POSSIBILITIES AND CONSTRAINTS IN PULSES PRODUCTION IN INDIA AND IMPACT OF NATIONAL FOOD SECURITY MISSION

(FINAL REPORT)

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Acronyms

AERC	Agricultural Economic Research Centre
AP	Andhra Pradesh
ASM	Assam
BHR	Bihar
CRIDA	Central Research Institute for Dryland Agriculture
GoI	Government of India
GUJ	Gujarat
HRY	Haryana
ICMR	Indian Council of Medical Research
INDIA	All-India level (Aggrigate)
KRN	Karnataka
MHR	Maharashtra
MoA	Ministry of Agriculture
MP	Madhya Pradesh
MSP	Minimum Support Prices
NAFED	National Agricultural Cooperative Marketing Federation of India Ltd.
NFSM	National Food Security Mission
NPDP	National Pulses Development Programme
NSSO	National Sample Survey Organisation
ORS	Orissa
RJ	Rajasthan
TN	Tamil Nadu
UP	Uttar Pradesh
WB	West Bengal

Notations for the variables used for econometric analysis are explained in the respective chapeters.

PREFACE

The present study is undertaken for the Ministry of Agriculture, mainly motivated by the recent severe stagnation and price rise in the pulses sector in the country. The study attempts to analyze the factors underlying the growth process and identify prospects and constraints in the sector. The study has undertaken an analysis of secondary data at the national and state level, supplemented by in-depth primary data surveys all over the country, to understand the situation at the ground level and farmers' perspective. The Institute of Economic Growth has carried out the analysis based on the secondary data and coordinated the primary data surveys carried out by the various Agricultural Economic Research Centres (AERC s). This report presents an integrated analysis based on the primary data surveys conducted by the AERC s and the analysis based on the secondary data from published sources. The studies by the following AERC s have been used in this report (the states covered are in the parentheses) – Allahabad (UP), Bhagalpur (Bihar), Delhi (Haryana), Pune (Maharashtra), Vallabh Vidyanagar (Rajasthan), Ludhiana (Punjab) and Waltair (AP). Study from Jabalpur AERC - even in a draft form was not received on time and therefore could not be included.

We have presented some of the preliminary findings of the study to the **Expert Group on Pulses** headed by Professor Y. K. Alagh. We thank Professor Alagh for his insightful comments and suggestions, which went a long way in improving the study. We also thank other participants in the meeting for their invaluable inputs. We wish to thank Dr B. S. Bhandari and other officials of the Directorate of Economics & Statistics for their cooperation and support. We thank the study teams in the various AERC s for their inputs through their primary data-based reports. Our sincere thanks to Institute for Social and Economic Change (ISEC), Bangalore for reviewing the report meticulously and providing us useful feedback. Last but not the least, we would like to place on record our appreciation of our colleagues in the Agricultural Economics Research Unit at IEG for their support.

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EXECUTIVE SUMMARY

POSSIBILITIES AND CONSTRAINTS IN PULSES PRODUCTION IN INDIA AND IMPACT OF NATIONAL FOOD SECURITY MISSION

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1) Abstract: Pulses constitute the major source of protein for majority of population in India that is predominantly vegetarian in dietary habits. The present study is mainly motivated by the severe stagnation and price rise in the pulses sector in the country in the last few years. The study is an attempt to analyze the pulses sector, identify the constraints in the sector and assess the impact of National Food Security Mission (NFSM). Secondary and primary data has been used in the analysis. The results show that yield is the major contributory factor to production growth. The results also show that there was a deceleration in pulse production during the period from mid 1980s to mid 1990 s and stagnation thereafter showing that the major pulses programs such as NPDP have not yielded the desired results. It is also observed that in the last decade some of the major states are showing decline in area or yield or both. Results of the econometric analysis show that the major determinants of area under pulses are rainfall and relative price / profitability. The major determinants of yield are rainfall, fertilizer use, and irrigation. Results from the primary data surveys in several states show that the returns from pulses cultivation are generally higher because of better prices. The farmers in the NFSM districts are aware of and adopted the improved varieties (IV) of pulses widely. Majority of the pulses production is marketed through the regulated market. However, public procurement of pulses by NAFED has not been observed in any of the sample districts. Higher pest incidence and lower yield are reported to be the major problems in growing pulses. Farmers

have mainly suggested improving irrigation facilities and making available the improved varieties (pest-resistant) to increase pulses production. Most farmers in the NFSM districts are aware of the NFSM and derived benefits from it. Higher yield has been reported as the most important benefit derived, followed by increased knowledge and reduced pest attacks. Increase in area and production of pulses has been recorded after the start of NFSM programme in most of the study states, except Haryana. Some of the policy implications that emerge from the study include providing assured price support through procurement by NAFED in the short-run; addressing the input supply problems such as provision of improved varieties, irrigation etc in the medium term; and developing and disseminating drought-resistant and pest-resistant varieties in the long-run.

2) **Introduction**: The study attempts to analyze the growth performance of pulses sector and identify prospects and constraints in the sector.

The main objectives of the study are

i) To analyze the temporal, spatial and crop-specific growth pattern of pulses
ii) To identify the determinants of pulses production (price and non-price factors) and assess their relative importance
iii) To identify the major constraints and delineate appropriate policy responses
iv) To assess the impact of NFSM, if any, on the pulses area and production

The study has undertaken an analysis of secondary data at the national and state level, supplemented by in-depth primary data surveys all over the country to understand the situation at the ground level and farmers' perspective.

3) Methodology:

The study attempts a detailed analysis of growth pattern at the national and state levels using secondary data, followed by econometric analysis to identify the major determinants of production in each state. Detailed primary data surveys have also been carried out in seven states to assess the economics of pulses cultivation in various states, constraints faced by the farmers, their suggestions for improving pulses production and the impact of NFSM, if any on the pulses production in the country. Two districts in each state – one NFSM district and one non-NFSM district have been selected. In each district, 50 households belonging to different size groups of landholding have been selected.

4) Results

Results based on Secondary Data

The overall growth trends of pulses in India show that yield is the major contributory factor to production growth. The contribution of area growth is minimal. There was a deceleration in pulse production during the second sub-period (1987-96) and a major stagnation during the third sub-period (1997-2007). The deceleration in the second sub-period indicates that the major pulses programs such as NPDP and other subsequent programs launched during this period have not yielded the desired results. There is wide variability in the growth pattern across states. In the last decade, some of the major states like Rajasthan and UP are showing decline in area or yield or both. The results of the econometric analysis show that the major determinants of pulses area for most of the crops are rainfall and relative price / profitability. The major determinants of yield are mainly the rainfall, fertilizer use and to a lesser extent irrigation.

Results based on Household Surveys (primary data)

Economics of Pulse Cultivation: i) The net returns per hectare are generally higher for pulses than for other crops. The net returns per quintal (price realized) are higher for pulses in all the districts without exception. ii) Between the NFSM and the Non-NFSM districts, the net returns per quintal are lower in the NFSM district for most of the crops and states although the

net returns per hectare are higher. This shows that the contribution of area and yield is better in the NFSM district as compared to the Non-NFSM district in most of the states, although this cannot be attributed to the NFSM programme alone because of a very short period of our study.

Technology Adoption: More than 80% of the farmers in the sampled districts are aware of the improved varieties (IV) of pulses. The level of awareness is generally lower in the Non-NFSM districts. The main sources of knowledge about IV s in the NFSM district are *extension agent.* As is to be expected, the role of extension agent is much stronger in the NFSM district as compared to the Non-NFSM district. The percentage of households with area under IV s and the percentage of area under IV s are also higher in the NFSM districts than the Non-NFSM districts. The percentage of farmers not following even one recommended practice is higher in Non-NFSM districts.

Marketing: Majority of the households (>50%) are marketing through the regulated market and majority of production (>50%) is being marketed through regulated market in almost all the states, except Rajasthan. **There is no procurement by NAFED in any of the sample districts – NFSM or non-NFSM in any of the states.**

Farmers' Perception: Profitability, lack of irrigation, home consumption, and inferior land quality are the reported reasons for growing pulses in most states. Higher pest incidence and lower yield are reported to be the major problems in growing pulses in majority of the states. Pod Borer is the most serious pest problem, except in UP, where pod fly is the major problem. Moong is the crop affected most by the pest problems followed by gram and arhar. Farmers in most of the states suggested improving irrigation facilities and making high-yielding varieties available as important, showing that non-price factors such as lower yield and yield instability are still important determinants of farmers' willingness to grow pulses.

Impact of NFSM: All the farmers are aware of and have derived benefits from NFSM in Rajasthan, Haryana, and AP. This percentage is slightly lower in Maharashtra and UP whereas in Punjab and Bihar this percentage is very

low. The programme has been found useful by farmers only in Rajasthan and AP. Assistance in the form of seeds is the most important in most of the states. Farmers in most of the states have reported higher yield as the most important benefit derived from the NFSM programme followed by increased knowledge and reduced pest attacks. As for impact on area and production, all the states except Haryana, have registered increase in area in 2008-09 of major crops – moong and gram compared to the previous two years. Similar is the case with production. All the crops except arhar showed an increase in production after the NFSM.

Policy Implications: The following broad policy implications emerge from the study. Providing assured price support through procurement in the short-run; ensuring timely availability of improved seeds at affordable prices (or subsidy), improvement of irrigation facilities, marketing facilities and extension for addressing pest problems in the medium term; development and dissemination of improved technology in the long-run are essential. Efforts should be made to increase area under pulses through bringing some of the rainfed rice fallow lands in eastern states. Data on some of the crucial inputs like crop-specific fertilizer and pesticide use should be made available to strengthen the research efforts.

Introduction

Pulses constitute the major source of protein for majority of population in India that is predominantly vegetarian in dietary habits. Pulses are important on environmental considerations too. Pulses enrich soil fertility through nitrogen fixation i.e. converting atmospheric nitrogen into organic nitrogen, which is available to subsequent crops. It has been estimated that in India, chickpea can fix up to 140 kg per hectare in a growing season (Reddy 2004). It is well established that in the northern parts of India, long-duration pigeon pea can fix to the order of 200 kg per hectare when grown over a period of 40 weeks and medium term pigeon pea can fix up to 40 kg per hectare.

The net availability of pulses has also declined considerably i.e. from about 60g/day/person in 1951 to 31g/day/person in 2008. The pulses production has virtually stagnated with area and production hovering around 22-24 million hectares and 12-14 million tons respectively for a number of years. The yield of pulses remained virtually stagnant over the last 40 years (about 540kg/ha). India accounts for about 20%-23% of the world pulse production - about 93% of the world chickpea production and 68% of the world pigeon pea production. The high proportion of global production accounted for by India indicates that there are very few import sources in the world market and it is imperative to increase domestic production in order to address the food security concerns. To devise an effective pulse production strategy, it is important to analyze the crop-specific growth trajectory over time and space to unravel the constraints inhibiting the pulses growth in India. The present study is an attempt in this direction.

Following are the specific objectives of the study

v) To analyze the temporal, spatial and crop-specific growth pattern of pulses
vi) To identify the determinants of pulses production (price and non-price factors) and assess their relative importance
vii) To identify the major constraints and delineate appropriate policy responses
viii) To assess the impact of NFSM, if any, on the pulses area and production

In Chapter 2, an overview of the pulses sector is presented. Some of the major work on pulses sector in India is reviewed in Chapter 3 followed by the methodology used and data sources in Chapter 4. Chapter 5 presents the detailed growth trends at all-India and state level. In Chapter 6, a detailed econometric analysis is undertaken to identify the determinants of pulses production. Chapter 7 to Chapter 12 discuss the results of the primary data survey carried out in seven states – Andhra Pradesh, Bihar, Haryana, Maharashtra, Punjab, Rajasthan, by the summary and conclusions of the study. The cropping pattern of the selected sample districts is discussed in Chapter 7. Chapter 8 discusses the economics of pulses cultivation vis-à-vis other major crops in these districts. Chapter 9 details the technology adoption pattern (usage of improved varieties and practices) in these districts. In Chapter 10, a detailed analysis of the marketing channels for pulses in the districts is undertaken. In Chapter 11, a detailed analysis of the farmers' perceptions relating various aspects of pulses cultivation is undertaken. Chapter 12 analyses the impact of NFSM, if any, is analyzed in terms increase in awareness of farmers, technology adoption, increase in area, production and profitability. Finally, Chapter 13 provides the broad conclusions and policy implications of the study.

Chapter 2

Pulses Sector in India – An Overview

The pulses production has virtually stagnated over the last 40 years. There are mainly two reasons for this. Firstly, 87% of the area under pulses is rainfed. The second reason is that pulses are mainly grown as a residual crop on marginal lands, after diverting the better-irrigated lands for higher yield-higher input crops like rice and wheat. Farmers are not motivated to grow pulses because of yield and price risk probably due to lack of effective procurement. Pulses face various abiotic (climate-related) and biotic (pest and insect related) stresses. Pulses are more susceptible to pest and insect attacks than cereals like rice and wheat. Lower production (as compared to demand) and lower stocks in both domestic and global markets have led to a steep rise in prices of pulses. As already mentioned, the net availability of pulses has also declined considerably i.e. from about 60g/day/person in 1951 to 31g/day/person in 2008.

The per capita net availability of pulses has declined from 18.5 kg/annum in 1976, at the start of our study period to 13.5 kg/annum in 2009 (*Agricultural Statistics at a Glance*, GoI 2010). The corresponding figures for foodgrains are 155.3 and 162.1 respectively. According to the 61st round consumer expenditure survey of the NSSO, 2004-05, the monthly per capita consumption of pulses has declined to less than one kg per month. The per capita consumption has come down from 0.84 kg per month in rural areas in the 55th round to 0.67 kg in the 61st round, while in the urban areas the decline is from 1 kg per month to 0.78 kg per month.

The reasons for reduction in consumption of pulses are manifold – low production and consequent higher prices inducing a leftward shift in demand curve of pulses, shifts in dietary patterns towards higher protein-rich foods like soybeans, fish etc. The reduced availability has a major adverse implication for nutritional security. The ICMR-recommended consumption of pulses is about 65g/day/person. As can be seen, the current availability is less than half of that. NFSM was launched in 2008 to increase pulse production by 2 million tons, among other things, through increase in area and productivity mainly through utilization of rice fallows and inter-cropping.

But it appears that with the large increases in minimum support price (MSP) of rice in recent years, this objective has not been fully met although there is some increase in pulses production during 2001-08 as compared to 1980s and 1990s.

Figure 2.1: Area and Production of Total Pulses in India

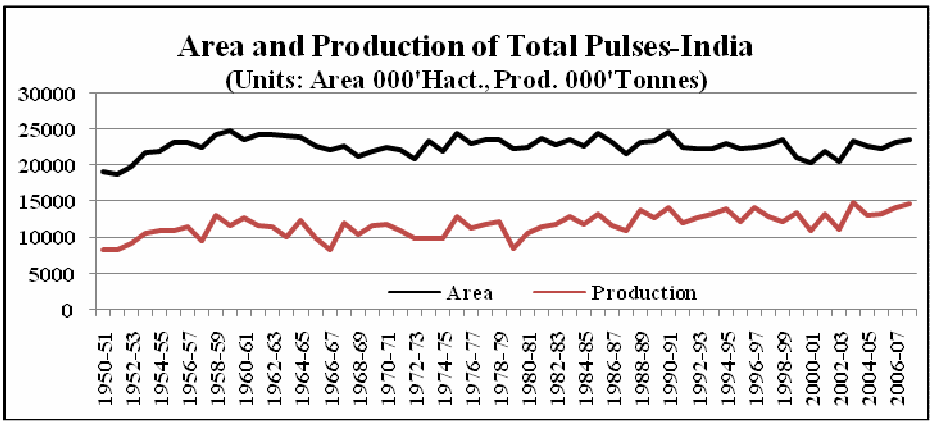
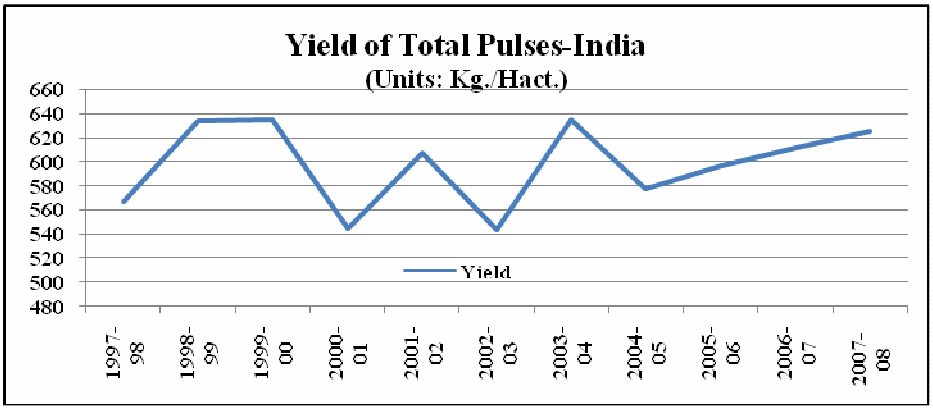


Figure 2.2: Yield of Total Pulses in India



Over the last decade, India accounted for 32% to 35% of world area under pulses and about 20%-23% of the world pulse production. The most important pulse crop grown in India is chickpea (gram or chana) which accounts for 90% of the world chickpea area and 93% of the world chickpea production. The other major pulses in India are pigeon pea (arhar), lentil (Masur), black gram (urad), and green gram (moong). Pigeon pea accounts for 65% and 68% of the global area and global production respectively. The corresponding figures for lentil are 37% and 32% respectively. The

high proportion of global production accounted for by India indicates that there are few import sources in the world market

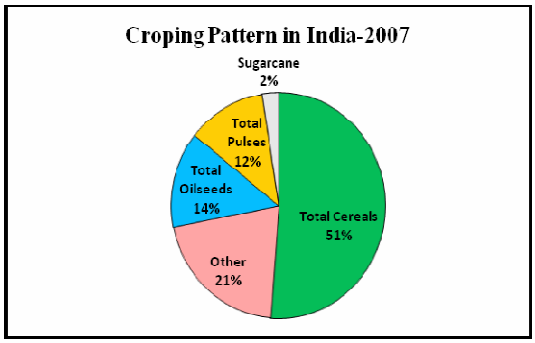
Pulses occupy only about 12% of the gross cropped area in the country (as of 2007). However, among the foodgrains, pulses occupy about 16% of the area and contribute about 6% of the foodgrain production, indicating the lower levels of yield in pulse crops (MoA, GoI). Gram is the predominant pulse crop in India with a share of 32% and 42% in the total area and production, respectively, of pulse crops in the country. Arhar is the second important crop with area and production share of 16% and 19% respectively. Moong and urad crops have lower productivity levels compared to gram and arhar. Moong has an area share of 14% and production share of 8%. The corresponding figures for urad are 13% and 10% respectively. The major pulse-growing states in the country are listed in the following table 2.1.

Table 2.1: Major Pulse-Growing States

PULSES CROPS	MAJOR STATES (Area share in % in bracket)
Total Pulses	Madhya Pradesh (18%), Maharashtra (17%), Rajasthan (14%), Uttar Pradesh(12%), Karnataka(10%), Andhra Pradesh(9%), Gujarat(4%) – Total 84%
Gram	Madhya Pradesh(41%), Rajasthan(14%), Maharashtra(14%), Uttar Pradesh(12%), Karnataka(7%), Andhra Pradesh(6%), Gujarat(2%), Haryana(2%), Bihar(1%) – Total 99%
Arhar	Maharashtra(30%), Karnataka(16%), Andhra Pradesh(13%), Uttar Pradesh(11%), Madhya Pradesh(11%), Gujarat(8%), Orissa(4%), Tamil Nadu(1%), Bihar(3%) – Total 97%
Urad	Maharashtra(18%), Andhra Pradesh(16%), Madhya Pradesh(19%), Uttar Pradesh(15%), Tamil Nadu(8%), Rajasthan(5%), Karnataka(5%), Orissa(4%), Gujarat(3%) – Total 93%
Moong	Rajasthan(22%), Maharashtra(21%), Andhra Pradesh(15%), Karnataka(13%), Orissa(7%), Bihar(6%), Gujarat(5%), Tamil Nadu(4%), Madhya Pradesh(3%) – Total 97%
Masur	Uttar Pradesh(43%), Madhya Pradesh(36%), Bihar (13%), West Bengal (5%), Assam (1%), Rajasthan(1%) – Total 99 %

Note: The area share of states is calculated using average area share of states in country's area under respective pulse crop during 2000 to 2007. Source – http://eands.dacnet.nic.in/

Figure 2.3: Cropping pattern and foodgrain production in India



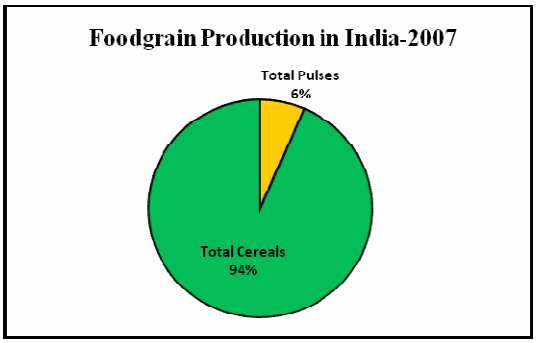
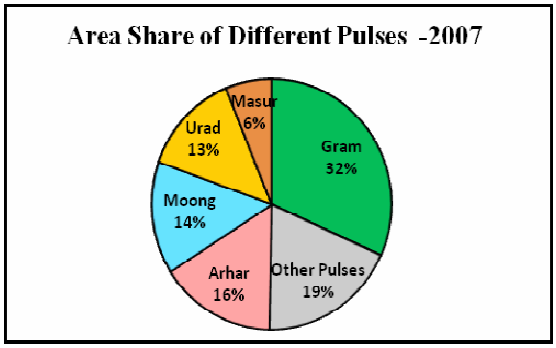
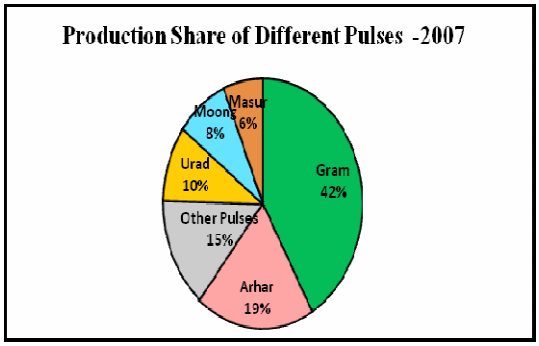


Figure 2.4: Area and production shares of pulses in India





Chapter 3
Review of Literature

The stagnation in pulses sector received intermittent attention in the literature but hardly any action on the policy front. Scholars over a period have highlighted several problems in the pulses sector that needed to be addressed. We present here some of the important studies spanning the last thirty years.

The early work on pulses in India was an interesting study by Sharma and Jodha (1982). The study indicates that there is a lot of regional specificity in pulses production, thus making a uniform policy difficult. There is a need for region-specific varieties and practices. The study also notes that there is a tendency in several states to move away from pulses when irrigation facilities become available. However, the study refutes the popular notion that the pulses have an inherent yield disadvantage. The study argues that, on the contrary, there is strong evidence of better adaptation to stress by pulse crops along with other positive externalities like nitrogen fixation.

Sharma (1986) argues that yield variability of pulses in un-irrigated regions, pest, and insect problems and non-availability of quality seeds are the major factors that force farmers to shift away from pulses cultivation when better irrigation facilities become available. The study recommends a variety of interventions with a mix of price and non-price measures such as encouraging short-duration summer varieties of moong and urad, inter-cropping in irrigated regions, using rice fallows for pulse farming, and mixed cropping and inter-cropping in rainfed regions. The study also underlines the importance of procurement and distribution of pulses by state agencies, strengthening the marketing system, and improving the extension system.

