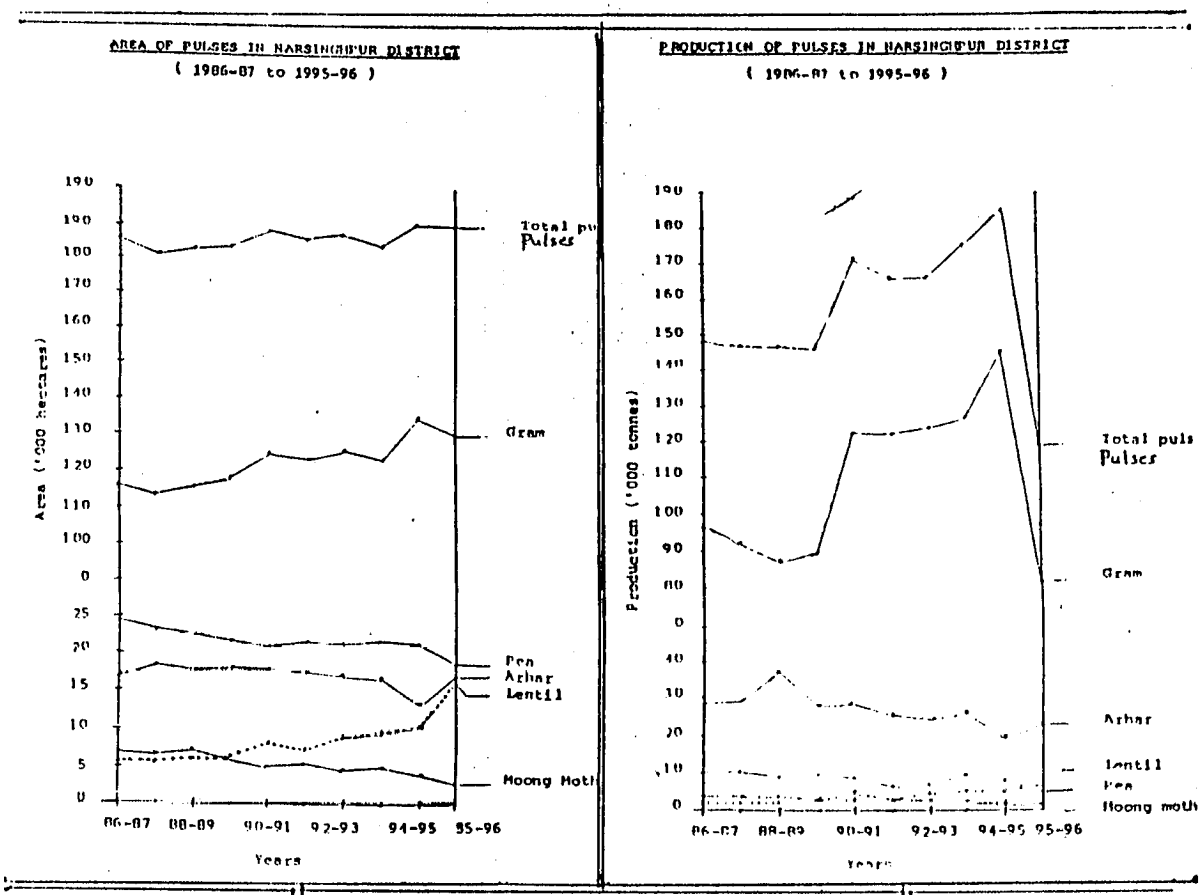
PRODUCTION OF PULSES IN JHABUA DISTRICT
(1986-87 to 1995-96)

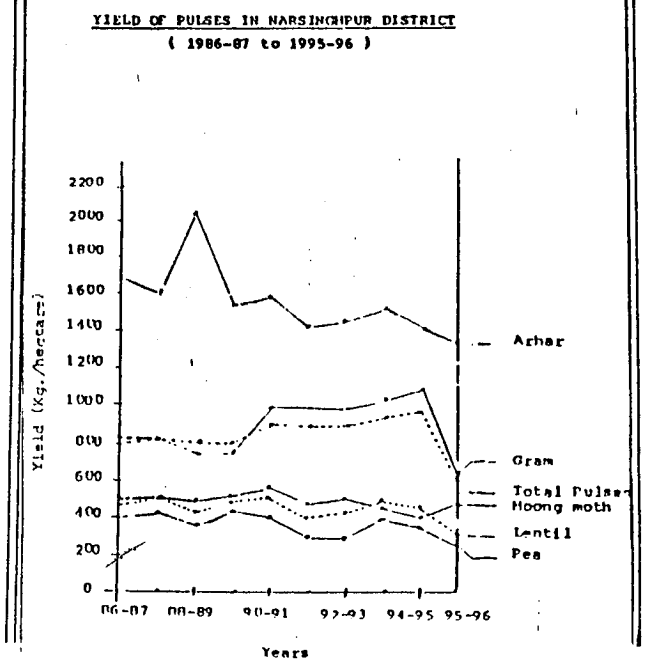


YIELD OF PULSES IN JHABUA DISTRICT
(1986-87 to 1995-96)