Swarna (1989) analyzed the growth trends at the state level and shows that the pulses face competition from cereals in only five irrigated (or wet) states. In the remaining drier states where a large proportion of pulse production takes place, pulses do not face competition from cereals. AERC (2001) is an important study and probably the only study based on primary data collected in all the pulse-growing states. This study highlights the following problem areas in descending order of importance – i) non-

availability of high-yielding and short-duration pulses, ii) lack of extension, training and credit facilities iii) lower relative profitability iv) pests and post-harvest losses. Tuteja (2009) and Reddy (2009) arrive at similar conclusions that. price support through procurement in the short-run; improved technology and input provision in the long-run are urgently needed.

Reddy (2004) analyzed the regional patterns in the production and consumption of pulses. The results of the study show that there is large variability in the production performance of the states. Also, there is considerable heterogeneity in consumption patterns as well. The paper argues for a region-specific approach and adoption of improved technology, backed by improved package of practices. The paper, using data of CRIDA (2002), shows that although the gross returns are highest when improved varieties are used in conjunction with improved farming practices, the incremental benefit-cost ratio is higher (about 7) for improved varieties with current farmers' practices. This is because the improved practices are relatively expensive.

Sathe and Agarwal (2004) analyzed the issues related to liberalization pulses sector. The paper examines issues such as major players in the world pulses market, international prices of pulses, production, consumption, main import sources, and domestic prices in India. The results of the study indicate that there is a need for further opening up the Indian markets for pulses imports.

Summing up, availability of improved technology at affordable prices, input provision particularly pesticides, assured market through procurement are some of the major problems highlighted in the previous work.

Chapter 4
Methodology and Data Sources

The study attempts a detailed analysis of growth pattern at the national and state levels using secondary data followed by an econometric analysis to identify the major determinants of production in each state. The study has supplemented the secondary data analysis with detailed primary data surveys in seven states to assess the economics of pulses cultivation in various states, constraints faced by the farmers, their suggestions for improving pulses production and the impact of NFSM, if any on the pulses production in the country.

1) Secondary Data Analysis: First, we discuss the growth performance of pulses at the national and disaggregate level. We have calculated growth rates of area, yield, and production by fitting a semi-logarithmic trend. Our period of analysis is 1975-76 to 2007-08 and we have further divided this period into three sub-periods – i) 1975-76 to 1987-88, ii) 1987-88 to 1997-98, iii) 1997-98 to 2007-08. Some of the major pulses development programs like National Pulses Development Programme (NPDP) were initiated in 1985. The effects of the programmes could have been visible in about two to three years. Therefore, we have taken 1975-76 to 1986-87 as the first sub-period. There was a widespread slowdown in Indian agriculture since 1997-98 until about 2003-04. Therefore, the second period is from 1987-88 to 1997-98. The third sub-period is from 1997-98 to the latest year for which state level data are available, which is 2007-08. Secondly, we have calculated the trends in growth acceleration to assess whether there is a step up in the growth rates between the sub-periods i.e. between first and second sub-periods (phase 1) and between second and third sub-periods (phase 2). After calculating the growth rates and growth acceleration (or deceleration), we have attempted to identify the determinants of pulses production through econometric modelling exercise. A systematic econometric analysis allows us to capture this dynamic effect on production, after controlling for other relevant factors.

For calculating growth rates, the standard method of semi-logarithmic trend equations of the following form was fitted to the data on area, yield, and production.

$$\ln y_t = a + bt \qquad \text{---------- (1)}$$

where y_t denoted the variable in question and t is the time trend. b gives the exponential growth rate in y_t and antilog(b)-1 gives the compound growth rate. In a log-linear trend equation of the above form 't' represents a combination of number of factors like weather, technology, institutional changes, changes in prices and the demand pattern, etc. We shall only try to capture the combined effect of these factors over various sub-periods.

Secondly, we have calculated the trends in growth acceleration to assess whether the growth rates accelerated or decelerated between the sub-periods i.e. between first and second sub-periods (henceforth called phase 1) and between second and third sub-periods (called phase 2). We assess whether the growth rate calculated in a sub-period is statistically different from the previous sub-period. Two alternative methods are available in the literature to test this. The first one is to fit two separate functions to each sub-period and examine the break in the trend through a separate test. The second method is to fit a single function with dummy variable to distinguish the sub-periods. The second alternative is preferred here because of the computational ease. Since there are three sub-periods, we have fitted two regressions. We shall denote the two sub-periods 1975-1987 and 1988-96 by phase1. Similarly, phase 2 denotes the two sub-periods 1988-96 and 1997-2007

The two regressions fitted for phase 1 and phase 2 are as follows.

Phase 1: $\ln y_t = a_0 + a_1 D_1 + b_0 t + b_1 (D_1 t)$ ---------- (2)

for the period 1975 to 1996 where D_1 =0 for years 1975 to 1987 and 1 for years from 1988 to 1996

Phase 2: $\ln y_t = a_0 + a_2 D_2 + b_0 t + b_2 (D_2 t)$ ---------- (3)

for the period 1988 to 2007 where D_2 =0 for years 1988 to 1996 and 1 for years from 1997 to 2007

We have introduced the intercept dummies to take care of the initial output in each sub-period. The annual rate of growth in the earlier period is given by b_0 and the annual rate of growth of the latter period is given by $b_0 + b_1$ or $b_0 + b_2$, as the case may be. The significance of b_1 in equation 2 and the significance of b_2 in equation 3 directly show if the growth trend in the sub-period is significantly different from the previous sub-period. The positive or negative sign of these coefficients also indicate if the growth rates are accelerating or decelerating over the previous sub-period.

After calculating the growth rates and growth acceleration (or deceleration), we have attempted to identify the determinants of pulses production through econometric modelling exercise.

2) <u>Primary data Analysis</u>

Socio-economic surveys of the pulse farmers have been carried out by seven AER Centres – Allahabad (U.P), Bhagalpur (Bihar), Delhi (Haryana), Pune (Maharashtra), VV Nagar (Rajasthan), Waltair (AP), Punjab (Ludhiana) have been included in the report. The following broad methodology has been followed for the primary surveys. The sampling methodology followed is stratified random sampling and is as follows.

i) One NFSM and one non-NFSM district from each state
ii) One representative village from each district
iii) 50 farmers from each village
iv) Various size groups of farmers decided using the probability proportional to size (PPS) method of stratified sampling.

The reference period for the primary data survey is the period from 2006-07 to 2008-09. The basic socio-economic characteristics of the households and profitability of pulse farming including the comparative economics (costs and returns) of pulse cultivation as compared to other competing crops have been analyzed for this period. The increase in area under pulses, if any, for 2008-09 (after the operationalisation of NFSM) has also been assessed.

Data Sources

i) Secondary Data

The data on area, production, and yield have been collected from several official publications

1) Yearly issues of *Area, Production and Yield of Principal Crops in India*
2) Yearly issues of *Agricultural Statistics at a Glance*
3) http://www.agricoop.nic.in/, http://dacnet.nic.in/eands/APY_96_To_06.htm
4) The wholesale and retail prices for different pulse and food grain crops are taken from *Agricultural Situation in India* and *Agricultural Prices in India*.
5) *Cost of Cultivation of Principal Crops in India* for net returns and gross returns
6) Fertilizer data is taken from yearly issues of *Fertilizer Statistics* published by the Fertilizer Association of India.

To derive the crop-specific data on fertilizer consumption and pesticide coverage, the following method is adopted. Crop-specific quantities of fertilizers and pesticides are collected from various issues (issues: 1981, 1986, 1991, 1996) of the All-India Report on Input Survey. The proportion of fertilizer consumed under pulse crops to total fertilizer consumed is calculated from this data. Suppose this proportion is 0.2 in 1981. This proportion is assumed to remain constant until the next input survey (up to 1985) and the fertilizer consumption of pulses for the following years is worked out by multiplying the total fertilizer consumption with this proportion. Similar procedure is followed to calculate the area covered under pesticides.

ii) **Primary data**: Socio-economic surveys by the AERCs. The number of households surveyed in each size group in different states is given in the following table.

Table 4.1: No of Sample farmers in NFSM and NON-NFSM districts in the states

Sample Groups	RAJ		MHR		HRY		AP		BHR		UP		PB	
	NFSM	NON NFSM	NFSM	NON NFSM	NFSM	NON NFSM	NFSM	NON NFSM	NFSM	NON NFSM	NFSM	NON NFSM	NFSM	NON NFSM
Marginal		15	15	14	4	13	20	20	19	18	8	6	3	
Small	4	22	19	17	11	17	16	16	15	14	27	6	4	
Medium	10	7	10	13	20	13	10	10	12	12	15	37	14	7
Large	36	6	6	6	15	7	4	4	4	6		1	29	43
Total	50	50	50	50	50	50	50	50	50	50	50	50	50	50

PART I

SECONDARY DATA ANALYSIS

Chapter 5

Growth Trends in India and Major States

This Chapter discusses the pattern of growth in the pulses sector in the country. Growth has several dimensions - the temporal trends, spatial trends, composition of growth across different pulse crops, recent performance etc. We have attempted to analyze the growth trends along all these dimensions. We have mainly analyzed i) the growth rates over the long-run for total pulses and individual pulse crops ii) growth acceleration iii) the determinants of pulses production using econometric analysis. First, an overall summary of the Chapter is presented followed by the detailed discussion of the growth trends.

Summary of the Chapter

There is a lot of heterogeneity across crops and within a crop across states in the long-run growth patterns. Overall, yield emerges as the major source of growth in production but this is mainly because of gram and partly because of masur. In all other crops contribution of area to production is as much, if not more, than that of yield. Similarly, almost all the crops, except gram, have recorded poor performance in second sub-period but due to the overwhelming share of gram in overall production, the second sub-period shows relatively better performance than the third sub-period on total pulses production. At the level of individual crops, there is a lot of heterogeneity across important states. The all-India trends generally reflect trends of a few major states. The more recent growth trends during the last sub-period (1997-2007) show deceleration / decline in a number of major states, which is a worrying feature.

The pattern of growth acceleration shows that all the crops, except gram, have shown deceleration during phase 1 (between sub-period 2 and sub-period 1) and slight acceleration in phase 2 (between sub-period 3 and sub-period 2). However, due to the large share of gram, the overall rate of acceleration in both phases turns out to be insignificant.

5.1 Growth Performance of the Pulses Sector in India

Yield is the major source of production growth for pulses sector over the period of analysis 1975-2008. Contribution of area has been negligible as can be seen from fig 5.1. Breaking the growth performance by the sub-periods, it is clear that there was a major stagnation during sub-period 3, which is due to insignificant growth in area and a decline in yield. The second sub-period, marked by some important programs, witnessed highest growth rate in yield but contribution of area has been negative even during this period. Looking at fig 5.2 it becomes clear that some of the trends witnessed at the aggregate level are mainly due to the performance of gram. Gram is the only crop that showed a high positive growth rate in yield despite a decline in area. All other crops have positive contribution to production growth from area, with varying degrees of contribution from yield. Since gram occupies about 40-45 per cent of the total pulses production, the positive contribution of yield to production growth is also reflected at the aggregate level. The temporal trend at the all-India level, which shows virtual stagnation in the third sub-period but not such dismal performance in the second sub-period, conceals some of the crop level trends at the state level. There is a general decline or deceleration in production growth in the second sub-period except for gram and masur (table 5.2). However, as already mentioned above, the all-India trends at the national level for total pulses sector do not reflect such deceleration in the second sub-period, mainly because of gram and masur. Therefore, it is important to recognize that there is a lot of heterogeneity across crops and regions in growth pattern.

Table 5.1: Growth rates for total pulses

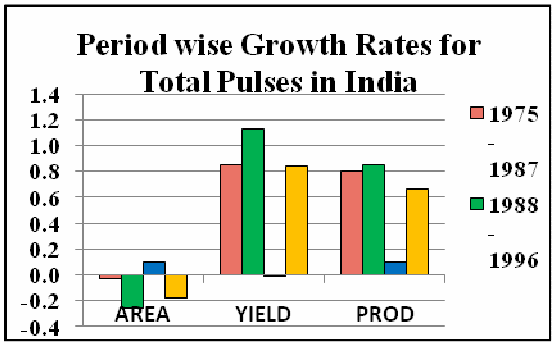
States	Period:1975-1987			Period:1988-1996			Period:1997-2007			Period:1975-2007		
	Area	Prod.	Yield	Area	Prod.	Yield	Area	Prod.	Yield	Area	Prod.	Yield
AP	0.23	4.82	4.60	0.82	1.28	0.44	2.37	6.85	4.43	1.22	3.97	2.72
GJ	6.30	9.73	3.20	3.35	5.59	2.82	-0.69	-0.24	0.55	1.81	3.32	1.50
KRN	2.28	0.48	-1.66	-0.59	2.40	3.10	2.54	2.84	0.31	1.35	1.49	0.17
MHR	0.17	0.88	1.09	1.26	3.30	2.11	0.65	1.89	1.22	1.00	2.80	1.72
RJ	-1.76	-2.42	-0.76	4.08	5.24	1.56	-1.43	-4.23	-2.86	-0.45	-0.44	-0.07
MP	0.56	1.86	1.28	1.21	3.70	2.46	0.43	0.66	0.21	0.26	2.01	1.73
UP	-0.46	1.12	1.57	-0.73	-0.65	0.06	-0.30	-1.11	-0.82	-0.43	-0.15	0.27
INDIA	-0.03	0.81	0.85	-0.26	0.85	1.13	0.10	0.09	-0.01	-0.18	0.67	0.85

Table 5.2: CROPWISE GROWTH RATES - ALL-INDIA

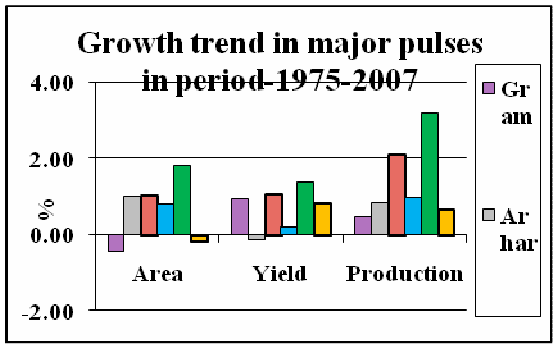
Crop	AREA				PROD.				YIELD			
	1975-1987	1988-1996	1997-2007	1975-2007	1975-1987	1988-1996	1997-2007	1975-2007	1975-1987	1988-1996	1997-2007	1975-2007
Total Pulses	-0.03	-0.26	0.10	-0.18	0.81	0.85	0.09	0.67	0.85	1.13	-0.01	0.85
Gram	-1.00	1.08	-0.33	-0.45	-0.46	3.09	-0.16	0.47	0.55	1.99	0.18	0.92
Arhar	2.16	0.04	0.42	1.00	2.94	-0.91	0.73	0.84	0.76	-0.95	0.30	-0.16
Moong	2.22	-1.57	1.34	0.79	4.54	-1.85	0.68	0.97	2.27	-0.29	-0.65	0.18
Urad	3.65	-1.78	0.54	1.05	5.77	-1.77	0.19	2.12	2.05	0.01	-0.34	1.07
Masur	1.29	1.84	0.83	1.81	3.93	1.58	0.64	3.21	2.62	-0.24	-0.16	1.38

Figure 5.1 & 5.2: GROWTH PERFORMANCE OF TOTAL PULSES AT NATIONAL LEVEL

(5.1)



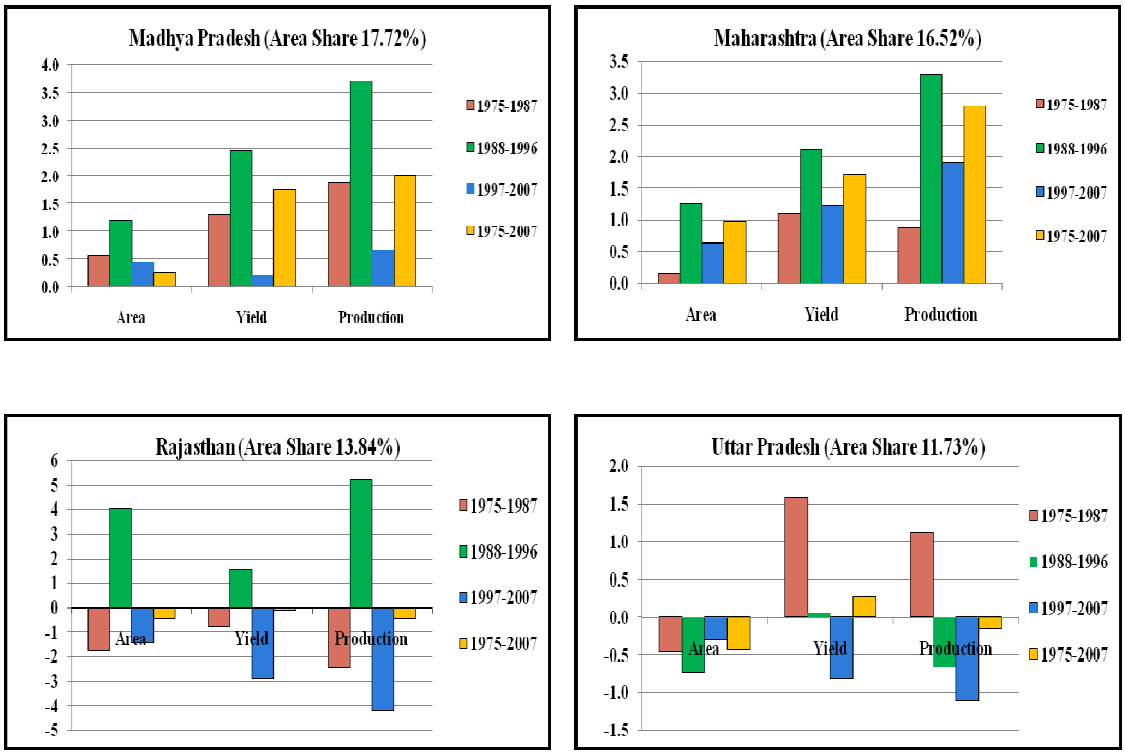
(5.2)

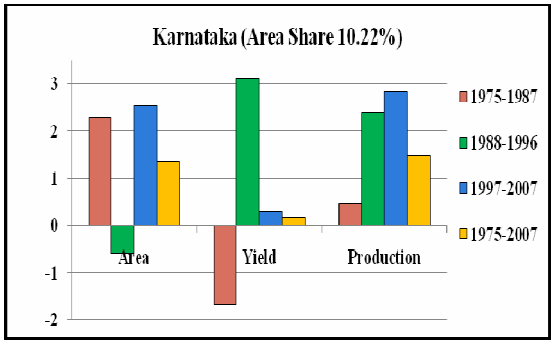


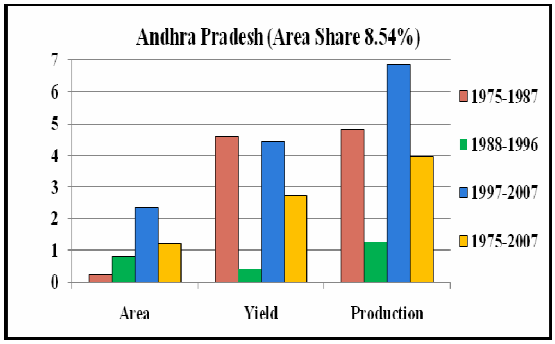
MP, Maharashtra, Rajasthan, UP, Karnataka, AP, and Gujarat are the major pulse-growing states in the country. MP and Maharashtra registered positive growth rates in area and yield in all the sub-periods (figure 5.3). This resulted in a positive production growth rate in all the sub-periods in these two important states. The yield growth rates are higher than those of area in all the sub-periods and the growth rate is substantially higher in the second sub-period than that of third sub-period in these states. Rajasthan has also shown a distinct and significant positive growth rate of area and yield in the second sub-period. In the remaining two sub-periods however, there is significant negative growth rate in this state, thus showing a positive production growth rate only in the second sub-period. In UP the performance is rather disappointing. Both area and yield have recorded significant negative growth rates in sub-periods 2 and 3, resulting in a large decline in production after the sub-period 1. Other smaller states like Karnataka and AP recorded positive production growth rates in sub-periods 2 and 3. In Karnataka, area is the major contributor whereas in AP yield has made major contribution to production growth. In Gujarat, third sub-period saw a major stagnation in production after impressive growth in the first two sub-periods.

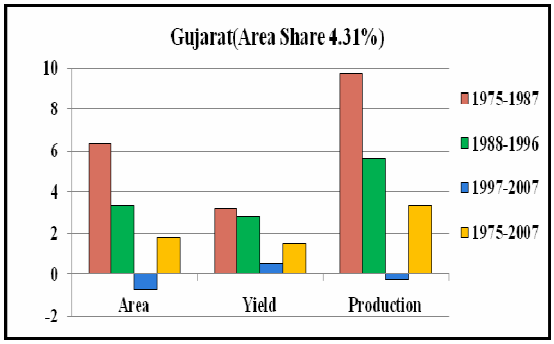
Figure 5.3:Period-wise Growth rates for area, yield and production for Total Pulses

(figures on Y axis denote CAGR in %)









5.2 Crop-Specific Growth Patterns

Gram

Maharashtra, MP, UP and Rajasthan are the major states growing gram. Maharashtra and MP show a continuous positive growth rate in both area and yield in all the sub-periods, which is reflected in positive growth rates of production in all the sub-periods (table 5.3). However, UP has registered a continuous decline in area leading to a continuous decline in area despite some positive growth of the yield. Rajasthan also showed a major decline in area in the third period. The positive growth rates in all the states, except UP, in the second period resulted in impressive positive growth in the second period. However, due to the large negative production growth rates in UP and Rajasthan in the third period, the production at the national level also recorded a slight decline in the third period.

Table 5.3: Growth rates for Gram

States	Period:1975-1987			Period:1988-1996			Period:1997-2007			Period:1975-2007		
	Area	**Prod.**	**Yield**	**Area**	**Prod.**	**Yield**	**Area**	**Prod.**	**Yield**	**Area**	**Prod.**	**Yield**
AP	-3.00	-3.19	-0.20	12.62	20.22	6.75	16.98	26.46	8.10	6.90	11.95	4.72
BHR	-2.63	1.19	3.92	-3.31	-1.10	2.28	-3.28	-3.30	-0.02	-3.59	-2.03	1.62
GJ	2.75	4.06	1.28	6.63	8.40	1.66	5.65	7.98	2.20	1.72	1.93	0.20
HRY	-5.08	-7.31	-2.35	-4.25	1.35	5.85	-12.09	-13.48	-1.58	-7.30	-6.64	0.72
KRN	1.56	1.22	-0.33	7.16	12.39	4.88	5.41	5.69	0.27	4.26	5.37	1.06
MP	1.62	3.51	1.86	2.57	5.54	2.90	1.23	0.91	-0.32	1.36	3.16	1.78
MHR	1.57	1.67	0.10	2.66	6.48	3.72	3.51	5.64	2.06	2.86	5.25	2.32
RJ	-0.82	-1.25	-0.44	4.18	5.62	1.38	-7.27	-9.11	-1.98	-1.64	-1.74	-0.10
UP	-1.79	0.70	2.53	-4.61	-2.78	1.91	-2.99	-3.39	-0.42	-3.01	-2.15	0.89
INDIA	-1.00	-0.46	0.55	1.08	3.09	1.99	-0.33	-0.16	0.18	-0.45	0.47	0.92

Arhar

The major states are Maharashtra, Karnataka, AP, UP, MP and Gujarat. The states of Maharashtra and AP show trends that are mirror images (table 5.4). In Maharashtra, there is positive area growth in all the sub-periods leading to positive production growth rate. Contribution of yield to production growth is less than that of area and actually showed a decline in the second sub-period. In AP, it is the yield which showed positive growth in all sub-periods resulting in positive production growth with relatively less contribution from area that showed a deceleration/decline in the second sub-period. Apart from these states, all other states registered major decline in production in the second sub-period, which is also reflected at the national level.

Table 5.4: Growth rates for Arhar

States	Period:1975-1987			Period:1988-1996			Period:1997-2007			Period:1975-2007		
	Area	**Prod.**	**Yield**	**Area**	**Prod.**	**Yield**	**Area**	**Prod.**	**Yield**	**Area**	**Prod.**	**Yield**
AP	3.26	6.90	3.52	-0.74	6.90	7.70	3.17	8.99	5.64	3.03	6.31	3.19
BHR	-2.38	3.39	5.91	0.10	-2.30	-2.40	8.28	2.53	-5.31	-0.19	0.59	0.78
GJ	12.66	16.51	3.42	1.95	5.49	3.48	-4.31	-2.47	1.92	3.14	4.66	1.47
KRN	3.49	1.15	-2.26	-3.58	-2.28	1.35	3.27	7.10	3.71	1.89	1.38	-0.50
MP	-0.59	2.01	2.62	-2.39	-5.61	-3.30	0.35	-1.47	-1.82	-1.35	-1.28	0.07
MHR	1.76	2.39	0.62	2.99	2.12	-0.85	0.86	2.78	1.91	2.05	2.77	0.71
ORS	10.09	15.28	4.72	1.35	0.30	-1.03	-0.90	2.09	3.02	2.62	3.43	0.80
TN	2.99	5.70	2.63	-6.07	-7.05	-1.05	-9.39	-9.71	-0.36	-2.15	-1.48	0.68
UP	-0.25	0.70	0.95	0.54	-2.78	-3.31	-2.24	-4.67	-2.48	-1.07	-2.03	-0.96
INDIA	2.16	2.94	0.76	0.04	-0.91	-0.95	0.42	0.73	0.30	1.00	0.84	-0.16

Moong

The important states are Rajasthan, Maharashtra, AP, Karnataka, Bihar, Gujarat, Orissa, and Tamil Nadu. In AP, there is insignificant area growth in any of the sub-periods (table 5.5). There were yield increases in the first two sub-periods followed a decline in the third. Maharashtra showed similar trends as AP. There were significant yield increases in first two sub-periods followed a decline in the third. The trends in Karnataka, Orissa, and Bihar are slightly different with deceleration/decline in the second followed by a slight improvement in the third. Overall, at the all-India level, the second sub-period shows a decline in both area and yield resulting in major production decline. In the third period, area showed positive growth rate but yield continued to register negative growth resulting in an insignificant production growth rate in the third sub-period.

Table 5.5: Growth rates for Moong

States	Period:1975-1987			Period:1988-1996			Period:1997-2007			Period:1975-2007		
	Area	**Prod.**	**Yield**	**Area**	**Prod.**	**Yield**	**Area**	**Prod.**	**Yield**	**Area**	**Prod.**	**Yield**
AP	0.77	4.87	4.07	0.12	2.76	2.63	-0.62	-1.00	-0.38	-0.35	0.53	0.88
BHR	3.86	7.29	3.30	-1.74	-0.67	1.08	0.63	0.42	-0.20	1.13	2.91	1.77
GJ	2.14	-25.19	-26.76	4.74	6.38	1.57	2.01	1.67	-0.33	1.34	0.79	-0.54
KRN	6.43	3.75	-2.52	-1.85	-4.70	-2.90	4.86	0.55	-4.11	4.39	2.41	-1.89
MP	-1.05	-1.06	-0.01	-4.95	-3.28	1.75	-1.85	-2.16	-0.32	-3.31	-2.57	0.76
MHR	-0.34	1.37	1.72	0.48	2.75	2.26	-0.58	-1.19	-0.62	1.06	2.86	1.78
ORS	3.47	5.72	2.17	-15.34	-22.53	-8.49	1.12	2.73	1.60	-3.94	-7.13	-3.32
RJ	-2.51	-7.24	-4.85	8.89	9.58	0.63	5.17	10.33	4.90	4.12	5.72	1.54
TN	1.26	0.36	-0.89	-1.46	0.32	1.80	1.39	1.13	-0.25	1.46	2.97	1.48
UP	26.21	28.13	1.52	-1.91	1.90	3.89	-5.24	-5.44	-0.21	2.53	4.12	1.55
INDIA	2.22	4.54	2.27	-1.57	-1.85	-0.29	1.34	0.68	-0.65	0.79	0.97	0.18

Urad

The major states are Maharashtra, AP, MP and UP. Other urad producing states are Gujarat, Karnataka, Orissa, Rajasthan, and Tamil Nadu. UP is the only state where area has recorded continuous positive growth rate and yield has continuously accelerated (table 5.6). As a result, production showed a continuous acceleration over the study period. The other major states of AP and MP show a negative growth rate in production in the second period. Orissa also showed similar growth pattern. AP showed a major decline in yield in the second sub-period leading to a decline in production. There is a near stagnancy in both area and yield in the next sub-period. MP showed a major decline

in area in the second sub-period resulting in decline in production. There is some improvement in the third sub-period. The trends of the major states AP and MP are reflected at the national level too. There is a major decline in area with a near zero growth in yield during the second period. This resulted in a decline in production at the national level during this period. There is an imperceptible improvement in the next period though. Maharashtra shows a temporal trend different from that of AP and MP. Unlike these two states, Maharashtra recorded an increase in area and yield during sub-period 2 followed by deceleration/decline in the next sub-period. These trends are also reflected in production. Gujarat, Karnataka and Rajasthan show similar trends to Maharashtra with area and yield (and as a result also production) showing positive growth rates in period 2 followed by a decline in the third sub-period.

Table 5.6: Growth rates for Urad

States	Period:1975-1987			Period:1988-1996			Period:1997-2007			Period:1975-2007		
	Area	**Prod.**	**Yield**	**Area**	**Prod.**	**Yield**	**Area**	**Prod.**	**Yield**	**Area**	**Prod.**	**Yield**
AP	4.45	11.38	6.63	2.36	-3.63	-5.86	-0.75	-0.58	0.17	3.84	4.89	1.01
ASM	-0.34	0.04	0.38	-0.11	4.39	4.50	-0.88	-1.17	-0.30			
BHR	-0.34	1.34	1.68	-3.30	-3.97	-0.70	4.45	3.59	-0.83	-1.08	0.62	1.72
GJ	5.12	-1.36	-6.17	4.71	5.81	1.05	-2.82	-4.94	-2.17	1.80	2.55	0.73
KRN	4.14	7.02	2.77	6.54	13.66	6.69	-0.56	-6.55	-6.02	4.45	4.41	-0.04
MP	1.93	1.46	-0.46	-3.97	-0.92	3.17	1.72	2.09	0.36	-0.73	0.60	1.33
MHR	-0.75	-0.73	0.02	1.72	5.71	3.93	-1.43	-1.81	-0.38	0.78	2.55	1.75
ORS	4.05	10.76	6.45	-16.75	-22.14	-6.47	-0.22	-0.78	-0.57	-6.11	-8.98	-3.06
RJ	5.23	0.72	-4.29	2.16	3.62	1.43	-1.67	-2.51	-0.85	1.30	1.24	-0.06
TN	7.47	8.88	1.31	-4.11	-5.08	-1.02	0.07	-1.77	-1.84	1.93	3.18	1.22
UP	3.40	1.45	-1.89	2.26	5.65	3.31	6.41	7.42	0.95	4.24	6.03	1.71
WB	-6.60	-5.54	1.13	-1.91	-2.75	-0.86	-4.20	-1.57	2.75	-3.21	-1.82	1.43
INDIA	3.65	5.77	2.05	-1.78	-1.77	0.01	0.54	0.19	-0.34	1.05	2.12	1.07

Masur

Masur shows impressive growth only in the first period (table 5.7). Thereafter yield has decelerated or declined in almost all the states. There is some positive growth in area in few of the major states like MP and UP but this is not sufficient to offset the deceleration in yield. As a result, production has either decelerated at the national level from the second sub-period and by the third sub-period it is almost stagnant.

Table 5.7: Growth rates for Masur

States	Period:1975-1987			Period:1988-1996			Period:1997-2007			Period:1975-2007		
	Area	**Prod.**	**Yield**	**Area**	**Prod.**	**Yield**	**Area**	**Prod.**	**Yield**	**Area**	**Prod.**	**Yield**
ASM	5.54	1.44	-4.20	-0.65	2.00	2.65	-0.16	0.32	0.47	1.79	2.71	0.90
BHR	0.96	3.70	2.71	-0.39	0.26	0.64	1.01	-0.90	-1.86	0.53	1.94	1.41
MP	-0.76	0.02	0.81	5.73	5.81	0.09	0.66	1.13	0.46	2.28	3.24	0.94
RJ	2.94	7.26	4.09	5.59	6.83	1.27	-7.51	-9.46	-2.11	1.39	3.59	2.10
UP	6.76	10.53	3.54	0.87	1.21	0.35	1.49	1.74	0.28	3.36	5.06	1.67
WB	-4.93	-3.39	1.61	-8.23	-9.54	-1.49	1.74	0.71	-0.90	-2.22	-0.44	1.78
INDIA	1.29	3.93	2.62	1.84	1.58	-0.24	0.83	0.64	-0.16	1.81	3.21	1.38

5.3 Trends in Growth Acceleration

Total Pulses

At the national level, area, production and yield remained virtually stagnant with insignificant acceleration or deceleration in phase 1 (table 5.8). This is because of the contrasting trends in area growth at the state level, with some states recording significant acceleration offset by some other states that registered significant deceleration. Yield remained virtually stagnant with the exception of two states. In phase 2 also, area growth showed contrasting trends in different states resulting in stagnant growth overall. Yield showed significant deceleration in four states resulting in an overall deceleration in this phase. With stagnant area growth and decelerating yield growth, overall production growth remained stagnant during this phase.

Overall, area registered acceleration at least in one phase in few states but yield remained stagnant or has decelerated in both phase in majority of the states, more so in the second phase. As a result, although some acceleration production was witnessed in phase 1 in some states, second phase is marked by virtual stagnation and decelerating production growth in almost all the states (except AP).

Table 5.8: Growth Accelerations for Total Pulses

STATES	Phase I			Phase II		
	Area	**Prod.**	**Yield**	**Area**	**Prod.**	**Yield**
AP	0.01	-0.04***	-0.04***	0.02**	0.06***	0.04***
GJ	-0.03**	-0.04	-0.004	-0.04***	-0.05	-0.02
KRN	-0.03***	0.02***	0.05***	0.03***	0.01	-0.02**
MHR	0.01***	0.02**	0.01	-0.01	-0.01	-0.01
MP	0.01***	0.02	0.01	-0.01	-0.03***	-0.02***
RJ	0.06***	0.08***	0.02	-0.05***	-0.1***	-0.05***
UP	-0.003	-0.02**	-0.01	0.005	-0.01	-0.01***
INDIA	-0.002	0.0003	0.003	0.005	-0.01	-0.01***

Note: *** and ** denote significance at 5 % and 10 % level of significance respectively.

Gram

In this crop, there is a very clear difference between the first and the second phase (table 5.9). The first phase was marked by a significant acceleration in area and yield growth in number of states. However, the second phase was marked by significant deceleration in both area and yield growth rates, except a couple of states that show some acceleration in area growth. As a result, the production growth rates show acceleration during phase 1 but are either stagnant or decelerating in phase 2. Summing up, there is a clear acceleration in the growth of area, yield, and production in phase 1 whereas a significant deceleration has set in during phase 2.

Table 5.9: Growth Accelerations for Gram

STATES	Phase I			Phase II		
	Area	**Prod.**	**Yield**	**Area**	**Prod.**	**Yield**
AP	0.15***	0.22***	0.07***	0.04***	0.05**	0.01
GJ	0.04	0.04	0.004	-0.01	-0.004	0.01
HRY	0.01	0.09***	0.08***	-0.09***	-0.16***	-0.07***
KRN	0.05***	0.1***	0.05***	-0.02	-0.06***	-0.04***
MHR	0.01	0.05***	0.04***	0.01	-0.01	-0.02
MP	0.01***	0.02	0.01	-0.01**	-0.04***	-0.03***
RJ	0.05***	0.07***	0.02	-0.12***	-0.15***	-0.03***
UP	-0.03***	-0.04***	-0.01	0.02***	-0.01	-0.02***
INDIA	0.02***	0.03***	0.01**	-0.01	-0.03***	-0.02***

Note: *** and ** denote significance at 5 % and 10 % level of significance respectively.

Arhar

The trend in arhar is somewhat opposite to that of gram. Arhar is marked by significant deceleration in area and yield growth rates during the first phase (table 5.10). This resulted in significant deceleration production growth rate at the all-India level. In the second phase, this trend in deceleration has been arrested. During this phase, some states registered acceleration in area growth while others continued the decelerating trend of the previous phase. As a result, the all-India area growth rate registered insignificant change in this phase. In the case of yield though, the deceleration of the previous phase is completely arrested in the second phase. Most states record insignificant positive changes in growth rates, making change at the national level also insignificant. Production which showed stagnation or significant deceleration in all the states in the first phase resulting in significant deceleration at all-India level, registered significant

acceleration in the second phase in some of the major states like MP and Karnataka leading to acceleration in the overall growth rate at the national level.

Table 5.10: Growth Accelerations for Arhar

STATES	Phase I			Phase II		
	Area	**Prod.**	**Yield**	**Area**	**Prod.**	**Yield**
AP	-0.04***	0.0001	0.04***	0.05***	0.02	-0.02
GJ	-0.1***	-0.1***	0.001	-0.06***	-0.08***	-0.02
KRN	-0.07***	-0.03**	0.04**	0.07***	0.09***	0.02
MHR	0.01***	-0.003	-0.01	-0.02***	0.01	0.03
MP	-0.02***	-0.08***	-0.06***	0.03***	0.04***	0.02**
TN	-0.09***	-0.13***	-0.04**	-0.04***	-0.03	0.01
UP	0.01***	-0.04***	-0.04***	-0.03***	-0.02***	0.01
INDIA	-0.02***	-0.04***	-0.02***	0.004	0.02**	0.01

Note: *** and ** denote significance at 5 % and 10 % level of significance respectively.

Moong:

The growth acceleration trends in moong are similar to that of arhar. In first phase, area and yield registered significant deceleration in most of the states and all-India, inducing a significant deceleration in the production growth rates (table 5.11). In the second phase though, there is significant acceleration in area growth in many states, which in turn, imparted significant acceleration to the production growth rate, although the yield growth remained largely stagnant.

Table 5.11: Growth Acceleration for Moong

STATES	Phase I			Phase II		
	Area	**Prod.**	**Yield**	**Area**	**Prod.**	**Yield**
AP	-0.01	-0.02	-0.01	-0.01	-0.04***	-0.03**
BHR	-0.06***	-0.08***	-0.02**	0.02***	0.01	-0.01**
GJ	0.03	0.35***	0.33***	-0.03**	-0.05	-0.02
KRN	-0.08***	-0.08***	-0.004	0.07***	0.05	-0.01
MHR	0.01	0.01	0.01	-0.01	-0.04**	-0.03**
MP	-0.04***	-0.02	0.02	0.03***	0.01	-0.02***
ORS	-0.2***	-0.31***	-0.11***	0.18***	0.28***	0.1***
RJ	0.11***	0.17***	0.06	-0.03***	0.01	0.04
TN	-0.03	-0.0004	0.03**	0.03	0.01	-0.02**
UP	-0.25***	-0.23***	0.02	-0.03***	-0.07***	-0.04***
INDIA	-0.04***	-0.06***	-0.03***	0.03***	0.03***	-0.004

Note: *** and ** denote significance at 5 % and 10 % level of significance respectively.

Urad

Urad also showed trend similar to moong. The area growth rates registered significant deceleration in majority of the states and all-India (table 5.12). Yield growth is slightly better with many states recording acceleration but at the all-India level, there is significant deceleration. Because of the predominant deceleration in area growth, the production growth has decelerated in a number of states and all-India during this phase. In the second phase, there is an improvement with area growth accelerating in some of the major states like UP and MP leading to significant acceleration at the national level. The trends in yield growth are not as impressive though with many of the important states like Karnataka, Maharashtra, MP, and UP registering deceleration resulting in stagnation at the national level. However, again due to the predominant effect of area growth, the overall production growth at the national level recorded significant acceleration.

Table 5.12: Growth Accelerations for Urad

STATES	Phase I			Phase II		
	Area	**Prod.**	**Yield**	**Area**	**Prod.**	**Yield**
AP	-0.02	-0.14***	-0.12***	-0.03**	0.03	0.06***
KRN	0.02***	0.06***	0.04**	-0.07***	-0.2***	-0.13***
MHR	0.02***	0.06***	0.04***	-0.03**	-0.07***	-0.04***
MP	-0.06***	-0.02***	0.04***	0.06***	0.03***	-0.03***
ORS	-0.22***	-0.33***	-0.11***	0.18***	0.24***	0.06***
RJ	-0.03***	0.03	0.06	-0.04	-0.06	-0.02
TN	-0.11***	-0.14***	-0.02	0.04	0.03	-0.01
UP	-0.01	0.04***	0.05***	0.04***	0.02	-0.02**
WB	0.05***	0.03	-0.02**	-0.02**	0.01	0.04***
INDIA	-0.05***	-0.07***	-0.02***	0.02***	0.02***	-0.003

Note: *** and ** denote significance at 5 % and 10 % level of significance respectively.

Masur

Although the growth rates of area and yield of masur are impressive, the acceleration of the same is not as convincing (table 5.13). The area decelerated in three states in the first phase, while there was some acceleration in MP, leading to an insignificant growth rate overall. The yield growth has decelerated in all the states. The insignificant area growth rate coupled with deceleration in yield resulted in significant deceleration in production during this phase at the national level. In the second phase, there is acceleration in area growth rates in all the states other than MP. However, a large and significant deceleration in MP resulted in overall deceleration at the national level. In terms of yield, all the states showed stagnation leading to stagnant growth rate at the national level. As

result of the stagnant growth rates in area and yield, the overall production growth rate at the national level is also insignificant during this phase.

Table 5.13: Growth Accelerations for Masur

STATES	Phase I			Phase II		
	Area	**Prod.**	**Yield**	**Area**	**Prod.**	**Yield**
BHR	-0.01***	-0.03***	-0.02***	0.01***	-0.01	-0.03**
MP	0.06***	0.06***	-0.01	-0.05***	-0.05***	0.004
UP	-0.06***	-0.09***	-0.03***	0.01	0.01	-0.001
WB	-0.04***	-0.07***	-0.03**	0.10***	0.11***	0.01
INDIA	0.01	-0.02**	-0.03***	-0.01***	-0.01	0.001

Note: *** and ** denote significance at 5 % and 10 % level of significance respectively.

5.4 Recent Growth Trends

Although long-term trends inform us about the general performance of the sector and possibly about the effectiveness of the policies pursued, the latest trends are more important to devise future policies. The state-level trends during the last decade are presented in table 5.14. The results clearly indicate some troubling trends. There has been a general decline or deceleration in area or yield or both in some of the major states for all the pulse crops. For instance, there is a decline in both area and yield of total pulses in Rajasthan and UP. A similar decline is evident in area and yield of gram in Rajasthan and UP while in the other major state M.P, there is a decline in yield. In the case of arhar, there is a decline in UP (area and yield) and MP (yield). In urad there is a decline in Maharashtra (area and yield) and AP (area) and In the case of moong, there is a decline in Maharashtra (area and yield), AP (area and yield) and Karnataka (yield). Finally, In the case of masur, there is evidence of yield decline in Bihar.

Table 5.14: Growth rates in area, production and yield for major producer states in recent time

GROWTH RATES FOR MAJOR PRODUCER STATES DURING PERIOD 1997-2007					
Crop	**State**	**Area**	**Prod.**	**Yield**	**Area Share (%)**
T. Pulses	MP	0.43	0.66	0.21	17.72
T. Pulses	MHR	0.65	1.89	1.22	16.52
T. Pulses	RJ	-1.43	-4.23	-2.86	13.84
T. Pulses	UP	-0.30	-1.11	-0.82	11.73
Gram	MP	1.23	0.91	-0.32	40.79
Gram	RJ	-7.27	-9.11	-1.98	14.06
Gram	MHR	3.51	5.64	2.06	14.01
Gram	UP	-2.99	-3.39	-0.42	11.52
Arhar	MHR	0.86	2.78	1.91	30.85
Arhar	KRN	3.27	7.10	3.71	16.09
Arhar	AP	3.17	8.99	5.64	13.19
Arhar	UP	-2.24	-4.67	-2.48	10.89
Arhar	MP	0.35	-1.47	-1.82	10.52
Urad	MP	1.72	2.09	0.36	19.04
Urad	MHR	-1.43	-1.81	-0.38	17.62
Urad	AP	-0.75	-0.58	0.17	16.18
Urad	UP	6.41	7.42	0.95	14.90
Moong	RJ	5.17	10.33	4.90	22.35
Moong	MHR	-0.58	-1.19	-0.62	20.84
Moong	AP	-0.62	-1.00	-0.38	14.71
Moong	KRN	4.86	0.55	-4.11	12.69
Masur	UP	1.49	1.74	0.28	42.55
Masur	MP	0.66	1.13	0.46	35.90
Masur	BHR	1.01	-0.85	-1.86	12.95

Are these declining trends reflective of lower relative profitability (which in turn, induces lower input use and land diversion from pulse crops) or higher volatility of pulse crop yields or both? Normally, these are the two factors cited in literature for the poor performance of the pulses sector in India. We attempted to analyze these in a closer detail in the next Chapter.

Chapter 6

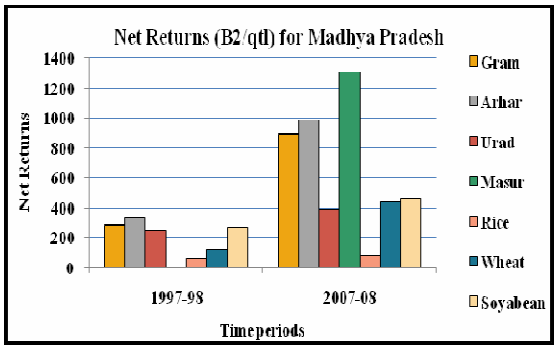
Determinants of Pulses Production: Econometric Analysis

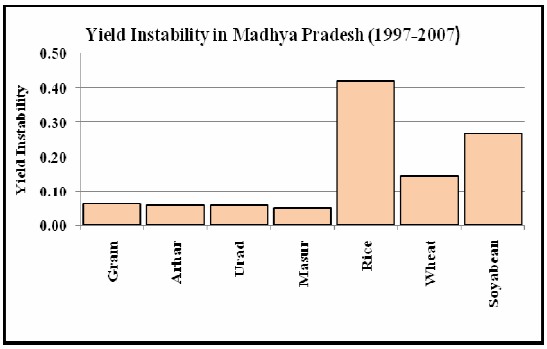
After analyzing the growth trends and acceleration in pulses sector in the previous Chapter, it is clear that the pulses sector has been decelerating for a long time and particularly in the last sub-period, that is, during 1997 to 2007. We have attempted to identify the determinants of this deceleration/decline. First, we have attempted to see the link, if any, between the relative profitability and instability on pulses production. For this, we have calculated the net returns per unit output[1] (rupees per quintal) of important pulse crops and other major crops in all the major pulse-growing states. The calculations are made for two time points – 1997/98 and 2007/08. To analyze the relative yield variability, we have calculated a measure of instability given by the standard deviation of the annual growth rates over the period 1997 to 2007. This measure has been calculated for all the important pulse and non-pulse crops in all the major pulse-growing states. The results of the relative profitability and yield instability are presented in the following diagrams (Figure 6.1).