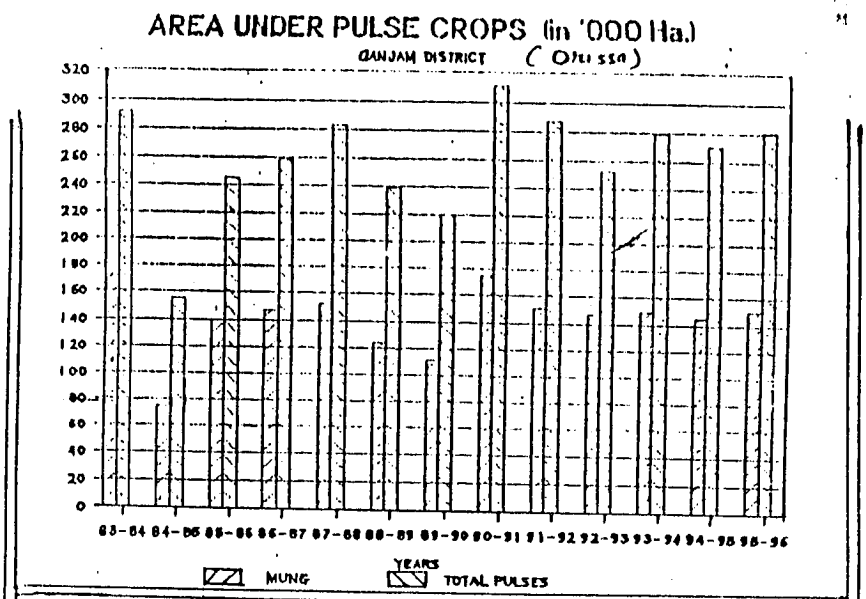


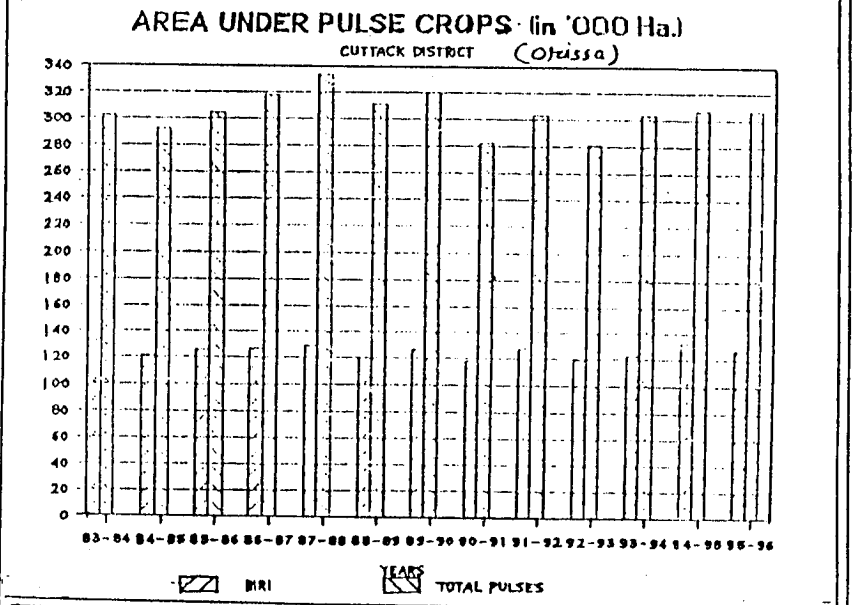
NARSINGHPUR DISTRICT, (MADHYA PRADESH)