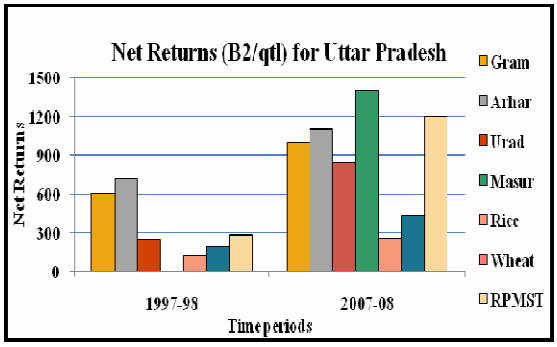
The results indicate that the net returns of pulse crops are either equal to or higher than other crops in most of the states. This result is also supported by many of the primary data-based studies carried out by various AERCs in the country. Also, the yield instability does not appear to be higher for pulses than for other major crops. Also, the market prices for pulses have been generally higher and growing in the last few years of the period. Therefore, it is important to analyze the reasons behind stagnation in pulse production in a more systematic way.

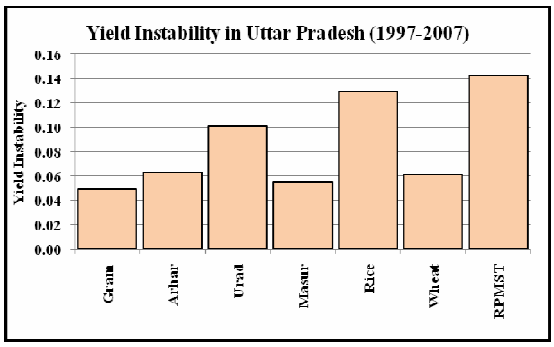
[1] Net returns are calculated as the difference between the value of production and cost of production. The costs considered are A2 and B2

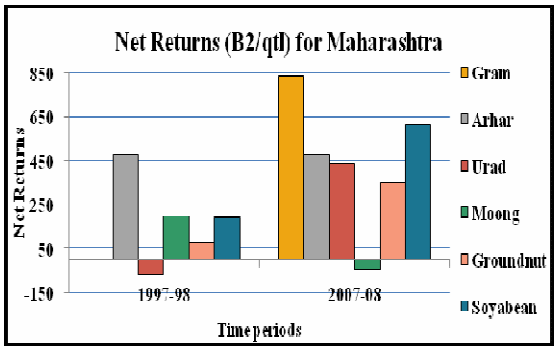
Figure 6.1: Net returns and Yield instability for the major crops in some states

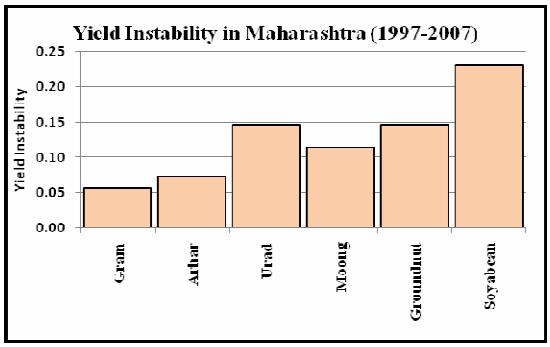


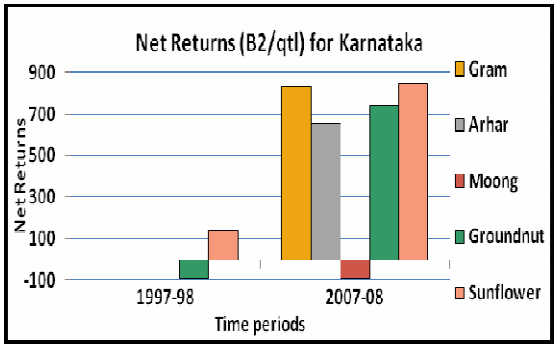


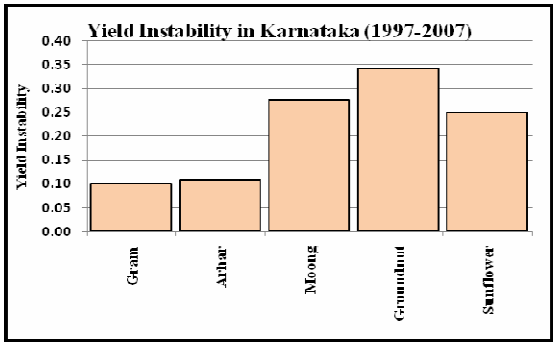


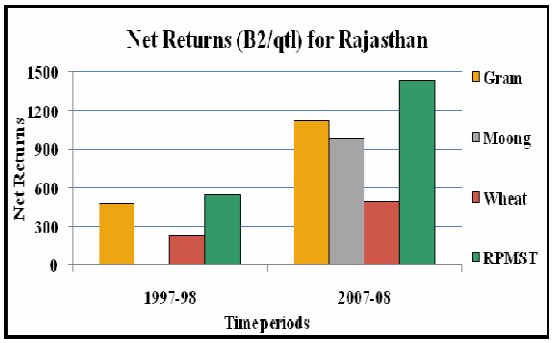


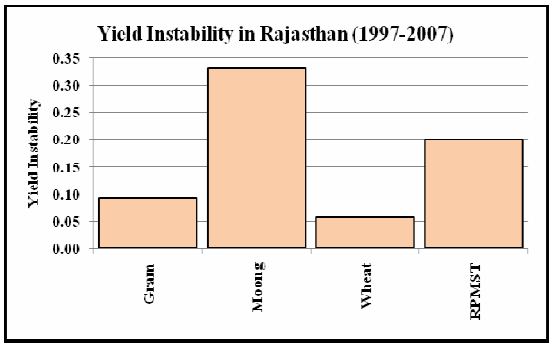












6.1 Model and Results

It needs to be noted that although the net returns of pulse crops are higher than other crops in 1997 and 2007, this does not tell us much about the dynamics (or in other words the movements) in relative profitability between pulse and non-pulse crops over this period. A systematic econometric analysis allows us to capture this dynamic effect on production, after controlling for other relevant factors. We have formulated the following econometric model in the Nerlovian framework of partial adjustment.

Area under ith pulse crop

$$a_{it} = f(a_{it-1}, RP_{it-1}, RF_{it}, GIA, INST_{it}, PEST_{it-1}, z_a, u_a)$$

Yield of the ith pulse crop

$$y_{it} = f(y_{it-1}, RF_{it}, \%Irr_{it}, FERTHA_{it}, PESTHA_{it}, a_{it}, z_y, u_y)$$

Production of the ith pulse crop

$$q_{it} = a_{it} \times y_{it}$$

<u>Notation</u>

a_{it} = Area under i_{th} pulse crop in period t

y_{it} = Yield of i_{th} pulse crop in period t

q_{it} = Production of i_{th} pulse crop in period t

RF_{it}, GIA_{it} = Rainfall and irrigation in year t

RP_{it} = Relative price or relative profitability i_{th} pulse crop vis-à-vis competing crops in year t

$INST_{it}$ = Production Instability measured as the standard deviation of year-on-year growth rates of last three years

$PEST_{it-1}$ = Area under pesticide coverage of the i_{th} pulse crop, as a proxy for pest incidence

$\%Irr_{it}$ = Percentage of irrigated area under the i_{th} pulse crop in period t

$FERTHA_{it}$ = Per hectare fertilizer consumption of the i_{th} pulse crop in period t

$PESTHA_{it}$ = Percentage of area treated with pesticides under the i_{th} pulse crop in period t

$z_{.t}$ and $u_{.t}$ denote the vector of other relevant exogenous variables and error term in the two equations respectively

Two equations – one each for area cropped and yield have been estimated for each of the pulse crops for all the major states. The hypothesized explanatory variables in area function are relative price (or relative profitability if cost data for the said crop are available for the state), rainfall, gross irrigated area (GIA), instability (price, yield or revenue variability) and pesticide use. GIA is expected to capture the irrigation-induced area shifts away from pulses, which is pointed out by many researchers in previous work. There are arguments in the literature that farmers shift away from pulses to more remunerative crops like cereals when irrigation facilities become available. If true, this would lead to a negative relationship in the movements between area under pulse crops and GIA. Thus, GIA variable is expected to show a negative sign in this equation. The other explanatory variables are the standard ones that are expected to influence area under pulses. All these variables, except instability, are expected to have positive effect on dependent variable.

The hypothesized explanatory variables in the yield function are the rainfall, irrigated area under the crop, fertilizer used, pesticide use, and area under the crop. The inclusion of area under the crop in yield equation is the novel feature of our model. This is intended to capture the shift of pulse cultivation to inferior lands. There are arguments (Swarna, 1984) that pulses are generally relegated to inferior lands in view of their lower yields and pest vulnerability. If true, marginal cultivation of pulses takes place on lower quality lands, which in turn, should pull down the average yield. Therefore, the area variable is expected to show negative effect on yield. All other explanatory variables are expected show positive effect on the dependent variable.

Rigorous statistical testing has been carried out to assess model adequacy. Breusch-Godfrey Lagrange Multiplier (BG LM test) for serial correlation, White's test for

Heteroscedasticity, Ramsey regression specification error test (RESET), Cusum Q2 test for parameter stability are some of the tests used for the purpose.

Total Pulses

Rainfall appears to be an important determinant of area under pulses showing a positive significant coefficient in at least four states and also at the national level. There are a couple of states like UP and AP where better rainfall seems to induce area shifts away from pulses, as reflected in significant negative coefficient for the variable. Relative price (RELPR) is also an important determinant of area under pulses. This variable shows significant positive coefficient in three states and also at the national level. The GIA variable, expected to capture the irrigation-induced area shifts from pulses, shows the expected negative sign in two states and at the national level. This variable shows a significant positive effect in AP showing that expansion of irrigation facilities has a beneficial effect on pulses area in the state. Other variables like pesticide use and instability show significant effect only in one or two states.

Turning to the yield function, rainfall is the overwhelming determinant of yield, showing a significant positive effect in seven states and at the national level. The other important determinants are fertilizer use, pesticide use and the percentage of irrigated area under pulses. Each of these variables showed positive effect on yield in two states and all-India. The area variable, expected to capture the inferior lands' effect on yield, does not show the expected negative coefficient in any of the states. In fact, this variable shows significant positive effect in two states – Maharashtra and Gujarat, showing that this hypothesis is not borne out by the data.

Table 6.1: Econometric results for Total Pulses for major states

(i) Area Function

STATE	AP	**GJ**	**KRN**	**MHR**	**MP**	**RJ**	**UP**	**INDIA**
Area(-1)	0.95***	0.79***	0.73***		0.68***	0.70***	0.68***	0.73***
t			0.01**	0.004***				
Rel. Price	0.04*	0.09*	0.04	0.01	0.03	0.09*	0.02	0.05***
RFALL(JUNSEP)		0.07***			0.06**		-0.02**	0.08***
RFALL(OCTDEC)	-0.04***							0.03***
RFALL(ANNUAL)				0.03		0.24***		
Pesticides (Avai)				0.67***				0.02***
GIA	0.10*		-0.22**				-0.06**	-0.08***
Instability					0.50** (y)			
$\bar{R}^2$	0.97	0.94	0.95	0.95	0.76	0.75	0.91	0.84

(ii) Yield Function

STATE	AP	GJ	KRN	MHR	MP	RJ	UP	INDIA
Yield(-1)	0.91***	0.48***	0.75***		0.50***	0.47***	0.79***	0.40***
RFALL(JUNSEP)	0.10***	0.16***	0.23***		0.08**		0.15***	0.10***
RFALL(OCTDEC)			0.07***					
RFALL(ANNUAL)						0.25***		
Fertilizers (use)	0.14**		0.02**				0.02	0.04**
Pesticides (use)				-0.56**	-0.02**			-0.04***
Irrig Area (Crop)	-0.08***			0.08***	0.12***			0.09**
Area		0.48***		1.78***			0.46	
$\bar{R}2$	0.97	0.81	0.58	0.96	0.96	0.62	0.70	0.96

Gram

Data for eight states and all-India has been analyzed for gram. The area function results are similar to that of total pulses. Rainfall is the main determinant followed by relative price / relative profitability, GIA and pesticide use. Rainfall shows significant effect on area in five states and also at the national level. Relative price / relative profitability shows a significant and positive effect in two states and all-India. The irrigation-induced shift away from gram is not evident, as reflected in a statistically significant negative coefficient of GIA only in one state (UP). Turning to the yield function, rainfall is the most important determinant, showing significant positive effect in seven states and also at all-India level. Fertilizer use is the next important determinant showing significant effect in three states. Pest incidence shows a significant negative effect on yield in three states. The marginal area effect, as is the case in total pulses, is significantly positive in three states and also at all-India level.

Table 6.2: Econometric results for Gram for major states

(i) Area Function

STATE	AP	GJ	HRY	KRN	MHR	MP	RJ	UP	INDIA
Area(-1)	0.99***	0.74***	1.14***	0.62***	0.70***	0.48***	0.80***	0.57***	0.71***
T					0.01*				
Rel. Price/Profit.	0.17*	0.46***	0.10	-0.09	0.04	0.05*** (pro.)	0.01 (pro.)	-0.0002 (pro.)	0.13***
R'FALL(JUNSEP)									0.27***
R'FALL(OCTDEC)									0.05**
R'FALL(ANNUAL)		0.53***	0.25***	-0.22**	0.14**	0.10***	0.35***		
Pesticides (Avai)		0.11*	0.08***	0.08*					
GIA	0.59**			0.54***		0.12***		-0.75***	
Instability			0.53** (R)			0.54** (y)		-0.70*** (y)	
Imports									-0.01***
$\bar{R}2$	0.98	0.79	0.97	0.97	0.96	0.96	0.88	0.99	0.75

(ii) Yield Function

STATE	AP	GJ	HRY	KRN	MHR	MP	RJ	UP	INDIA
Yield(-1)	0.72***	0.55***	0.83***	0.77***	0.58***	0.43***	0.48***	0.79***	0.50***
T	0.02***								0.004***
RFALL(JUNSEP)	0.24***		0.13***		0.19***			0.18***	
RFALL(OCTDEC)			-0.017						0.03*
ANNUAL		0.07*		0.27**			0.08*		
Fertilizers (use)			0.02**	0.19***				0.04*	
Pesticides (use)				-0.11**	-0.12***	-0.04***	0.09**		
Irrig Area (Crop)				-0.22***	0.15**	0.05*	0.03		
Area		0.17***			0.43***	0.66***			0.14*
$\bar{R}2$	0.96	0.77	0.69	0.84	0.97	0.96	0.58	0.84	0.94

Arhar

Data for seven states and all-India has been analyzed for arhar. Relative price / relative profitability has shown significant effect on area in three states but there is a significant negative effect in MP. Rainfall shows a significant positive effect in AP and Maharashtra but shows a significant negative coefficient in UP, showing that in UP area shift away from pulses occurs when rainfall is favourable. The pesticide usage expectedly shows significant negative effect in three states. Irrigation shows negative shift in MP and Tamil Nadu. The yield/price instability shows significant negative effect in three states and all-India.

Turning to yield function, rainfall is the most important determinant with a positive and significant effect in four states and all-India. Fertilizer use follows next with significant effect in two states. Pesticide use is significant in only one state. Irrigated area, contrary to expectations, shows significant negative effect in MP and UP. This result can be placed in proper perspective when read in combination with results of area function. In area function results, it is seen that increase in rainfall or irrigation induces shifts away from arhar in UP and MP respectively. This implies that the better-quality lands are diverted away from pulses in these two states, which may explain the negative coefficient of irrigation variable on yield.

Table 6.3: Econometric results for Arhar for major states

(i) Area Function

STATE	AP	GJ	KRN	MHR	MP	TN	UP	INDIA
Area(-1)	1.04***	0.75***	0.69***	0.97***	0.45***	1.34***	0.86***	0.78***
T		-0.01***	0.02***	0.01***	-0.01**	0.03**		0.02***
t2					0.0003***	-0.001**	-0.0001***	-0.001***
t3								0.00002***
Rel. Price/Profit.	0.05	0.04** (pro.)	0.03	0.06***	-0.04*** (pro.)		0.03*** (pro.)	
RFALL(JUNSEP)				0.02*			-0.07***	0.02
RFALL(ANNUAL)	0.08*							
Pesticides (Avai)	-0.07		-0.35***	-0.13***	0.03**	-0.87**		
GIA				0.08	-0.12***	-0.87***		
Instability		-0.35*** (p)	-0.18 (y)	0.16** (y)			-0.26*** (p)	-0.14 (y)
Imports								
$\bar{R}2$	0.98	0.99	0.96	0.99	0.99	0.94	0.98	0.98

(ii) Yield Function

STATE	AP	GJ	KRN	MHR	MP	TN	UP	INDIA
Yield(-1)	0.48***	0.65***	0.6***	0.21	0.69***	0.73***	0.47**	0.67***
t			-0.03***	0.01***	0.03***		0.03**	-0.002
t2			0.001***		-0.0006***		-0.0008**	0.00
JUNSEP		0.15***	0.18 (Anl.)		0.13**	0.10	0.11**	0.08*
OCTDEC		0.02		-0.06***				
Fertilizers (use)	0.14***	0.15**		-0.07**				
Pesticides (use)				-0.14*			0.05***	
Irrig Area (Crop)	0.07				-0.15***	0.04	-0.09**	
Area				0.31				
$\bar{R}2$	0.92	0.78	0.76	0.83	0.84	0.66	0.88	0.60

Moong

Data for ten states and all-India have been analyzed. In area function, rainfall emerges as the important determinant, showing significant positive effect in five states and all-India. However, two states (Karnataka and Maharashtra) show significant negative effects showing area shifts away from moong when rainfall condition is favourable in these states. The shift away from pulses with irrigation appears to hold in three states and also at all-India. The GIA variable in these states shows a significant negative coefficient. Relative price / profitability shows significant positive effect in three states and all-India. However, in AP and UP, the price variable is significantly negative, which is contrary to the hypothesized behaviour.

Turning to yield function, rainfall is the important determinant showing significant positive effect in five states and all-India level. Rainfall is followed by fertilizer and irrigation, each of which shows significant positive effect in four states. Pesticide use

shows significant effect in three states. The marginal area effect does not appear to hold except in UP, where the area variable shows significant negative coefficient. In two states and all-India, there is a significant positive area effect showing that in these states moong cultivation is being extended to better-quality lands.

Table 6.4: Econometric results for Moong for major states

(i) Area Function

STATE	AP	BHR	GJ	KRN	MHR	MP	ORS	RJ	TN	UP	INDIA
Area(-1)	0.74***	0.78***	0.63***	0.51***	0.62***	0.81***	1.00***	0.83***	0.75***	0.40***	0.89***
t		0.01**		0.02***	0.03***		-0.04**	0.02**		-0.02***	
t2		-0.0003**			-0.001***		0.001**				
Rel. Price/Profit	-0.04** (pro.)					0.04*	0.07 (pro.)	0.22**	0.13*	-0.22**	0.12***
RFALL(JUNSEP)	0.04*	-0.03				0.03**		0.20***			0.06**
RFALL(OCTDEC)				-0.12**	-0.03**		0.07***				
RFALL(ANNUAL))			0.11***								
Pesticides (Avai)											0.02
GIA		-0.31**			0.24	-0.2***		-0.38*			-0.1***
Instability		0.32*** (p)		-0.33 (y)	0.27*** (p)	-0.2*** (r)			0.50*** [r]	0.21** (p)	
$\bar{R}2$	0.84	0.96	0.85	0.95	0.94	0.99	0.98	0.97	0.78	0.94	0.96

(ii) Yield Function

STATE	AP	BHR	GJ	KRN	MHR	MP	ORS	RJ	TN	UP	INDIA
Yield(-1)	0.56***	0.64***	0.79***	0.66***	0.36**	0.55***	0.91***	0.29*	0.75***	0.69***	0.33
t											0.01
t2											-0.0004**
RFALL(JUNSEP)			0.58***	0.34**		0.19***		0.66***			0.16**
RFALL(OCTDEC)	0.06*						0.02			-0.02*	
Fertilizers (use)	0.07**	0.08***			0.09**	0.04**					
Pesticides (use)	-0.09***			-0.25**	0.44***		0.14***			12.4***	
Irrig Area (Crop)		0.05***					-0.2***	0.38***	0.07*	0.24*	
Area	0.43**		-0.48	0.37**						-12.4***	0.42***
$\bar{R}2$	0.80	0.95	0.63	0.73	0.88	0.84	0.98	0.59	0.84	0.89	0.75

Urad

Data for nine states and all-India have been analyzed for urad. In area function, relative price/relative profitability is the most important determinant showing positive significant effect in six out the nine states and also at all-India level. This is followed by rainfall, which is significant in four states. Instability shows significant negative effect in two states and all-India. Imports show a significant negative effect at the national level. In the yield function, rainfall is positive and significant in three states while fertilizer use and

irrigation are significant in three states each. Marginal area effect is present in two states and all-India.

Table 6.5: Econometric results for Urad for major states

(i) Area Function

STATE	AP	KRN	MHR	MP	ORS	RJ	TN	UP	WB	INDIA
Area(-1)	0.67**	0.72***	0.79***	0.90***	0.96***	0.82***	0.93***	0.97***	0.87***	0.99***
T			0.04*	-0.09*	-0.05***					
t2			-0.001*	0.00	0.001***					
Rel. Price/Profit	0.05*** (pro.)	0.14***	0.01*** (pro.)	0.06*** (pro.)		0.14*	-0.12	0.04***		0.14***
RFALL(JUNSEP)				0.08*			0.12**			
RFALL(OCTDEC)		0.05***			0.07***					
RFALL(ANNUAL)	-0.07									
GIA		0.42***					0.55**		-0.07	
Instability				-0.23** (r)				-0.98* (y)		-0.65 (y)
Imports										-0.03***
$\bar{R}^2$	0.97	0.99	0.81	0.96	0.99	0.84	0.88	0.98	0.97	0.95

(ii) Yield Function

STATE	AP	KRN	MHR	MP	ORS	RJ	TN	UP	WB	INDIA
Yield(-1)	0.94***	0.51***	0.65***	0.44***	0.44***	0.39***	0.68***	0.69***	0.58***	0.80***
t	0.05***									
t2	-0.001***									
RFALL(JUNSEP)				0.19***		0.33***		-0.15***		0.08
RFALL(OCTDEC)	-0.08***	0.18***					0.09			
Fertilizers (use)		0.43***	0.09*			-0.21**	-0.26*		0.07**	
Pesticides (use)				-0.14*	-0.02					
Irrig Area (Crop)				0.08***		0.29	0.22**	0.33**	0.07	
Area	-0.45***	-0.32***			0.32***	0.24				0.15**
$\bar{R}^2$	0.93	0.79	0.75	0.93	0.98	0.79	0.79	0.92	0.88	0.95

Masur

Data for four states and all-India have been analyzed. The area function estimates show that GIA shows significant positive coefficient in three states and all-India, showing absence of the irrigation-induced area shifts from masur. This is also consistent with the fact that masur is a crop grown in relatively better-irrigated conditions as compared to other pulse crops. Relative price, pest incidence, and instability show minor effect and are significant only in one state each. In the yield function, fertilizer is the most important determinant, which shows positive significant coefficient in three out of the four states. Other variables are largely insignificant.

Table 6.6: Econometric results for Masur for major states

(i) Area Function

STATE	BHR	MP	UP	WB	INDIA
Area(-1)	0.52***	0.83***	0.99***	-0.92*	0.66***
t				-0.02***	
Rel. Price			0.14**		0.05*
RFALL(JUNSEP)		0.04**	0.03	0.10	-0.06**
Pesticides (Avai)				1.79***	
GIA	0.14**	0.12***	-0.21*	0.38***	0.25***
Instability	-0.25**				
$\bar{R}2$	0.78	0.99	0.99	0.95	0.99

(ii) Yield Function

STATE	BHR	MP	UP	WB	INDIA
Yield(-1)	0.62***	0.66***	0.45***	0.68***	0.74***
t					0.02***
t2					-0.0003***
RFALL(JUNSEP)		0.13**	0.067*		
RFALL(OCTDEC)					
Fertilizers (use)	0.09**	0.01**	-0.13**	0.09***	
Pesticides (use)					
Irrig Area (Crop)	0.03*	-0.05**			-0.20
Area			0.47***		
$\bar{R}2$	0.89	0.92	0.96	0.86	0.97

Summary of the Chapter: The major determinants of area of most of the pulse crops are rainfall and relative price / profitability. The negative irrigation effect, that is, the irrigation-induced area shifts away from pulses is not present except In the case of moong. In gram and masur, irrigation has actually contributed positively to area growth in many states. The major determinants of yield are mainly the rainfall, fertilizer use and to a lesser extent irrigation. The marginal area effect, that is, the adverse effect on yield due to cultivation on inferior lands, is present to a small degree only In the case of moong and urad. In the case of gram, there is some evidence that cultivation appears to be carried out on better-quality lands in at least three states.

TABLE 6.7: ECONOMETRIC ANALYSIS - SUMMARY RESULTS

CROP	AREA FUNCTION	R^2	YIELD FUNCTION	R^2
TOTAL PULSES	Lagged area, rainfall, relprice / profitability. Negative irrigation effect negligible	0.75 (RJ) to 0.97 (AP)	Lagged yield, rainfall, fertilizer use, % of irrigated area, pesticide use. Negative marginal area effect not present	0.58 (KRN) to 0.97 (AP)
GRAM	Lagged area, rainfall, relprice/profitability, GIA (+ve). Negative irrigation effect negligible	0.79 (GJ) to 0.99 (UP)	Lagged yield, rainfall, fertilizer use. Negative marginal area effect not present but +ve in 3 states	0.58 (RJ) to 0.97 (MHR)
ARHAR	Lagged area, relprice/profitability, pesticide, instability. Negative irrigation effect not present	0.94 (TN) to 0.99 (MP)	Lagged yield, rainfall, fertilizer use	0.60 (AI) to 0.92 (AP)
MOONG	Lagged area, rainfall, relprice/profitability. Negative irrigation effect present in 3 states and all-India	0.78 (TN) to 0.99 (MP)	Lagged yield, rainfall, fertilizer use, irrigation, pesticide. Negative marginal area effect only in UP.	0.59 (RJ) to 0.95 (BHR)
URAD	Lagged area, relprice/profitability, rainfall. Negative irrigation effect not present	0.81 (MHR) to 0.99 (KRN, ORS)	Lagged yield, rainfall, fertilizer use, irrigation. Negative marginal area effect only in 2 states (AP, KRN)	0.79 (MHR) to 0.98 (ORS)
MASUR	Lagged area and GIA. Irrigation effect is positive.	0.78 (BHR) to 0.99 (AI)	Lagged yield, fertilizer use. Marginal area effect not present	0.86 (WB) to 0.97 (AI)

PART II

PRIMARY DATA ANALYSIS

Chapter 7
Cropping Pattern and Irrigation

In this chapter, the broad cropping pattern and irrigation details in all the sample districts are discussed. A brief summary of the Chapter is presented first followed by a detailed description of the cropping pattern and irrigation in each of the states.

Summary of the Chapter

Pulses are dominant only in Maharashtra, UP and AP during rabi season (Tables 7.1.1 to 7.1.14). Among the pulse crops, moong, urad, and arhar are dominant during kharif whereas gram and masur are dominant crops during the rabi season (Tables 7.2.1 to 7.2.14). But this pattern of dominance is highly heterogeneous across states indicating that area-specific approaches are required to address problems of pulse production in the country. More than 60% of the total cropped area is irrigated in all the states except Maharashtra, AP, and the non-NFSM district of Rajasthan (Tables 7.3.1 to 7.3.12). Tubewell is the major source of irrigation in Rajasthan, Bihar and Punjab whereas in UP the major source is canal. As for irrigation of different crops, rice and wheat possess the largest share of the total irrigated area while irrigation for pulses is moderate (Tables 7.4.1 to 7.4.18). Among the pulse crops, moong in the kharif season and gram in the rabi season show the highest percentage of irrigated area of cropped area.

7.1: Cropping Pattern in the States

Rajasthan: In the NFSM district (Churu) the main kharif crops are bajra (21%), moong (10%), moth (10%), groundnut (11%) and guar and other minor crops (Table 7.1.1). The figures in parenthesis indicate percentage to total area. The major rabi crops are wheat (19%), gram (13%), barley, rapeseed & mustard and other minor crops. Small farmers mainly grew bajra, moong, gram, and moth only. Medium and large farmers grew wheat, groundnut, rp&mst, guar and methi. Some shift has been witnessed in kharif area towards groundnut due to pest problems and blue bull problems in pulses cultivation and assured returns in groundnut cultivation. In the non-NFSM district (Bhilwara) the major kharif crops are maize (21%), urad (17%), jowar, moong and minor crops (Table 7.1.2). In the rabi season, the major crops are wheat (19%), gram and rapeseed & mustard.

Maize is the major kharif crop uniformly across all size groups. Maize is followed by urad. In the large farmer category, wheat is cultivated more than urad. In the rabi season, there is some shift from gram to rapeseed & mustard to save from irrigation stress

Maharashtra: In the NFSM district (Amaravati), the major kharif crops are moong (66%), cotton (9%), jowar (8%), arhar (7%) and soybean (6%) (Table 7.1.3). In the rabi season, the major crops are gram (95%) and sunflower (5%). In the kharif season, marginal farmers allocated highest proportion of area to moong and soybean and relatively lesser proportion to other crops in the kharif season. In the rabi season however, marginal farmers allocated lesser proportion of area to pulses. In the non-NFSM district (Beed) Cotton (45%), arhar (19%), moong (16%), soybean (10%) and bajra (8%) are the major kharif crops (Table 7.1.4). The major rabi crops are gram (45%), sugarcane (35%) and others (20%). Cotton is the major kharif crop uniformly across all size groups. As for kharif pulse crops, small farmers allocated larger share of area to moong unlike other categories of farmers who have allocated more area to arhar. In the rabi season, marginal and small farmers allocated a much larger proportion of area to gram as compared to medium and large farmers who allocated a larger proportion of area to sugarcane and other crops.

Haryana: The major kharif crops in the NFSM (Bhiwani District) are cotton (62%), bajra (30%), pulses (1%) (Table 7.1.5). In the rabi season, wheat (45%), mustard (34%), and pulses (20%) are the major crops. Marginal and small farmers allocated relatively higher proportion of area to bajra as compared to cotton in the kharif season. In the rabi season however, these farmers, like other categories, allocated higher proportion of area to wheat, mustard and pulses. The major kharif crops in the non-NFSM district (Mahendragarh district) are bajra (58%), jowar (27%), pulses (11%) (Table 7.1.6). The major crops in the rabi season are wheat (40%), pulses (39%), mustard (19%). Bajra is the major kharif crop uniformly across all size groups. In the rabi season, marginal and small farmers allocated a much larger proportion of area to pulses as compared to medium and large farmers who allocated a larger proportion of area to wheat and mustard.

Andhra Pradesh: The major kharif crops in the NFSM (Prakasam District) are Tobacco (49%), rice (22%), pulses (8%) and other crops (21%) (Table 7.1.7). In the rabi season

gram (100%) is the only crop. Marginal farmers allocated highest proportion of area to rice and relatively much lesser proportion to tobacco and other crops in the kharif season. In the rabi season however, all size groups of farmers allocated total area to pulses (gram). In the Non-NFSM district (Ranga Reddy district), the major kharif crops are maize (45%), pulses (28%), cotton (14%) and rice (11%) (Table 7.1.8). In the rabi season however, all size groups of farmers allocated total area to pulses (gram). Maize is the major kharif crop uniformly across all size groups. However, marginal farmers allocated less than 1% area to tobacco while the proportion allocated to tobacco increases as we move to higher size groups. Arhar is the major kharif pulse crop while gram is the major pulse crop in the rabi season.

Bihar: The major crops in the NFSM (Patna) district are rice (35%), wheat (29%), pulses (16%) and other crops (20%) (Table 7.1.9). This cropping pattern is similar across all size groups. In the non-NFSM district (Kishanganj) also rice (41%), wheat (28%), pulses (12%), other crops (19%) are the major crops (Table 7.1.10). This cropping pattern is similar across all size groups

Uttar Pradesh: The major kharif crops in the NFSM (Lalitpur District) district are Pulses (90%) and in the rabi season pulses (59%) and wheat (41%) are the major crops (Table 7.1.11). Overall, 74% of the GCA has been allocated to pulses and 21% to wheat and 5% to other crops in the district. Marginal farmers allocated highest proportion of area to pulses. In the Non-NFSM district (Allahabad district), the major crops in the kharif season are rice (47%), Pulses (27%) and other crops (26%) and the rabi season are pulses (58%), wheat (42%) (Table 7.1.12). Overall, 42% of the GCA in the district has been allocated to pulses, 24% to rice, 20% to wheat and 14% to other crops. Marginal farmers allocated substantially higher proportion of area to pulses.

Punjab: The major kharif crops in the NFSM district (Ferozpur District) are rice (89%), pulses (7%), other crops (4%) (Table 7.1.13). In the rabi season, the major crops are wheat (91%), pulses (5%), other crops (3%). It is notable that marginal and small farmers have not allocated any area to pulses in either season. In the Non-NFSM district (Moga district), the major kharif crops are rice (95%), other crops (5%) (Table 7.1.14). In the rabi season, wheat (97%) is the major crop.

Table 7.1.1: Percentage share of different crops in total area - Rajasthan: NFSM district- Churu

Size Group	Moong	Moth	Gram	Bajra	Wht	RPMST	Methi	Guar	G'Nut	Barely	Chula	Cumin	Fodr.	S'mum	Total
Marginal															
Small	25	14	21	39											100
Medium	15	9	17	24	24	2	2	3	5						100
Large	9	10	13	21	19	3	1	7	11	2	0.2	1	3	0.4	100
Total	10	10	13	21	19	3	2	7	11	2	0.2	1	2	0.3	100

Table 7.1.2: Percentage share of different crops in total area - Rajasthan: Non-NFSM district- Bhilwara

Size Group	Barley	Gram	Cumin	Jowar	Maize	Moong	RPMST	Sesamum	Urad	Wheat	Total
Marginal	0.5	4	1	15	33	4	0.5	2	20	20	100
Small		6	6	14	20	8	5	2	21	18	100
Medium	1	7	5	16	15	6	10	4	19	17	100
Large		7	5	9	22	3	13	8	13	21	100
Total	0.2	7	5	12	21	5	9	5	17	19	100

Table 7.1.3: Percentage share of different crops in total area - Maharashtra: NFSM District- Amravati

Size Group	Kharif Season										Rabi Season		
	Pulses			Other Crops						G. Total	Pulse	Other Crops	G. Total
	Moong	Arhar	Ttl	S'bean	Jowr	Ctn	Bajra	Otr	Ttl		Gram	Sunflower	
Marginal	72	6	78	10	5	4		3	22	100	90	10	100
Small	63	8	71	6	7	8	1	7	29	100	96	4	100
Medium	65	8	73	5	8	10		4	27	100	96	4	100
Large	68	7	74	6	9	10		0.5	26	100	95	5	100
Total	66	7	73	6	8	9	0.4	4	27	100	95	5	100

Table 7.1.4: Percentage share of different crops in total area - Maharashtra: Non-NFSM District- Beed

Size Group	Kharif Season									Rabi Season			
	Pulses			Other Crops					G. Total	Pulse	Other Crops		G. Total
	Moong	Arhar	Ttl	S'bean	Jowar	Ctn	Bajra	Total		Gram	Sugarcane	Other	
Marginal	11	25	36	7	2	51	4	64	100	85	15		100
Small	26	16	42	12		39	7	58	100	62	18	20	100
Medium	10	26	36	8	1	55	0.2	64	100	38	20	42	100
Large	16	15	31	11		41	17	69	100	39	44	17	100
Total	16	19	36	10	1	45	8	64	100	45	35	20	100

Table 7.1.5: Percentage share of different crops in total area - Haryana: NFSM District- Bhiwani

Size Group	Kharif					Rabi					Zaid	Overall					
	Pulses	Bajra	Cotton	Others	Total	Pulses	Wheat	Mustard	Others	Total	Chillies	Pulses	Cotton	Wheat	Other Major Crops	Other Crops	Total
Marginal		97		3	100	15	58	27	0	100		7		28	60	4	100
Small		41	44	16	100	18	63	18	1	100		10	20	34	29	8	100
Medium	1	29	61	8	100	19	45	35	2	100		10	28	24	32	7	100
Large	1	27	68	4	100	22	43	35	0	100	100	13	27	25	31	4	100
Overall	1	30	62	7	100	20	45	34	1	100	100	12	26	25	32	5	100

Table 7.1.6: Percent. share of different crops in total area - Haryana: Non-NFSM District- Mahendragarh

Size Group	Kharif					Rabi					Zaid	Overall					
	Pulses	Bajra	Jowar	Others	Total	Pulses	Wheat	Mustard	Others	Total	Chillies	Pulses	Bajra	Wheat	Other Major Crops	Other Crops	Total
Marginal	16	74	3	7	100	54	40	6		100		35	36	20	5	3	100
Small	10	59	31		100	45	32	22	1	100		28	29	16	26	1	100
Medium	14	60	26		100	39	38	22	1	100		26	30	19	24	0	100
Large	10	52	31	7	100	33	46	19	2	100	100	22	25	24	25	5	100
Overall	11	58	27	3	100	39	40	19	1	100	100	25	28	20	23	2	100

Table 7.1.7: Percentage share of different crops in total area - AP: NFSM District- Prakasam

Size Group	Kharif					Rabi	
	Arhar	Rice	Tobacco	Other Crops	Total	Gram	Total
Marginal		89	11		100	100	100
Small	6	27	61	6	100	100	100
Medium	22	11	50	17	100	100	100
Large		22	45	33	100	100	100
Overall	8	22	49	21	100	100	100

Table 7.1.8: Percentage share of different crops in total area - AP: Non-NFSM District- Ranga Reddy

Size Group	Kharif						Rabi	
	Arhar	Rice	Cotton	Maize	Other Crops	Total	Gram	Total
Marginal	21		1	79		100	100	100
Small	32		15	53		100	100	100
Medium	28	20	16	34	3	100	100	100
Large	29	16	18	30	7	100	100	100
Overall	28	11	14	45	3	100	100	100

Table 7.1.9: Percentage share of different crops in total area - Bihar: NFSM Patna

Size Group	Pulses	Rice	Wheat	Other Crops	Total
Marginal	17	36	29	18	100
Small	20	32	28	20	100
Medium	15	36	30	19	100
Large	15	36	28	21	100
Overall	16	35	29	20	100

Table 7.1.10: Percentage share of different crops in total area - Bihar: Non-NFSM District Kishanganj

Size Group	Pulses	Rice	Wheat	Other Crops	Total
Marginal	14	37	29	20	100
Small	13	37	30	21	100
Medium	14	39	27	20	100
Large	11	44	28	17	100
Overall	12	41	28	19	100

Table 7.1.11: Percentage share of different crops in total area - UP: NFSM District- Lalitpur

Size Group	Kharif			Rabi			All Season			
	Pulses	Others	Total	Pulses	Wheat	Total	Pulses	Wheat	Others	Total
Marginal	94	6	100	68	32	100	81	16	3	100
Small	84	16	100	48	52	100	66	26	8	100
Medium	92	8	100	65	35	100	79	18	4	100
Large										
Total	90	10	100	59	41	100	74	21	5	100

Table 7.1.12: Percentage share of different crops in total area - UP: Non-NFSM District- Allahabad

Size Group	Kharif				Rabi				All Season				
	Pulses	Rice	Othr	Total	Pulse	Wheat	Othr	Total	Pulses	Rice	Wheat	Others	Total
Marginal		79	21	100	100			100	75	20		5	100
Small	24	53	23	100	65	35		100	44	27	17	12	100
Medium	27	46	27	100	58	42	0.1	100	42	24	20	14	100
Large	23	54	23	100	45	55		100	34	28	27	12	100
Total	27	47	26	100	58	42	0.1	100	42	24	20	14	100

Table 7.1.13: Percentage share of different crops in total area - Punjab: NFSM District- Ferozepur

Size Group	Kharif				Rabi				Zaid	All Season				
	Pulses	Rice	Otr	Ttl.	Pulses	Wheat	Othr	Ttl.	Pulses	Pulses	Rice	Wheat	Othr	Ttl.
Marginal		89	11	100		89	11	100	100	22	35	35	8	100
Small		89	11	100		89	11	100	100	10	40	40	10	100
Medium	8	86	5	100	5	89	5	100	100	11	41	43	5	100
Large	7	89	4	100	6	92	3	100	100	12	42	43	3	100
Total	7	89	4	100	5	91	3	100	100	12	42	43	4	100

Table 7.1.14: Percentage share of different crops in total area - Punjab: Non-NFSM District- Moga

Size Group	Kharif			Rabi			Zaid	All Season				
	Rice	Others	Total	Wheat	Others	Total	Pulses	Pulses	Rice	Wheat	Others	Total
Marginal												
Small												
Medium	96	4	100	97	3	100	100	20	38	39	3	100
Large	95	5	100	97	3	100	100	10	43	44	4	100
Total	95	5	100	97	3	100	100	11	42	43	3	100

7.2: Area under Pulses in Various States

Rajasthan: In the NFSM district, about 33% of GCA is under pulses in TE 2009 (Table 7.1.1). Small farmers allocated about 61% of GCA to pulses. Medium farmers allocated about 41%. Large farmers allocated about 32% of the GCA but are moving away to groundnut as already mentioned. Among pulses, gram has the highest area share of about 40% followed by moth with 30% and moong with 29% (Table 7.2.1). In the non-NFSM district, about 28% of the GCA is under pulses in TE 2009 (Table 7.1.2). Small farmers allocated about 35% of GCA while large farmers allocated about 22%. Among pulses, urad has the highest area share of about 60% followed by gram with 23% and moong with 17% (Table 7.2.2).

Maharashtra: In the NFSM district, about 73% and 95% of area is under pulses in kharif and rabi seasons respectively during 2007-2009 (Table 7.1.3). Marginal farmers allocated about 78% and 90% of area to pulses in kharif and rabi seasons respectively. Small farmers allocated about 71% and 96% of area. Medium farmers allocated about 73% and 96% of the area. Large farmers allocated about 74% and 95% of area to pulses. Among pulses, moong (90% of pulses area) and arhar (10%) are the major kharif pulse crops while gram (100%) is the major rabi pulse crop (Table 7.2.3). In the non-NFSM district, about 36% and 45% of the area is under pulses in kharif and rabi seasons respectively during 2007-2009 (Table 7.1.4). Marginal farmers allocated about 36% and 85% of area in the two seasons respectively. Small farmers allocated about 42% and 62% of the area. Medium farmers allocated about 36% and 38% of the area. Large farmers allocated about 31% and 44% of area. Among pulses, arhar (54% of pulses area) and moong (46%) are the major kharif pulse crops while gram (100%) is the major rabi pulse crop (Table 7.2.4).

Haryana: About 12% and 25% of the cropped area is under pulses in the NFSM and non-NFSM districts respectively during 2007-2009 (Table 7.1.5 & Table 7.1.6). In the Bhiwani district, the overwhelming share in pulse farming is that of the large farmers (about 61%). Moong is the only major pulse crop (occupying about 100% of kharif pulse area) and gram is the only major rabi pulse crop in both the districts (Table 7.2.5 & Table 7.2.6).

Andhra Pradesh: In the NFSM district, about 8% of kharif area is under pulses during 2006-09 (Table 7.1.7). Arhar is the predominant kharif pulse crop. All the area (100%) during the rabi season is under pulses cultivation (gram). About 95% of the total pulses area in the district is sown during the rabi season (Table 7.2.7). In the non-NFSM district, about 28% of the kharif area and 100% of rabi area is under pulses (Table 7.1.8). As in the case of NFSM district, arhar and gram are the major pulse crops during the kharif and rabi seasons respectively. However, unlike the NFSM district, major part of pulses production takes place in the kharif season (Table 7.2.8).

Bihar: In the NFSM district major portion of the area – more than 90% under pulses is cultivated during the rabi season. Among pulses, masur (53% of pulses area), gram (42%), and arhar (5%) are the major pulse crops (Table 7.2.9). In the non-NFSM district, about 80% under pulses is cultivated during the rabi season. Among pulses, masur (44% of pulses area), gram (35%), and arhar (21%) are the major pulse crops (Table 7.2.10).

Uttar Pradesh: In the NFSM district, about 90% and 59% of area is under pulses in kharif and rabi seasons respectively during 2007-2009 (Table 7.1.11). Among pulses, urad (93% of kharif pulses area) is the major kharif pulse crop while and peas (100% of the rabi pulses area) is the major rabi pulse crop (Table 7.2.11). In the Non-NFSM district, about 27% and 58% of the area is under pulses in kharif and rabi seasons respectively during 2007-2009 (Table 7.1.12). Among pulses, urad (51%) and arhar (49%) are the major kharif pulse crops while masur (75%) and gram (25%) are the major rabi pulse crops (Table 7.2.12).

Punjab: In the NFSM district, about 7% and 5% of GCA is under pulses in kharif and rabi seasons respectively during 2009-10 (Table 7.1.13). Among pulses, moong (100% of kharif pulses area) in the kharif season and gram (100%) in the rabi season are the

major pulse crops in the district (Table 7.2.13). In the non-NFSM district, pulses are grown only during the zaid season in the district. There is no pulse farming during kharif and rabi seasons. Summer moong (100%) is the only zaid pulse crop in the district (Table 7.1.14 & Table 7.2.14).