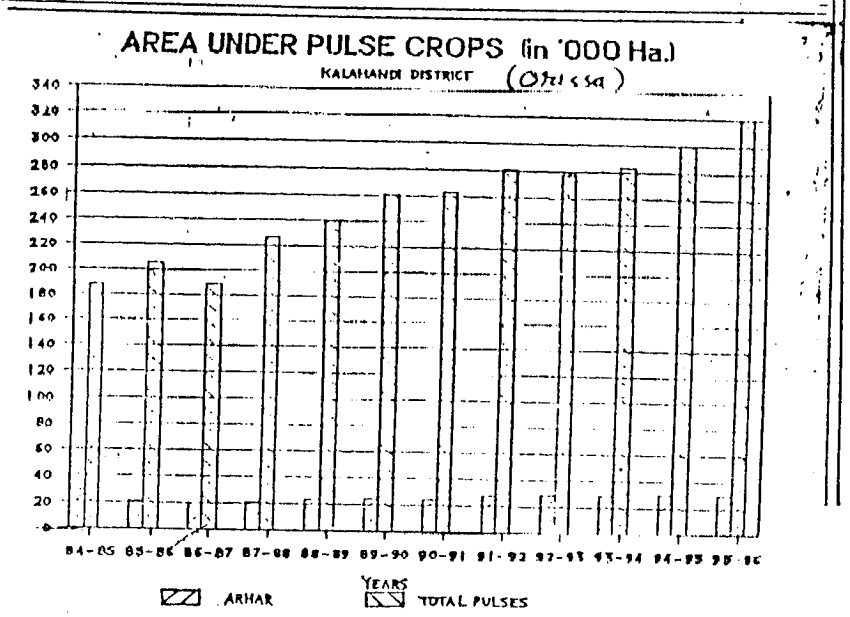




GANJAM, CUTTACK AND KALAHANDI DISTRICTS, (ORISSA)

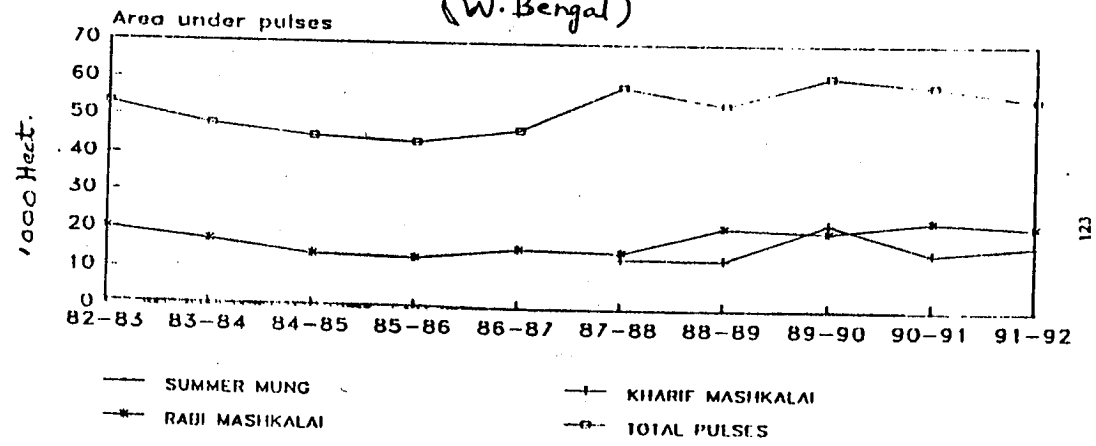




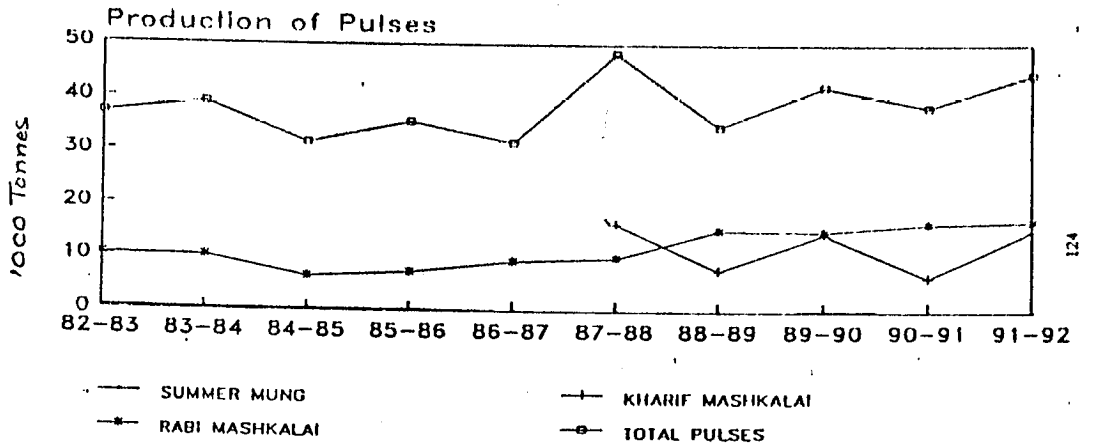


MALDA DISTRICT (WEST BENGAL)