Table 7.2.1: Percentages distribution of area under pulses - Rajasthan: NFSM district- Churu

Size Group	Moong	Moth	Gram	Chula	Total
Marginal					
Small	42	23	35		100
Medium	37	22	42		100
Large	28	31	40	1	100
Total	29	30	40	1	100

Table 7.2.2: Percentages distribution of area under pulses - Rajasthan: Non-NFSM district- Bhilwara

Size Group	Moong	Urad	Gram	Total
Marginal	15	70	15	100
Small	22	60	18	100
Medium	18	58	23	100
Large	12	58	30	100
Total	17	60	23	100

Table 7.2.3: Percentages distribution of area under pulses - Maharashtra: NFSM District- Amravati

Size Group	Kharif Season			Rabi Season	
	Moong	arhar	Total	Gram	Total
Marginal	92	8	100	100	100
Small	88	12	100	100	100
Medium	89	11	100	100	100
Large	91	9	100	100	100
Total	90	10	100	100	100

Table 7.2.4: Percentages distribution of area under pulses - Maharashtra: Non-NFSM District- Beed

Size Group	Kharif Season			Rabi Season	
	Moong	arhar	Total	Gram	Total
Marginal	30	70	100	100	100
Small	61	39	100	100	100
Medium	29	71	100	100	100
Large	52	48	100	100	100
Total	46	54	100	100	100

Table 7.2.5: Percentages distribution of area under pulses - Haryana: NFSM District- Bhiwani

Size Group	Kharif Season	Rabi Season	All Season
	Moong	Gram	Total
Marginal		100	100
Small		100	100
Medium	6	94	100
Large	3	97	100
Total	4	96	100

Table 7.2.6: Percentages distribution of area under pulses - Haryana: Non-NFSM District- Mahendragarh

Size Group	Kharif Season			Rabi Season	All Season
	Moong	Arhar	Total	Gram	Total
Marginal	22		22	78	100
Small	17	1	18	82	100
Medium	27		27	73	100
Large	21		21	79	100
Total	22	0.3	22	78	100

Table 7.2.7: Percentages distribution of area under pulses – AP: NFSM District- Prakasam

Size Group	Gram	arhar	Total
Marginal	100		100
Small	97	3	100
Medium	85	15	100
Large	100		100
Overall	95	5	100

Table 7.2.8: Percentages distribution of area under pulses – AP: Non-NFSM District- Ranga Reddy

Size Group	Gram	arhar	Total
Marginal	29	71	100
Small	15	85	100
Medium	13	87	100
Large	16	84	100
Overall	17	83	100

Table 7.2.9: Percentages distribution of area under pulses – Bihar: Area under Pulses – NFSM Patna

Size Group	masur	Gram	Arhar	Total
Marginal	53	43	4	100
Small	51	41	7	100
Medium	55	41	4	100
Large	52	44	4	100
Overall	53	42	5	100

Table 7.2.10: Percentages distribution of area under pulses – Bihar: Non-NFSM District Kishanganj

Size Group	masur	Gram	Arhar	Total
Marginal	50	33	17	100
Small	43	36	21	100
Medium	45	36	19	100
Large	43	33	23	100
Overall	44	35	21	100

Table 7.2.11: Percentages distribution of area under pulses – UP: NFSM District- Lalitpur

Size Group	Kharif			Rabi	
	Urad	Moong	Total	Pea	Total
Marginal	100		100	100	100
Small	99	1	100	100	100
Medium	87	13	100	100	100
Large					
Total	92	8	100	100	100

Table 7.2.12: Percentages distribution of area under pulses – UP: Non-NFSM District- Allahabad

	Kharif			Rabi		
Size Group	Urad	Arhar	Total	Masur	Gram	Total
Marginal				100		100
Small		100	100	69	31	100
Medium	51	49	100	64	36	100
Large	89	11	100	52	48	100
Total	51	49	100	75	25	100

Table 7.2.13: Percentages distribution of area under pulses – Punjab: NFSM District- Ferozepur

	Kharif		Rabi		Zaid		All Seasons			
Size Group	Kharif Moong	Total	Gram	Total	Summer Moong	Total	Kharif Moong	Gram	Summer Moong	Total
Marginal					100	100			100	100
Small					100	100			100	100
Medium	100	100	100	100	100	100	43	35	22	100
Large	100	100	100	100	100	100	48	29	23	100
Total	100	100	100	100	100	100	49	29	22	100

Table 7.2.14: Percentages distribution of area under pulses – Punjab: Non-NFSM District- Moga

	Zaid		All Seasons	
Size Group	Summer Moong	Total	Summer Moong	Total
Marginal				
Small				
Medium	100	100	100	100
Large	100	100	100	100
Total	100	100	100	100

7.3: Irrigation- Overall

Rajasthan: In the NFSM district, overall 90% of GCA irrigated and 10% un-irrigated (Table 7.3.1); 76% of the area is irrigated and 24% un-irrigated for medium farmers; and 100% of the area is un-irrigated for small farmers. The entire irrigation is by tubewell. In the non-NFSM district, about 40% of GCA is irrigated and 60% un-irrigated (Table 7.3.2); 51% of the area is irrigated and 49% un-irrigated for large farmers. Major irrigation source is tubewell.

Maharashtra: In the NFSM district 100% area in the sampled farms is un-irrigated (Table 7.3.3). In the non-NFSM district, 32% of GCA is irrigated and 68% un-irrigated (Table 7.3.4); 100% of the area is un-irrigated in the case of marginal farmers. Irrigation increases with land size. About 46% of the area is irrigated for large farmers.

Andhra Pradesh: In the NFSM district 89% of the area is un-irrigated and only 11% is irrigated (Table 7.3.5). Marginal farmers have the highest percentage of irrigated area – 17%. The entire irrigation is by canal. In the Non-NFSM district also, 87% of the area is un-irrigated (Table 7.3.6). The percentage of irrigated area increases with size of the landholding. All the area under marginal farmers is un-irrigated. The only source of irrigation in this district is canal.

Bihar: In the NFSM district, 88% of the area s irrigated and only 12% is un-irrigated (Table 7.3.7). The irrigation percentage increases with land size. The main source of irrigation is tubewell (78%). In the non-NFSM district, 86% of the area is irrigated (Table 7.3.8). The irrigation percentage increases with size of the landholding. The major sources of irrigation are tubewell (65%) and tank (13%). The tubewell-irrigated area percentage is lowest among marginal farmers and highest among large farmers.

Uttar Pradesh: In the NFSM district, almost the entire area is irrigated (99%) (Table 7.3.9). Canal (73%) and tubewell (26%) are the major sources of irrigation. It is notable that the tubewell-irrigated area percentage is highest in marginal farmers. In the Non-NFSM district, 62% of the area is irrigated and 38% is un-irrigated (Table 7.3.10). The percentage is very low in marginal size group (16%) while for all other size groups it is above 60%. The main source of irrigation is canal (57%). The irrigated area under canal is also very low for marginal farmers – only 13%, as compared to 73% for large farmers.

Table 7.3.1: Percentage distribution of irrigated area by source – Rajasthan: NFSM district- Churu

Size Group	Irrigated Area					Un-irrigated Area	NIA
	Canal	Tubewell	Tank	Others	Total		
Marginal							
Small						100	100
Medium		76			76	24	100
Large		93			93	7	100
Total		90			90	10	100

Table 7.3.2: Percentage distribution of irrigated area by source – Rajasthan: Non-NFSM district- Bhilwara

Size Group	Irrigated Area					Un-irrigated Area	NIA
	Canal	Tubewell	Tank	Others	Total		
Marginal		17		17	35	65	100
Small		25		7	33	84	100
Medium		30			30	87	100
Large		51			51	49	100
Total		36		4	40	60	100

Table 7.3.3: Percentage distribution of irrigated area by source – Maharashtra: NFSM District- Amravati

Size Group	Irrigated Area					Un-irrigated Area	NIA
	Canal	Tubewell	Tank	Others	Total		
Marginal						100	100
Small						100	100
Medium						100	100
Large						100	100
Total						100	100

Table 7.3.4: Percentage distribution of irrigated area by source – Maharashtra: Non-NFSM District- Beed

Size Group	Irrigated Area					Un-irrigated Area	NIA
	Canal	Tubewell	Tank	Others	Total		
Marginal						100	100
Small				19	19	81	100
Medium				23	23	77	100
Large		8		38	46	54	100
Total		4		28	32	68	100

Table 7.3.5: Percentage distribution of irrigated area by source – AP: NFSM District- Prakasam

Size Group	Irrigated Area					Un-irrigated Area	NIA
	Canal	Tubewell	Tank	Others	Total		
Marginal	17				17	83	100
Small	10				10	90	100
Medium	9				9	91	100
Large	11				11	89	100
Total	11				11	89	100

Table 7.3.6: Percentage distribution of irrigated area by source – AP: Non-NFSM District- Ranga Reddy

Size Group	Irrigated Area					Un-irrigated Area	NIA
	Canal	Tubewell	Tank	Others	Total		
Marginal						100	100
Small						100	100
Medium	21				21	79	100
Large	22				22	78	100
Total	13				13	87	100

Table 7.3.7: Percentage distribution of irrigated area by source – Bihar: NFSM District –Patna

Size Group	Irrigated Area					Un-irrigated Area	NIA
	Canal	Tubewell	Tank	Others	Total		
Marginal		70		10	80	20	100
Small		70		10	80	20	100
Medium		80		10	90	10	100
Large		80		10	90	10	100
Total		78		10	88	12	100

Table 7.3.8: Percentage distribution of irrigated area by source – Bihar: Non-NFSM District –Kishanganj

Size Group	Irrigated Area					Un-irrigated Area	NIA
	Canal	Tubewell	Tank	Others	Total		
Marginal		58	16	11	84	16	100
Small		62	15	8	85	15	100
Medium		62	13	9	84	16	100
Large		69	11	8	88	12	100
Total		65	13	8	86	14	100

Table 7.3.9: Percentage distribution of irrigated area by source – UP: NFSM District- Lalitpur

Size Group	Irrigated Area					Un-irrigated Area	NIA
	Canal	Tubewell	Tank	Others	Total		
Marginal	60	39			99	1	100
Small	69	30			99	1	100
Medium	77	22			99	1	100
Large							100
Total	73	26			99	1	100

Table 7.3.10: Percentage distribution of irrigated area by source – UP: Non-NFSM District- Allahabad

Size Group	Irrigated Area					Un-irrigated Area	NIA
	Canal	Tubewell	Tank	Others	Total		
Marginal	13	3			16	84	100
Small	59	4			63	37	100
Medium	56	4			61	39	100
Large	73	4			77	23	100
Total	57	4			62	38	100

Table 7.3.11: Percentage distribution of irrigated area by source – Punjab: NFSM District- Firozpur

Size Group	Irrigated Area					Un-irrigated Area	Total
	Canal	Tube well	Tank	Others	Total		
Marginal	65	100			100		100
Small	68	100			100		100
Medium	88	100			100		100
Large	89	100			100		100
Total	88	100			100		100

Table 7.3.12: Percentage distribution of irrigated area by source – Punjab: Non-NFSM District- Moga

Size Group	Irrigated Area					Un-irrigated Area	Total
	Canal	Tube well	Tank	Others	Total		
Marginal							
Small							
Medium	46	100			100		100
Large	48	100			100		100
Total	47	100			100		100

7.4: Cropwise Irrigation

Rajasthan: In NFSM district about 90% of area under pulses is irrigated (Table 7.3.1). All the pulse crops have irrigation of at least 85% of the cropped area except Chula (Table 7.4.1). The share of pulses in total irrigated area is only 33%, which is only 10% lower than cereals (Table 7.4.2). In the non-NFSM district, only 40% of area under pulses is irrigated in this district as opposed to 90% in NFSM district, showing the distinct lack of irrigation facilities for pulses in Bhilwara district. Gram has about 14% irrigated area while moong and urad have negligible irrigation coverage (Table 7.4.3). The share in total irrigated area highly skewed in favour of cereals (Table 7.4.4). About 91% of the total irrigated area is under cereals while pulses have a share of only 3%. Thus, pulses seem to be grown under un-irrigated conditions in this district.

Maharashtra: In the NFSM district, 100% area under pulses is un-irrigated (Table 7.3.3). In the non-NFSM district, only 19% of area in kharif and 14% area in rabi under pulses is irrigated in this district (Table 7.4.5). The share in total irrigated area is slightly skewed in favour sugarcane and kharif cereals with about 43% and 25% share in the GIA (Table 7.4.6). Kharif pulses have a share of about 11% while the rabi pulses (gram) have a share of only 8% of the GIA. Thus, pulses seem to be grown largely under un-irrigated conditions in this district also.

Haryana: In the NFSM district a large share of irrigated area is under wheat and cotton (57%) followed by other crops (32%) (Table 7.4.8). Pulses occupy a share of only 11% in the GIA. However, 100% of the area under pulses in the kharif season and 64% in the rabi season is irrigated (Table 7.4.7). In non-NFSM district, the share of pulses in GIA is slightly higher in this district at 22% (Table 7.4.10). However, wheat and other crops command a much larger share at 50% and 28% respectively. Entire area under gram, which is the only rabi pulse crop, is irrigated.

Andhra Pradesh: In the NFSM district, overall 11% of area is irrigated and 89% un-irrigated (Table 7.3.5). All irrigation is by canal. The share of pulses in total irrigated area is only 11%, while that of rice is 80% (Table 7.4.11). All the area under pulses is irrigated. All the pulse crops have irrigation of 100% of the cropped area. In the Non-NFSM district, entire 100% of the rabi area is irrigated. Major irrigation source is canal. The entire area under pulses is un-irrigated in this district unlike the NFSM district, showing the distinct lack of irrigation facilities for pulses in this district. The share in total irrigated area highly skewed in favour of rice (Table 7.4.12). About 80% of the total irrigated area is under rice while brinjals and chillies have a combined share of about 20%

Bihar: In the NFSM district, 88% area in the sampled farms is irrigated (Table 7.3.7). In the non-NFSM district, overall 86% of GCA irrigated and 14% un-irrigated (Table 7.3.8).

Uttar Pradesh: In the NFSM district, overall 99% of GCA irrigated and 1% un-irrigated (Table 7.3.9). About two-thirds of irrigation is by canal and one-third is by tubewell. The

share of pulses in total irrigated area is about 59%, which is almost 20% higher than wheat (Table 7.4.13). In the Non-NFSM district, 62% of GCA irrigated and 38% un-irrigated (Table 7.3.10). Marginal farmers have very little irrigated area – only about 16% of their GCA is irrigated. Major irrigation source is canal (92%) followed by tubewell (8%). In the case of gram, the 100% of area is irrigated but in the case of arhar and masur, the corresponding percentage is 38% and 18% respectively. Urad is totally grown in un-irrigated conditions. The share in total irrigated area highly skewed in favour of wheat. About 77% of the total irrigated area is under wheat while pulses have a share of only 23% (Table 7.4.14). Thus, pulses seem to be grown largely under un-irrigated conditions in this district, as opposed to the NFSM district.

Punjab: In the NFSM district, 100% of GCA is irrigated in the district (Table 7.3.11). About 53% of the irrigation is by canal and the remaining 47% is through tubewell. All the area under pulses is irrigated. All the pulse crops have irrigation of 100% of the cropped area (Table 7.4.15). In the non-NFSM district, entire 100% of the GCA is irrigated (Table 7.3.12). About 32% of the irrigation is by canal and the remaining 68% is through tubewell. The entire area under pulses is irrigated in this district (Table 7.4.17).

Table 7.4.1: Percentage of irrigated area to the total area under pulses- Rajasthan: NFSM district- Churu

Size Group	Moong	Moth	Chula	Gram	Total
Marginal					
Small					
Medium	63	79		81	74
Large	93	92	41	100	95
Total	86	89	41	96	91

Table 7.4.2: - Share of Different Crops in Total Irrigated Area – Rajasthan: NFSM district- Churu

Size Group	Wheat	Bajra	Gram	G'Nut	Moth	Moong	others	Total
Marginal								
Small								
Medium	27	26	17	2	9	12	7	100
Large	20	20	14	12	10	9	15	100
Total	21	20	14	11	10	9	14	100

Table 7.4.3: Percentage of irrigated area to the total area under pulses – Rajasthan: Non-NFSM district- Bhilwara

Size Group	Moong	Urad	Gram	Total
Marginal	39	13	100	30
Small			33	6
Medium				
Large				
Total	3	1	14	4

Table 7.4.4: Share of Different Crops in Total Irrigated Area – Rajasthan: Non-NFSM district- Bhilwara

Size Group	Maize	Wheat	Gram	Urad	Barley	Moong	others	Total
Marginal	42	38	8	5	1	3	3	100
Small	49	46	5	0	0	0	0	100
Medium	47	51	0	0	2	0	2	100
Large	45	44	0	0	0	0	11	100
Total	46	45	2	0	0	0	6	100

Table 7.4.5: Percentage of irrigated area to the total area under pulses – Maharashtra: Non-NFSM District- Beed

Size Group	Kharif Season			Rabi Season	
Farmers	Moong	Arhar	Total	Gram	Total
Marginal					
Small	9		5	7	7
Medium	18	11	13	26	26
Large	61	20	41	17	17
Total	29	10	19	14	14

Table 7.4.6: Share of Different Crops in Total Irrigated Area – Maharashtra: Non-NFSM District- Beed

Size Group	Kharif Season									Rabi Season				GIA
	Pulses			Other Crops					G. Total	Pulse	Other Crops		G. Total	
Farmers	Moong	Arhar	Ttl	S'bean	Jowr	Cott	Bajra	Total		Gram	Sug	Other		
Marginal											100		100	100
Small	11		11	30			5	35	46	11	43		54	100
Medium	6	9	14	11	1	14		27	41	13	26	20	59	100
Large	8	2	10	8		15		23	33	7	46	14	67	100
Total	8	3	11	10	0	13	0	24	35	8	43	14	65	100

Table 7.4.7: Percentage of irrigated area to the total area under pulses – Haryana: NFSM District- Bhiwani

Size Group	Gram	Moong	Total
Marginal	63		63
Small	60		60
Medium	59	100	62
Large	67	100	68
Total	64	100	66

Table 7.4.8: Share of Different Crops in Total Irrigated Area – Haryana: NFSM District- Bhiwani

Size Group	Pulses	Wheat & Cotton	All Other Crops	Total
Marginal	6	40	54	100
Small	8	54	38	100
Medium	9	52	39	100
Large	12	61	26	100
Total	11	57	32	100

Table 7.4.9: Percentage of irrigated area to the total area under pulses – Haryana: Non-NFSM District- Mahendragarh

Size Group	Gram	Moong	Arhar	Total
Marginal	39	67		45
Small	46	55	100	48
Medium	46	38		44
Large	41	48		43
Total	44	47	100	45

Table 7.4.10: Share of Different Crops in Total Irrigated Area – Haryana: Non-NFSM District- Mahendragarh

Size Group	Pulses	Wheat	All Other Crops	Total
Marginal	31	56	13	100
Small	20	45	35	100
Medium	26	47	28	100
Large	19	54	27	100
Total	22	50	28	100

Table 7.4.11: Share of Different Crops in Total Irrigated Area – AP: NFSM District- Prakasam

Size Group	Pulses	Rice	other (Vegetables)	Total
Marginal	37	63		100
Small		100		100
Medium	16	48	36	100
Large		100		100
Total	11	80	9	100

Table 7.4.12: Share of Different Crops in Total Irrigated Area – AP: Non-NFSM District- Ranga Reddy

Size Group	Rice	Other (Vegetables)	Others	Total
Marginal	100			100
Small	100			100
Medium	88	12		100
Large	71	6	23	100
Total	79	9	12	100

Table 7.4.13: Share of Different Crops in Total Irrigated Area – UP: NFSM District- Lalitpur

Size Group	Pulses	Wheat	Total
Marginal	68	32	100
Small	48	52	100
Medium	65	35	100
Large			
Total	59	41	100

Table 7.4.14: Share of Different Crops in Total Irrigated Area – UP: Non-NFSM District- Allahabad

Size Group	Pulses	Wheat	Total
Marginal	36	64	100
Small	27	73	100
Medium	24	76	100
Large	16	84	100
Total	23	77	100

Table 7.4.15: Percentage of irrigated area to the total area under pulses – Punjab: NFSM District- Ferozepur

Size Group	Summer Moong	Moong	Gram	Total
Marginal	100			100
Small	100			100
Medium	100	100	100	100
Large	100	100	100	100
Total	100	100	100	100

Table 7.4.16: Share of Different Crops in Total Irrigated Area – Punjab: NFSM District- Ferozepur

Size Group	Pulses	Rice & Wheat	All other crops	Total
Marginal	22	69	8	100
Small	10	80	10	100
Medium	11	84	5	100
Large	12	86	3	100
Total	12	85	4	100

Table 7.4.17: Percentage of irrigated area to the total area under pulses – Punjab: Non-NFSM District- Moga

Size Group	Summer Moong	Total
Marginal		
Small		
Medium	100	100
Large	100	100
Total	100	100

Table 7.4.18: Share of Different Crops in Total Irrigated Area – Punjab: Non-NFSM District- Moga

Size Group	Pulses	Rice & Wheat	All other crops	Total
Marginal				
Small				
Medium	20	77	3	100
Large	10	87	4	100
Total	11	86	3	100

Chapter 8
Economics of Pulses Cultivation

The profitability of pulses farming has been assessed in this Chapter. First, the economics of pulses cultivation vis-à-vis other crops has been analyzed in the NFSM and the Non-NFSM districts separately. This should help in understanding the relative profitability of the pulses sector as a whole compared to other major crops. This is followed by a comparative assessment of profitability of individual major pulses in the NFSM and non-NFSM districts. Finally, the increase (or decrease) in the profitability of pulses farming after the initiation of the NFSM scheme is assessed in the NFSM and the Non-NFSM district. The Non-NFSM district acts as the control group here and if the NFSM scheme is effective, then the profitability of pulses farming is expected to increase at a faster rate in the NFSM district than in the Non-NFSM district. The net returns per hectare of a crop, defined as gross returns per hectare minus the total paid out costs per sown are under the crop, is used as the indicator of profitability. However, this indicator does not inform us about whether the higher returns arise from crop structural components such as higher area and yield or from price-related factors (higher price). The following example makes this point clearer. The example makes the simplifying assumption of constant costs and the differences between the two crops arise only because of area, yield, and price differences.

Case 1

	Area	Yield	Production	PRICE	NET RETURNS	NET RETURNS PER HA	NET RETURNS PER QTL
Crop1	5	10	50	5	250	50	5
Crop1	5	1	5	50	250	50	50

Case 2

	Area	Yield	Production	PRICE	NET RETURNS	NET RETURNS PER HA	NET RETURNS PER QTL
Crop1	8	10	80	30	2400	300	30
Crop1	5	10	50	40	2000	400	40

Case 3

	Area	Yield	Production	PRICE	NET RETURNS	NET RETURNS PER HA	NET RETURNS PER QTL
Crop1	8	54	432	40	17280	2160	40
Crop1	5	32	160	40	6400	1280	40

As can be seen from the above tables, In the case 1, although the net returns per hectare are the same for the two crops, there is a large difference in the net returns per quintal,

which arises mainly because of the differences in the price. In the other two cases, although the net returns per hectare for the two crops are different (higher for crop1 in case 2 and lower for crop1 in case 3), the differences in net returns per quintal mainly reflect the differences in price received. Therefore, by looking at the net returns per quintal, in combination with the net returns per hectare, one can discern the role of price vis-à-vis the crop structural components such as area and yield. Therefore, we have used the net returns per hectare and net returns per quintal in our analysis. First, an overall summary of the Chapter is provided followed by a detailed analysis of the profitability issues in each state.

Summary of the Chapter

The net returns per hectare have been generally higher for pulses than for other crops in the sample districts of most states, except Bihar. The net returns per quintal (price realized) are higher for pulses in all the districts without exception. Comparing the profitability of pulses in the NFSM and the Non-NFSM districts, the net returns per quintal are lower in the NFSM district for most of the crops and states although the net returns per hectare are higher. This shows that the contribution of area and yield is better in the NFSM district as compared to the non-NFSM district in most of the states, although this cannot be ascribed to the NFSM programme alone because of a very short period of our study. At the individual crop level, the per hectare returns of moong are generally lower in the NFSM district than the non-NFSM district whereas In the case of gram the returns are higher in the NFSM district. No clear pattern emerges for other crops. For pulses as a whole (total pulses) the net returns per hectare are higher in the NFSM districts of all the states as compared to the Non-NFSM districts.

Maharashtra

1. Profitability of Pulses vis-à-vis Other Major Crops (Tables 8.1 & 8.2)

NFSM District (Amrawati): The profitability of pulses crops, in terms of net returns per hectare, is higher compared to other major crops in the NFSM district for all the size groups of farmers (Table 8.1). The percentage difference varies from 4% to 16% for medium and marginal size groups respectively. Overall, net returns per hectare for total pulses is rupees 12611 – 7% higher compared to other crops (11737 rupees) in NFSM district. The net returns per quintal are also higher for total pulses compared to other major crops in all the size groups (Table 8.1). The returns are highest for large farmers

(1572 rupees) and lowest for the marginal farmer (1465 rupees) for total pulses. For the total of all other major crops, the returns are highest for the medium size groups, 1003 rupees and lowest for the large size groups, 954 rupees. The difference in net returns per quintal between pulses and other crops is maximum for the large farmer – 65% and overall it is 54%.

NON-NFSM District (Beed): It is interesting to analyze the profitability of total pulses vis-a-vis other crops in Beed district. Overall, the net returns per hectare from pulses crops (11689 rupees) are much lower than those from other crops (19787 rupees) in all the size groups (Table 8.2). The difference varies from 19% in marginal farmers group to 52% in large size groups. The situation is reverse in the case of net returns per quintal (Table 8.2). These are higher for pulses than other crops for all the size groups in the district. The much higher net returns per quintal of pulses vis-à-vis other crops perhaps indicate that the prices of pulses are higher than that of other crops.

Table 8.1: Profitability of Pulses vis-à-vis Other Major Crops – Maharashtra: NFSM District (Amrawati)

in Rs.

Size Group	Total pulses		Total major crops		% Difference	
	Net returns per hectare	Net returns per qtl	Net returns per hectare	Net returns per qtl	Net returns per hectare	Net returns per qtl
Marginal	12005	1465	10321	959	16	53
Small	12509	1528	11440	1000	9	53
Medium	12586	1518	12055	1003	4	51
Large	13069	1572	12222	954	7	65
Total	12611	1528	11737	995	7	54
% differences are calculated as: ((total pulses-total major crops)/total major crops))*100						

Table 8.2: Profitability of Pulses vis-à-vis Other Major Crops - Maharashtra: NON-NFSM District (Beed)

in Rs.

Size Group	Total pulses		Total major crops		% Difference	
	Net returns per hectare	Net returns per qtl	Net returns per hectare	Net returns per qtl	Net returns per hectare	Net returns per qtl
Marginal	11887	1389	14716	170	-19	717
Small	11980	1450	15772	151	-24	858
Medium	12433	1392	16033	146	-22	852
Large	11285	1438	23339	58	-52	2382
Total	11689	1403	19787	76	-41	1751

2. Profitability of Pulses in NFSM and non-NFSM districts (Table 8.3)

Among the pulses crops moong, arhar and gram crops are common in both the NFSM and non-NFSM districts. Overall, net returns per hectare for arhar (18679 rupees) in NFSM district are higher than those in non-NFSM districts (15257 rupees) by 18%. For gram (14059 rupees) the returns are higher by 28% as compared to non-NFSM district (10177 rupees) (Table 8.3). In the case of total pulses, it is 12611 rupees (7% higher in NFSM district). For the moong crop, it is almost same in both the districts (-0.3 %).

The net returns per quintal are also higher in the NFSM district – the difference varying from 1% to 13% to 24% for gram, arhar, and moong respectively (Table 8.3). Overall, it is 1528 rupees in NFSM district compared to 1403 rupees in non-NFSM district (8% higher) for total pulses. Arhar has the highest net returns per hectare (18680 rupees and 15257 rupees) in both NFSM and non-NFSM districts, respectively, compared to all other pulse crops.

Table 8.3: Profitability of Pulses in NFSM and non-NFSM districts of Maharashtra

in Rs.

Crops	NFSM Amravati District		Non-NFSM Beed District		% Difference between Dist.	
	Net returns per hectare	Net returns per qtl	Net returns per hectare	Net returns per qtl	Net returns per hectare	Net returns per qtl
Moong	10407	1922	10434	1462	-0.3	24
Arhar	18680	1747	15257	1514	18	13
Gram	14059	1292	10177	1281	28	1
Total pulses	12611	1528	11689	1403	7	8

3. Profitability of Pulses in NFSM and non-NFSM districts – By Size Groups (Table 8.4)

Moong: Between NFSM and non-NFSM districts the percentage difference in net returns per hectare from moong cultivation and net returns per quintal are -0.3 % and 24%, respectively (Table 8.4). Net returns per hectare for the moong crop in NFSM district are little less than that of in non-NFSM district for all the size groups except in medium size groups. The percentage difference between difference size groups in NFSM and non-NFSM districts in varying from -5% to +4 % for large and medium size groups, respectively.

The net returns per quintal for the moong crop in NFSM district are comparatively much higher than that of in non-NFSM district for all the size groups, showing that the prices in the NFSM district are much higher. Across the size groups also, net returns per quintal in NFSM district are also following the same pattern. These are varying from 17% for small size group to 28 % in medium size group.

Arhar: For the arhar crop, there are significantly higher net returns per hectare and per quintal in all the size groups for NFSM district (Table 8.4). The percentage difference in net returns per hectare between corresponding size groups between the NFSM and non-NFSM districts are in the range of 15% to 21%. Similarly, for the net returns per quintal, this percentage difference is in the range of 6% to 16%. Across the size groups, the net returns per hectare in NFSM and non-NFSM district are 18680 rupees and 15257 rupees

respectively - 18% higher in NFSM district and similarly net returns per quintal in NFSM and non-NFSM district are 1747 rupees and 1514 rupees respectively - 13% higher in NFSM district. The highest net returns per quintal under both, NFSM and non-NFSM districts are shown by the large size groups (1812 rupees and 1595 rupees respectively), showing higher prices received by this size group.

Gram: For the gram crop, there are higher net returns per hectare in all the size groups for the NFSM district, but net returns per quintal are almost the same in both the districts (Table 8.4). The percentage differences in net returns per hectare for all the size groups are significantly higher in favour of NFSM. These are in range of 22% to 33% for small and large size groups, respectively.

The percentage differences in net returns per quintal among all the size groups are not much significantly different in the two districts. Overall, net returns per hectare in NFSM and non-NFSM district are 14059 rupees and 10177 rupees respectively - 28% higher in NFSM district and similarly net returns per quintal in NFSM and non-NFSM district are 1292 rupees and 1281 rupees respectively - 0.83 % higher in NFSM district. It is notable that the highest net returns per quintal in NFSM and non-NFSM districts are for large farmers in both districts. Similarly lowest returns are for marginal size groups in both the districts.

Total Pulses: Taking all the pulses together, there are higher net returns per hectare and higher net returns per quintal in NFSM district compared to non-NFSM district in all the size groups (Table 8.4). The percentage difference in net returns per hectare across different size groups are higher in NFSM district compared to corresponding size groups in non-NFSM district and overall, the percentage difference is 7%. The net returns per quintal in NFSM are moderately higher in all the size groups compared to non-NFSM district. The percentage difference is higher in NFSM district in the range of 5% to 9% for small and large size groups respectively. Overall, it is 8% higher in the NFSM district.

Table 8.4: Profitability of Pulses in NFSM and non-NFSM districts of Maharashtra–By Size Groups

in Rs.

Crops and Size Groups	NFSM Amravati District		Non-NFSM Beed District		% Difference between Districts	
	Net returns per hectare	Net returns per qtl	Net returns per hectare	Net returns per qtl	Net returns per hectare	Net returns per qtl
Moong						
Marginal	9873	1872	10072	1502	-2	20
Small	10870	1961	11128	1628	-2	17
Medium	10525	1923	10132	1392	4	28
Large	10322	1929	10800	1465	-5	24
Total	10407	1922	10434	1462	-0.3	24
Arhar						
Marginal	18407	1686	15705	1589	15	6
Small	19487	1803	15907	1523	18	16
Medium	17682	1703	14500	1446	18	15
Large	19933	1812	15749	1595	21	12
Total	18680	1747	15257	1514	18	13
Gram						
Marginal	13550	1127	9878	1227	27	-9
Small	13162	1256	10242	1247	22	1
Medium	13896	1267	10546	1272	24	-0.05
Large	15118	1351	10153	1317	33	3
Total	14059	1292	10177	1281	28	1
total pulses						
Marginal	12005	1465	11887	1389	1	5
Small	12509	1528	11980	1450	4	5
Medium	12586	1518	12433	1392	1	8
Large	13069	1572	11285	1438	14	9
Total	12611	1528	11689	1403	7	8

4. Profitability of Pulse Farming – Before and After NFSM (Table 8.5)

Implementation of the NFSM programme does appear to have a positive effect on the returns from pulses farming. The net returns per hectare and per quintal have been lower in the NFSM district, as compared to non-NFSM district, in 2006-07, before the implementation of the NFSM. This feature is notable in all the size groups except the large farmers. However, in the next two years and particularly in 2008-09, the net returns per hectare and per quintal in the NFSM district increased and were much higher than in the non-NFSM districts. Overall, for all the size groups, the differences for net returns per hectare and per quintal were -10% and 2% respectively in 2006-07. By 2008-09, these percentages have increased to 19% and 13% respectively (Table 8.5).

This is also clear from looking at the percentage increase in the net returns per hectare and net returns per quintal over time in each district. The percentage increase in the NFSM district in 2008-09 is substantially higher than in the non-NFSM districts for corresponding size groups. Overall, the percentage increases in 2008-09 (over 2007-08) in net returns per hectare and net returns per quintal are 44% and 26% respectively in the NFSM district (Table 8.5). The corresponding percentages in the non-NFSM district are

20% and 18% respectively – much lower compared to the NFSM district. This shows that there is some improvement in profitability of pulse farming after the implementation of NFSM, in the NFSM district.

Table 8.5: Profitability of Pulse Farming – Before and After NFSM- Maharashtra

in Rs.

Size Group	% Difference between Districts		% Difference -Years wise			
			NFSM Amravati District		Non-NFSM Beed District	
	Net returns per hectare	Net returns per qtl	Net returns per hectare	Net returns per qtl	Net returns per hectare	Net returns per qtl
Marginal						
2006-07	-29	-8				
2007-08	12	9	69	33	15	12
2008-09	7	10	22	16	28	15
Average	1	5				
Small						
2006-07	-18	-4				
2007-08	0	3	40	20	19	11
2008-09	20	13	33	20	7	8
Average	4	5				
Medium						
2006-07	-22	-3				
2007-08	-7	11	25	12	10	-3
2008-09	18	14	55	30	19	25
Average	1	8				
Large						
2006-07	7	2				
2007-08	7	8	23	11	24	4
2008-09	21	14	50	27	27	20
Average	14	9				
Total						
2006-07	-10	2				
2007-08	3	7	33	16	18	10
2008-09	19	13	44	26	20	18
Average	7	8				

Rajasthan

1. Profitability of Pulses vis-à-vis Other Major Crops (Tables 8.6 & 8.7)

NFSM District (Churu): There are significantly higher net returns per hectare in all the size groups from pulses compared to other major crops in NFSM district (Table 8.6). The percentage difference in net returns per hectare in NFSM district from pulses crops with respect other crops is in the range of 25% to 144% for large size groups and small size groups, respectively. Overall, for all size groups, net returns per hectare from pulses crop are 22091 rupees and those from other major crops are 16944 rupees - a difference of 30%.

The net returns per quintal are significantly higher for pulses compared to other crops in all the size groups (Table 8.6). It is highest in small size groups (2672 rupees) and lowest

for the large size groups (2377 rupees) for total pulses. Marginal size group is not included in the study for NFSM district. For other crops, net returns per quintal are highest for the large size groups (1099 rupees) and lowest for the small size groups (706 rupees). Overall, for all size groups, net returns per quintal from pulses are 2399 rupees - about 124% higher compared to other major crops (1072 rupees).

NON-NFSM District (Bhilwara): Similar to the NFSM district, there are higher net returns in the non-NFSM district from pulses crops as compared to other crops (Table 8.7). The percentage difference in net returns per hectare in non-NFSM district from pulses crops with respect to other crops is in the range of 3% to 27% for small size groups and large size groups, respectively. Overall, for all size groups, the net returns per hectare from pulses crop are 31510 rupees and those from other major crops are 27432 rupees - about 15% higher for pulses.

As regards net returns per quintal also, the non-NFSM district Bhilwara is following a pattern similar to that of NFSM district (Table 8.7). The net returns per quintal are significantly higher for the total pulses compared to other crops in all the size groups. Overall, for all size groups, net returns per quintal from pulses crop are 2692 rupees - almost 156% higher compared to other major crops (1050 rupees).

Table 8.6: Profitability of Pulses vis-à-vis Other Major Crops – Rajasthan: NFSM District (Churu)

in Rs.

Size Group	Total pulses		Total major crops		% Difference	
	Net returns per hectare	Net returns per qtl	Net returns per hectare	Net returns per qtl	Net returns per hectare	Net returns per qtl
Marginal						
Small	22313	2672	9160	706	144	278
Medium	25759	2493	14147	823	82	203
Large	21656	2377	17266	1099	25	116
Total	22091	2399	16944	1072	30	124

Table 8.7: Profitability of Pulses vis-à-vis Other Major Crops – Rajasthan: NON-NFSM District (Bhilwara)

in Rs.

Size Group	Total pulses		Total major crops		% Difference	
	Net returns per hectare	Net returns per qtl	Net returns per hectare	Net returns per qtl	Net returns per hectare	Net returns per qtl
Marginal	36878	2966	31486	978	17	203
Small	33263	2760	32150	1091	3	153
Medium	28287	2570	27265	1041	4	147
Large	30824	2628	24332	1042	27	152
Total	31510	2692	27432	1050	15	156

2. Profitability of Pulses in NFSM and non-NFSM districts (Table 8.8)

Moong and gram are the common pulse crops in both the NFSM and non-NFSM districts. In addition to these pulses moth crop is grown is the NFSM district Churu and urad is grown in the non-NFSM district Bhilwara. For both the common pulses, the net returns per hectare for all size groups are lower in the NFSM district (Table 8.8). The net returns per hectare in NFSM district for moong (29135 rupees) and gram (14614 rupees) are lower by 29% and 26% respectively as compared to non-NFSM districts. For total pulses, the net returns per hectare are 22091 rupees in NFSM district as compared to 31510 rupees in non-NFSM district - 43% lower.

The net returns per quintal vary by the crop and there is no definite pattern in crop wise profitability between NFSM and non-NFSM districts (Table 8.8). Overall, the net returns per quintal are slightly lower in the NFSM district – about 2399 rupees, which is about 12% lower than the non-NFSM district (2692 rupees). But for moong and gram crops, the net returns per quintal are a little higher in the NFSM district. Moong provides the maximum net returns per hectare and maximum net returns per quintal among the all pulse crops in both the districts.

Table 8.8: Profitability of Pulses in NFSM and non-NFSM districts of Rajasthan

in Rs.

Crops	Churu district: NFSM		Bhilwara district: Non-NFSM		% Difference between Dist.	
	Net returns per hectare	Net returns per qtl	Net returns per hectare	Net returns per qtl	Net returns per hectare	Net returns per qtl
Moong	29135	3334	37495	3250	-29	3
Urad			35376	3167		
Moth	24973	3244				
Gram	14614	1359	18372	1347	-26	1
Total pulses	22091	2399	31510	2692	-43	-12

3. Profitability of Pulses in NFSM and non-NFSM districts – By Size Groups (Table 8.9)

Moong: Net returns per hectare for the moong crop in NFSM district are comparatively less than that of in non-NFSM district for all the size groups except in medium size groups (Table 8.9). The marginal size group is not included for NFSM district. In the NFSM district net returns per hectare are lowest in large size groups, 27543 rupees and highest in the medium size groups, 37767 rupees. In the case of the non-NFSM district, the lowest net returns are for the large size groups (31718 rupees) and the highest net returns per hectare are for marginal size groups (44550 rupees). Overall, in NFSM district, the net returns per hectare are 29135 rupees, which are 29% lower than that of in non-NFSM district (37495 rupees).

Net returns per quintal for the moong crop in NFSM district are little higher than those in non-NFSM districts for all the size groups (Table 8.9). These are varying from 2% for small size group to 9% in medium size group. It is notable that the net returns per quintal in NFSM and non-NFSM districts are lowest for large size groups (3277 rupees and 3008 rupees respectively). Overall, the net returns per quintal between NFSM (3334 rupees) are 3% higher than the non-NFSM (3250 rupees) district.

Gram: The gram crop is not a profitable crop for the farmers in any of the size groups in NFSM district. Especially for small size groups in NFSM districts, the net returns per hectare and net returns per quintal are very low (Table 8.9). There are lower net returns per hectare in all the size groups in the NFSM districts for the gram crop, but net returns per quintal vary according size groups in both the districts. Overall, net returns per hectare in NFSM and non-NFSM district are 14614 rupees and 18372 rupees, respectively - 26% higher in non-NFSM district. The small size groups in NFSM district have lowest net returns per hectare and lowest net returns per quintal but the same size group shows highest returns in the non-NFSM district.

Turning to the net returns per quintal, only the large farmers group has the positive percentage difference (6%) in NFSM district when compared to the same size group in the non-NFSM district. All other size groups show negative percentage difference (Table 8.9). The negative percentage differences in net returns per quintal are very large for small size group showing much lower net returns in the NFSM district. Overall, net returns per quintal in NFSM and non-NFSM district are 1359 rupees and 1347 rupees respectively - 0.83 % higher in NFSM district.

Total Pulses: There are lower net returns per hectare and lower net returns per quintal in the NFSM district compared to non-NFSM district in all the size groups (Table 8.9). The percentage differences in net returns per hectare among different size groups are significantly lower- 49%, 10% and 42% lower for small, medium, and large size groups in NFSM district, respectively. Overall, for all farmers group net returns per hectare in NFSM and non-NFSM district are, respectively, 22091 rupees and 31510 rupees – lower in the NFSM district by 43%.

The net returns per quintal in the NFSM district are moderately low in all the size groups compared to non-NFSM district (Table 8.9). The percentage difference is higher in non-NFSM district over NFSM district in the range 3% to 11% (for medium and large size

groups respectively). Overall, for all farmers, net returns per quintal in NFSM and non-NFSM districts are 2399 rupees and 2692 rupees respectively - which is 12% lower in the NFSM district.

Table 8.9: Profitability of Pulses in NFSM and non-NFSM districts of Rajasthan- By Size Group

in Rs.

Crops and Size Groups	NFSM Churu district		Non-NFSM Bhilwara district		% Difference between Districts	
	Net returns per hectare	Net returns per qtl	Net returns per hectare	Net returns per qtl	Net returns per hectare	Net returns per qtl
Moong						
Marginal			44550	3403		
Small	32984	3362	39445	3308	-20	2
Medium	37767	3508	34965	3202	7	9
Large	27543	3277	31718	3008	-15	8
Total	29135	3334	37495	3250	-29	3
Moth						
Marginal						
Small	34361	3468				
Medium	27121	3306				
Large	24595	3229				
Total	24973	3244				
Gram						
Marginal			20384	1316		
Small	1698	305	25053	1484	-1375	-387
Medium	13761	1203	16105	1293	-17	-8
Large	15007	1391	16776	1307	-12	6
Total	14614	1359	18372	1347	-26	1
Urad						
Marginal			39203	3352		
Small			33456	3011		
Medium			32475	3008		
Large			38697	3357		
Total			35376	3167		
Total pulses						
Marginal			36878	2966		
Small	22313	2672	33263	2760	-49	-3
Medium	25759	2493	28287	2570	-10	-3
Large	21656	2377	30824	2628	-42	-11
Total	22091	2399	31510	2692	-43	-12

4. Profitability of Pulse Farming – Before and After NFSM (Table 8.10)

In Rajasthan, the NFSM does not appear to have a similar positive effect as in Maharashtra. In 2006-07, the net returns per hectare and per quintal were substantially lower in the NFSM district (-56% and -37% respectively). Although there was a slight improvement in 2007-08 (-5% and 3%), there is again a substantial deterioration in 2008-09. In 2008-09, the corresponding percentages fell to -81% and -16%, showing a much lower level of profitability of pulse farming in the NFSM district (Table 8.10). The net returns per hectare and net returns per quintal in the NFSM district in 2008-09 are rupees 25144 and rupees 3169 respectively. The corresponding figures for the non-

NFSM districts are 45593 and 3667 respectively – showing a distinct deceleration in profitability of pulse farming in NFSM district.

It is also clear from the percentage increase (or decrease) in each district over the last two years. In 2007-08, the percentage increase in NFSM district over the previous year was significantly higher than the non-NFSM districts (Table 8.10). The percentage increase in net returns per hectare and per quintal were 157% and 118% in 2007-08 for NFSM district whereas for the non-NFSM districts the corresponding figures were 73% and 54% respectively. However, by 2008-09, the figures for NFSM district were -15% and 15%, as compared to 47% and 37% for the non-NFSM districts. This shows a distinct slowdown in profitability of pulse farming in the NFSM district.

Table 8.10: Profitability of Pulse Farming – Before and After NFSM- Rajasthan

in Rs.

Size Group	% Difference between Districts		% Difference – Years wise			
			NFSM Churu district		Non-NFSM Bhilwara district	
	Net returns per hectare	Net returns per qtl	Net returns per hectare	Net returns per qtl	Net returns per hectare	Net returns per qtl
Marginal						
2006-07						
2007-08					125	78
2008-09					43	25
Average						
Small						
2006-07	-24	-22				
2007-08	0	12	192	177	136	99
2008-09	-151	-12	-43	3	42	32
Average	-49	-3				
Medium						
2006-07	-2	-7				
2007-08	-7	-6	68	58	76	55
2008-09	-16	0	36	52	47	44
Average	-10	-3				
Large						
2006-07	-109	-68				
2007-08	8	14	173	128	19	16
2008-09	-75	-10	-20	11	53	43
Average	-42	-11				
Total						
2006-07	-55	-37				
2007-08	-5	3	157	118	73	54
2008-09	-81	-16	-15	15	47	37
Average	-43	-12				

Andhra Pradesh

1. Profitability of Pulses vis-à-vis Other Major Crops (Tables 8.11 & 8.12)

NFSM District (Prakasam): There are significantly higher net returns per hectare in all the size groups, except medium size group, from pulses compared to all other major crops in the NFSM district (Table 8.11). Out of all the size groups, large farmers get the

highest net returns per hectare (31270 rupees) for pulses. The marginal farmers get the lowest net returns per hectare from pulses (18625 rupees) and also other crops (12524 rupees). The percentage difference between returns from pulses and other crops is positive in all the size groups except the medium size group. Overall, for all the size groups, net returns per hectare from pulses crop are 23907 rupees, 17% higher than those from total of all other major crops, 20358 rupees.

The net returns per quintal are significantly higher for the total pulses compared to other crops in all the size groups (Table 8.11). It is highest in large farmers group, 1385 rupees and lowest for the marginal farmers group, 889 rupees. Overall, for all the size groups, net returns per quintal from pulses crop are 1113 rupees - almost 60% higher than those from other major crops, 695 rupees.

NON-NFSM District (Ranga Reddy): Similar to the NFSM district, the net returns from pulses crops are significantly higher in the pulses as compared other crops in the non-NFSM district (Table 8.12). In both the crop groups, the large farmers are getting the highest net returns per hectare, 21857 rupees, and 12104 rupees respectively. The lowest returns per hectare are in the small size group (17283 rupees) and marginal size groups (7917 rupees) respectively. The percentage difference in net returns per hectare from pulses crops compared to other crops is very high and varies in the range of 55% to 120% across size groups. Overall, for all size groups, net returns per hectare from pulses are 18959 rupees and from other crops are 10385 rupees - about 83% higher for pulses.

The net returns per quintal are also significantly higher for the total pulses compared to other crops in all of the size groups (Table 8.12). It is lowest for marginal size groups, 1701 rupees and highest for the large size groups, 1985 rupees. For other crops, net returns per quintal are very low compared to that of total pulses. They are highest for the large size groups, 230 rupees and lowest for the marginal size groups, 165 rupees. Overall, for all the size groups, net returns per quintal from pulses crop are 1856 rupees - almost **nine times** higher than from other major crops (202 rupees).