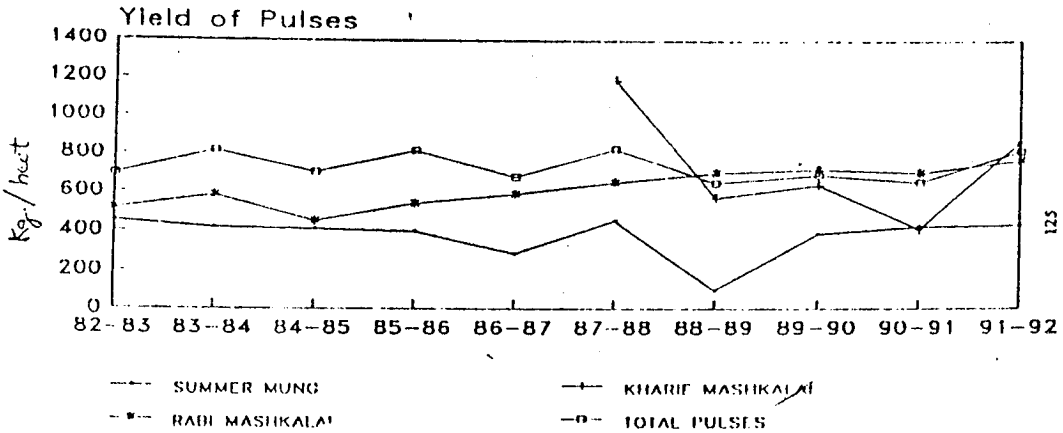
AREA UNDER SELECTED PULSES (MALDA 1982–83 TO 1991–92)



PRODUCTION OF SELECTED PULSES (MALDA 1982–83 TO 1991–92)

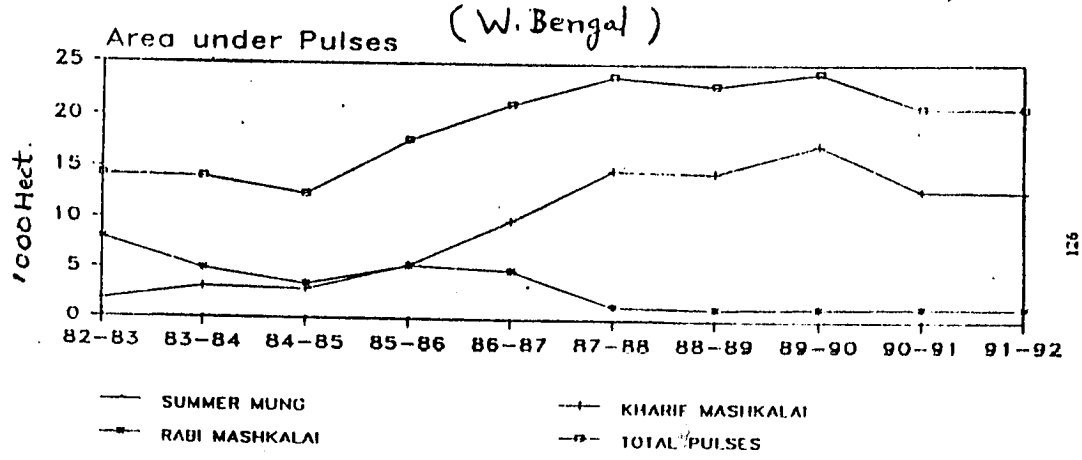


YIELD OF SELECTED PULSES (MALDA 1982–83 TO 1991–92)

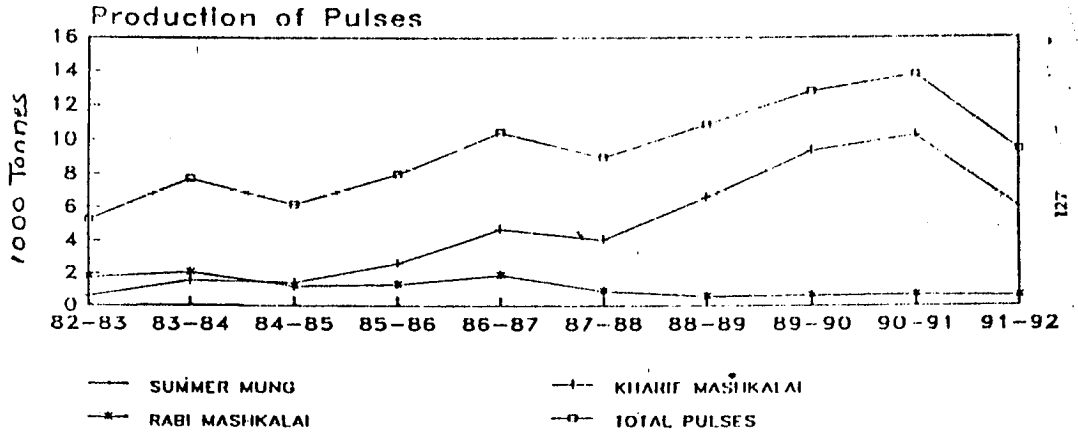


PURULIA DISTRICT (WEST BENGAL)

AREA UNDER SELECTED PULSES (PURULIA 1982–83 TO 1991–92)



PRODUCTION OF SELECTED PULSES (PURULIA 1982–83 TO 1991–92)



YIELD OF SELECTED PULSES (PURULIA 1982-83 TO 1991-92)