Table 8.11: Profitability of Pulses vis-à-vis Other Major Crops – AP: NFSM District (Prakasam)

in Rs.

Size Group	Total pulses		Total major crops		% Difference	
	Net returns per hectare	Net returns per qtl	Net returns per hectare	Net returns per qtl	Net returns per hectare	Net returns per qtl
Marginal	18625	889	12524	266	49	234
Small	21012	986	17758	605	18	63
Medium	21187	1037	25763	797	-18	30
Large	31270	1385	19587	626	60	121
Total	23907	1113	20358	695	17	60

Table 8.12: Profitability of Pulses vis-à-vis Other Major Crops – AP: NON-NFSM District (Ranga Reddy)

in Rs.

Size Group	Total pulses		Total major crops		% Difference	
	Net returns per hectare	Net returns per qtl	Net returns per hectare	Net returns per qtl	Net returns per hectare	Net returns per qtl
Marginal	17449	1701	7917	165	120	931
Small	17283	1799	8130	168	113	973
Medium	18275	1836	11763	218	55	743
Large	21857	1985	12104	230	81	762
Total	18959	1856	10385	202	83	817

2. Profitability of Pulses in NFSM and non-NFSM districts (Table 8.13)

Gram and arhar are the two main pulses crops grown in Amrawati and Ranga Reddy districts. Gram has higher net returns per hectare for all size groups in NFSM district while returns from arhar are lower (Table 8.13). For gram, net returns per hectare are 24402 rupees in NFSM districts, which is 57% higher than non-NFSM districts (10536 rupees). For arhar, the net returns per hectare are 15021 rupees in NFSM districts, which is 84% lower than that in non-NFSM districts (27588 rupees). Overall, for total pulses it is 23907 rupees in NFSM districts, 21% higher returns compared to 18959 rupees in non-NFSM districts.

The net returns per quintal are higher for gram by 14% in NFSM district (1112 rupees) compared to those in non-NFSM district (956 rupees). Returns from arhar are significantly lower in the NFSM district by 72% in NFSM district (1190 rupees) compared to those in non-NFSM district (2049 rupees). Overall, it is 1113 rupees in NFSM district compared to 1856 rupees in non-NFSM district (67% lower in NFSM district) for total pulses (Table 8.13).

Table 8.13: Profitability of Pulses in NFSM and non-NFSM districts of AP.

in Rs.

Crops	Prakasam district: NFSM		Ranga Reddy district: Non-NFSM		% Difference between Dist.	
	Net returns per hectare	Net returns per qtl	Net returns per hectare	Net returns per qtl	Net returns per hectare	Net returns per qtl
Gram	24402	1112	10536	956	57	14
Arhar	15021	1190	27588	2049	-84	-72
Total pulses	23907	1113	18959	1856	21	-67

3. Profitability of Pulses in NFSM and non-NFSM districts – By Size Groups (Table 8.14)

Gram: Net returns per hectare for the gram crop are significantly higher in NFSM district those in the non-NFSM district for all the size groups (Table 8.14). In the NFSM district net returns per hectare are lowest in marginal farmers group (18625 rupees) and highest in the large farmers group (31270 rupees). As opposed to this, the net returns per

hectare for gram in non-NFSM district are lowest in large farmers group (8787 rupees) and highest in the marginal farmers group (12654 rupees). The percentage difference in net returns per hectare between NFSM and non-NFSM districts for marginal and large size groups is 32% and 72%, respectively. Overall, in NFSM district, the net returns per hectare are 24402 rupees, which are 57% higher than those in the non-NFSM districts (10536 rupees).

Net returns per quintal for the gram crop in NFSM district are little higher than that of in non-NFSM district for all the size groups except marginal size group (Table 8.14). In the NFSM district net returns per quintal are lowest in marginal farmers group, 889 rupees and highest in the large farmers group, 1385 rupees. In the non-NFSM district, the net returns per hectare are lowest in the large farmer group, 834 rupees and highest in the marginal farmers group, 1030 rupees. Overall, for the total farmer size group in NFSM district net returns per quintal are 1112 rupees - 14% higher than the non-NFSM district (956 rupees).

Arhar: Arhar crop does not appear to be a profitable crop for the small and medium size groups in NFSM district. For these size groups the net returns per hectare and net returns per quintal are significantly lower compared to that of non-NFSM districts (Table 8.14). The net returns per hectare for small and medium size groups in NFSM district are, respectively, 55% and 28% lower than those in non-NFSM districts. In the non-NFSM districts, the net returns per hectare are lowest for small farmers group (18547 rupees) and highest for large farmers group (24308 rupees). Overall, for all farmers group, the net returns per hectare in NFSM and non-NFSM district are 15021 rupees and 27588 rupees, respectively - 84% lower in the NFSM district.

The net returns per quintal for small and medium size groups in NFSM district are also comparatively very low in NFSM district, 83% and 70% lower than those in the non-NFSM districts (Table 8.14). The net returns per quintal in non-NFSM districts is lowest for small farmers group, 1952 rupees and highest for large farmers group, 2185 rupees. Overall, the net returns per quintal in NFSM and non-NFSM districts are 1190 rupees and 2049 rupees respectively - 72% lower in the NFSM district.

Total Pulses: For all the pulses together, there are higher net returns per hectare in the NFSM district compared to non-NFSM district in all the size groups but significantly less net returns per quintal in NFSM districts, showing lower productivity of pulses there (Table 8.14). The highest net returns per hectare are for large farmers group in both NFSM and non-NFSM districts - 31270 rupees and 21857 rupees respectively. The lowest returns are for marginal farmers at 18625 rupees and 17283 rupees for small size groups respectively. The percentage differences are little higher - 6% and 30% higher for marginal and large size groups respectively. Overall, for all farmers group, net returns per hectare in NFSM and non-NFSM district are, respectively, 23907 rupees and 18959 rupees - 21% higher in the NFSM district.

The net returns per quintal in NFSM are significantly lower in all the respective size groups compared to non-NFSM district (Table 8.14). The highest net returns per quintal in NFSM and non-NFSM districts are 1385 rupees and 1985 rupees (both for large size groups). Similarly, the lowest returns are for the marginal size group in both the districts - 889 rupees and 1701 rupees respectively. The lowest and highest percentage differences are 43% lower and 91% lower for large and marginal size groups in NFSM district, respectively. Overall, for all farmers, net returns per quintal in NFSM and non-NFSM districts are 1113 rupees and 1856 rupees, respectively - 67% lower in the NFSM district.

Table 8.14: Profitability of Pulses in NFSM and non-NFSM districts of AP -By Size Group

in Rs.

Crops and Size Groups	NFSM district: Prakasam		Non-NFSM district: Ranga Reddy		% Difference between Districts	
	Net returns per hectare	Net returns per qtl	Net returns per hectare	Net returns per qtl	Net returns per hectare	Net returns per qtl
Gram						
Marginal	18625	889	12654	1030	32	-16
Small	21314	985	9876	954	54	3
Medium	22531	1024	11120	1009	51	1
Large	31270	1385	8787	834	72	40
Total	24402	1112	10536	956	57	14
Arhar						
Marginal			19457	2054		
Small	11929	1067	18547	1952	-55	-83
Medium	15129	1166	19350	1976	-28	-70
Large			24308	2185		
Total	15021	1190	27588	2049	-84	-72
Total pulses						
Marginal	18625	889	17449	1701	6	-91
Small	21012	986	17283	1799	18	-83
Medium	21187	1037	18275	1836	14	-77
Large	31270	1385	21857	1985	30	-43
Total	23907	1113	18959	1856	21	-67

4. **Profitability of Pulse Farming – Before and After NFSM (Table 8.15)**

The net returns per hectare were higher in 2006-07 in the NFSM district than the non-NFSM district but the returns per quintal were much lower (Table 8.15). This trend continued even after the implementation of the NFSM. In 2008-09, the overall net returns per hectare in the NFSM district were higher by 26% while the net returns per quintal were lower by 58%. This trend is visible across all the size groups without exception. This shows that, although the net returns in general have increased in the NFSM district as compared to the non-NFSM district (which is borne out by the net returns per hectare), the price has not increased commensurately. This resulted in a slower growth of per-quintal-returns in the NFSM district.

Table 8.15: Profitability of Pulse Farming – Before and After NFSM- AP.

in Rs.

Size Group	% Difference between Districts		% Difference: Years wise			
			NFSM District: Prakasam		Non-NFSM District: Ranga Reddy	
	Net returns per hectare	Net returns per qtl	Net returns per hectare	Net returns per qtl	Net returns per hectare	Net returns per qtl
Marginal						
2006-07	14	-53				
2007-08	-5	-115	28	11	56	55
2008-09	9	-98	95	68	69	54
Average	6	-91				
Small						
2006-07	43	-14				
2007-08	9	-120	51	20	142	130
2008-09	13	-95	66	66	60	47
Average	18	-83				
Medium						
2006-07	30	-32				
2007-08	5	-103	50	30	104	100
2008-09	12	-82	96	81	82	62
Average	14	-77				
Large						
2006-07	19	-44				
2007-08	5	-109	43	23	69	79
2008-09	43	-19	161	177	58	59
Average	30	-43				
Total						
2006-07	28	-35				
2007-08	4	-112	44	22	91	91
2008-09	26	-58	115	109	66	56
Average	21	-67				

Haryana

1. **Profitability of Pulses vis-à-vis Other Major Crops (Tables 8.16 & 8.17)**

NFSM District (Bhiwani): There are significantly lower net returns per hectare in NFSM district in all the size groups from pulses compared to other major crops except

marginal size group (Table 8.16). Out of all the size groups, large farmers get the highest net returns per hectare (16870 rupees) from pulses while the lowest net returns per hectare accrue to small farmers (8921 rupees). The net returns per hectare in NFSM districts from pulses compared with other crops are lower by 59% in the small farmers group. Overall, for all size groups, net returns per hectare from pulses are 14915 rupees, 36% lower than other crops.

The net returns per quintal are significantly higher for the total pulses compared to other crops in all the size groups except small size groups where it is 7% lower for pulses (Table 8.16). For the total pulses, large farmers recorded the highest net returns per quintal (1350 rupees) while the lowest net returns per quintal are for the small size group (931 rupees). Overall, for all size groups, net returns per quintal from pulses crop are 1272 rupees as compared to 1079 rupees from other major crops - about 18% higher.

NON-NFSM District (Mahendragarh): There is significant positive difference in net returns from pulses as compared to net returns from other crops in the non-NFSM districts (Table 8.17). The percentage difference in net returns per hectare in non-NFSM district from pulses crops with respect to other crops vary in the range of 16% to 85% across size groups. Overall, for all size groups, the net returns per hectare from pulses crop are 14630 rupees and those from other major crops are 10995 rupees, about 33% higher for pulses.

The net returns per quintal are also significantly higher for the total pulses as compared to other crops in all the size groups (Table 8.17). Overall, for all size groups, the net returns per quintal from pulses crop are 1544 rupees, which are almost double than those from other major crops, 768 rupees.

Table 8.16: Profitability of Pulses vis-à-vis Other Major Crops – Haryana: NFSM District (Bhiwani)

in Rs.

Size Group	Total pulses		Total major crops		% Difference	
	Net returns per hectare	Net returns per qtl	Net returns per hectare	Net returns per qtl	Net returns per hectare	Net returns per qtl
Marginal	13798	1293	12147	644	14	101
Small	8921	931	21993	996	-59	-7
Medium	13487	1179	25814	1125	-48	5
Large	16870	1350	22113	1073	-24	26
Total	14915	1272	23195	1079	-36	18

Total Pulses include Gram and Moong for both the districts. Total of major crops includes for Bhiwani-(Wheat+ Baira+Cotton+Mustard).

Table 8.17: **Profitability of Pulses vis-à-vis Other Crops–Haryana: NON-NFSM District (Mahendragarh)**

in Rs.

Size Group	Total pulses		Total major crops		% Difference	
	Net returns per hectare	Net returns per qtl	Net returns per hectare	Net returns per qtl	Net returns per hectare	Net returns per qtl
Marginal	15975	1481	11043	638	45	132
Small	13515	1344	11628	705	16	91
Medium	14136	1632	7650	661	85	147
Large	15388	1627	13209	895	16	82
Total	14630	1544	10995	768	33	101
Total Pulses include Gram and Moong for both the districts. Total of major crops includes for Mahendragarh-(Wheat+Baira+Gowar+Mustard)						

2. Profitability of Pulses in NFSM and non-NFSM districts (Table 8.18)

Gram and moong are the two main pulses crops grown in Bhiwani and Mahendragarh districts. Moong shows higher net returns per hectare and net returns per quintal as compared to gram in both NFSM and non-NFSM districts (Table 8.18). However, as compared to the non-NFSM district, the returns are higher in the NFSM district for both the crops. In the case of gram, the net returns per hectare are 14714 rupees in NFSM district, which is 9% higher than that in non-NFSM district, (13395 rupees). For moong, net returns per hectare are 19754 rupees in the NFSM district, which is 3% higher than that of non-NFSM district (19168 rupees). Overall, for total pulses, it is 14915 rupees in the NFSM district (2% higher returns) compared to 14630 rupees in the non-NFSM district.

The net returns per quintal are lower for gram crop by 6% in the NFSM district (1242 rupees) compared to that of non-NFSM district (1313 rupees). For moong, the returns are lower by 17% in the NFSM district (2379 rupees) as compared to non-NFSM districts (2788 rupees). Overall, for total pulses, it is 1272 rupees in the NFSM district as compared to 1544 rupees in the non-NFSM districts - 21% lower in the NFSM district (Table 8.18). The lower net returns per quintal as compared to net returns per hectare shows that the productivity in the NFSM district is perhaps lower than that in the non-NFSM district.

Table 8.18: **Profitability of Pulses in NFSM and non-NFSM districts of Haryana**

in Rs.

Crops	NFSM District: Bhiwani		Non-NFSM District: Mahendragarh		% Difference between Dist.	
	Net returns per hectare	Net returns per qtl	Net returns per hectare	Net returns per qtl	Net returns per hectare	Net returns per qtl
Gram	14714	1242	13395	1313	9	-6
Moong	19754	2379	19168	2788	3	-17
Total pulses	14915	1272	14630	1544	2	-21

3. **Profitability of Pulses in NFSM and non-NFSM districts – By Size Groups (Table 8.19)**

Gram: Net returns per hectare for the gram crop are slightly higher in NFSM district than the non-NFSM districts for all the size groups, except small farmers (Table 8.19). The net returns per hectare are lowest in small farmers group, 8921 rupees and highest in the large farmers group, 16709 rupees. The net returns per hectare for gram in non-NFSM districts are also lowest in the small farmers group, 12030 rupees and highest in the large farmers group, 15338 rupees. The net returns per hectare in the NFSM district are lower by 35% as compared to the non-NFSM districts in the small farmer group. For all other size groups the returns are higher in the NFSM district. Overall, in the NFSM district, the net returns per hectare are 14714 rupees, which are 9% higher than the non-NFSM districts (13395 rupees).

Net returns per quintal for the gram crop in NFSM district are little lower than in the non-NFSM districts for all the size groups except marginal size group. In both, NFSM and non-NFSM districts, the net returns per quintal are lowest in small farmers group and highest in the large farmers group (Table 8.19). Overall, for the total farmers in the NFSM district, the net returns per quintal are 1242 rupees, which are 6% lower than the non-NFSM district (1313 rupees).

Moong: All the farmers growing moong crop in the NFSM district belong to the medium and large size groups. Moong is not profitable for the medium size group in the district. The net returns per hectare and net returns per quintal are lower by 6% and 29% respectively, compared to the non-NFSM districts for this size group (Table 8.19). For large size group, there are significant higher net returns per hectare (36% higher) but little lower net returns per quintal (4% lower) in the NFSM district compared to non-NFSM districts. Overall, for all farmers, the net returns per hectare in NFSM and non-NFSM districts are 19754 rupees and 19168 rupees respectively, which is 3% higher in the NFSM district. For all farmers, the net returns per quintal in NFSM and non-NFSM districts are 2379 rupees and 2788 rupees, respectively, which is 17% lower in the NFSM district (Table 8.19).

Total Pulses: For total pulses, crops there are lower net returns per hectare and lower net returns per quintal in the NFSM district compared to the non-NFSM districts in most of

the size groups. Only large size groups have higher net returns per hectare in NFSM district (Table 8.19). The percentage differences in net returns per hectare are lower for medium and small size groups in the NFSM district whereas for the large farmers, the percentage difference is higher in the NFSM district. Overall, for all farmers, the net returns per hectare in the NFSM and the non-NFSM districts are 14915 rupees and 14630 rupees respectively - 2% higher in the NFSM district.

The net returns per quintal in NFSM in all size groups are lower compared to non-NFSM districts (Table 8.19). The percentage differences are in the range of 15% and 44% lower for marginal and small size groups in NFSM district, respectively. Overall, for all farmers, the net returns per quintal in NFSM and non-NFSM districts are 1272 rupees and 1544 rupees, respectively - 21% lower in the NFSM district.

Table 8.19: Profitability of Pulses in NFSM and non-NFSM districts of Haryana- By Size Groups

in Rs.

Crops and Size Groups	NFSM District: Bhiwani		Non-NFSM District: Mahendragarh		% Difference between Districts	
	Net returns per hectare	Net returns per qtl	Net returns per hectare	Net returns per qtl	Net returns per hectare	Net returns per qtl
Gram						
Marginal	13798	1293	13721	1239	1	4
Small	8921	931	12030	1129	-35	-21
Medium	13086	1122	12405	1302	5	-16
Large	16709	1326	15338	1467	8	-11
Total	14714	1242	13395	1313	9	-6
Moong						
Marginal			22958	2421		
Small			22506	2866		
Medium	19652	2354	20900	3035	-6	-29
Large	23766	2484	15247	2579	36	-4
Total	19754	2379	19168	2788	3	-17
total pulses						
Marginal	13798	1293	15975	1481	-16	-15
Small	8921	931	13515	1344	-51	-44
Medium	13487	1179	14136	1632	-5	-38
Large	16870	1350	15388	1627	9	-21
Total	14915	1272	14630	1544	2	-21

4. Profitability of Pulse Farming – Before and After NFSM (Table 8.20)

The returns from pulse farming were substantially lower in 2006-07 in the NFSM district, as compared to the non-NFSM district (Table 8.20). The net returns per hectare were lower by 8% and the net returns per quintal were lower by 35% - showing a much lower level of productivity in the NFSM district. However, these percentages improved to -6% and -28% in 2007-08 and further improved to 15% and -6% showing a distinct improvement in pulse profitability in the NFSM district after the implementation of NFSM.

However, a careful look shows that the entire improvement is due to large farmers group. This group has shown 31% increase in net returns per hectare and 1% increase in net returns per quintal in 2008-09 (Table 8.20). All other size groups have shown significantly lower (negative) percentage. Therefore, it appears that all the improvement has occurred only because of increase in large farmers' profitability. This is also confirmed by looking at the percentage increases within each of these districts over three years. Except in large farmers group, the percentage differences have been largely negative (decreases) and much lower than the non-NFSM district. Therefore, it can be concluded that pulse farming is less profitable in NFSM district and implementation of the NFSM has benefited only the large farmers.

Table 8.20: Profitability of Pulse Farming – Before and After NFSM- Haryana

in Rs.

Size Group	% Difference between Districts		% Difference: Years wise			
			NFSM District: Bhiwani		Non-NFSM District: Mahendragarh	
	Net returns per hectare	Net returns per qtl	Net returns per hectare	Net returns per qtl	Net returns per hectare	Net returns per qtl
Marginal						
2006-07	-56	-33				
2007-08	0	-10	59	19	1	-2
2008-09	-2	-2	-29	-10	-27	-16
Average	-16	-15				
Small						
2006-07	-43	-40				
2007-08	-52	-45	-5	3	1	6
2008-09	-62	-48	-24	-16	-19	-14
Average	-51	-44				
Medium						
2006-07	-4	-47				
2007-08	27	-12	12	9	-21	-17
2008-09	-52	-59	-29	-10	47	28
Average	-5	-38				
Large						
2006-07	0	-33				
2007-08	-20	-39	2	2	23	6
2008-09	31	1	70	43	-2	1
Average	9	-21				
Total						
2006-07	-8	-35				
2007-08	-6	-28	5	5	3	-1
2008-09	15	-6	25	23	0	2
Average	2	-21				

Uttar Pradesh

1. Profitability of Pulses vis-à-vis Other Major Crops (Tables 8.21 & 8.22)

NFSM District (Lalitpur): There are significantly higher net returns per hectare and net returns per quintal in NFSM district for all the size groups from pulses crops as compared to other major crops (Table 8.21). In all the size groups in NFSM district there are almost same net returns per hectare. The net returns per hectare from other crops are very low in the NFSM district. There are very high percentage differences in net returns per hectare in the NFSM district from pulses crops as compared to other crops. These are in the range of 139% to 168% across size groups. Overall, for all size groups, the net returns per hectare from pulses crop are 17600 rupees - 155% higher than other major crops (6900 rupees).

The net returns per quintal are also significantly much higher for pulses as compared to other crops in all the size groups. Overall, for all size groups, the net returns per quintal from pulses crop are 1419 rupees - about 227% higher than other major crops (434 rupees).

NON-NFSM District (Allahabad): There are significantly higher net returns per quintal from pulses crops as compared to other crops in the non-NFSM districts but the net returns per hectare are lower in general (Table 8.22). The small and marginal farmers groups are getting the highest net returns per hectare (20170 rupees) for pulses and for other crops (26596 rupees) respectively. The large size group shows the lowest net returns per hectare for pulses (11063 rupees) and also for other crops (16532 rupees). The percentage difference in net returns per hectare, in the non-NFSM districts, from pulses crops with respect to other crops are lower by 10%. Overall, for all size groups, the net returns per hectare from pulses crop are 15735 rupees and other major crops are 17445 rupees - about 10% lower for pulses.

The net returns per quintal are significantly higher for pulses compared to other crops in all of the size groups. For other crops, the net returns per quintal are less than half of that of total pulses for all size groups except marginal. Overall, for all size groups, the net returns per quintal from pulses crop are 1748 rupees - almost 144% higher than other major crops (717 rupees).

Table 8.21: **Profitability of Pulses vis-à-vis Other Major Crops – UP: NFSM District (Lalitpur)**

in Rs.

Size Group	Total pulses		Total major crops		% Difference	
	Net returns per hectare	Net returns per qtl	Net returns per hectare	Net returns per qtl	Net returns per hectare	Net returns per qtl
Marginal	17794	1280	7450	465	139	175
Small	17539	1470	6547	420	168	250
Medium	17480	1409	7213	445	142	217
Large						
Total	17600	1419	6900	434	155	227

Table 8.22: **Profitability of Pulses vis-à-vis Other Major Crops – UP: NON-NFSM District (Allahabad)**

in Rs.

Size Group	Total pulses		Total major crops		% Difference	
	Net returns per hectare	Net returns per qtl	Net returns per hectare	Net returns per qtl	Net returns per hectare	Net returns per qtl
Marginal	15723	1597	26596	972	-41	64
Small	20170	1788	18688	724	8	147
Medium	15753	1758	17382	722	-9	144
Large	11063	1494	16532	658	-33	127
Total	15735	1748	17445	717	-10	144

2. Profitability of Pulses in NFSM and non-NFSM districts (Table 8.23)

Almost all the major pulse crops are grown in Uttar Pradesh. Moong, urad, and pea are the main pulses grown in the NFSM district and gram, arhar, urad, and masur are grown in Allahabad district. In the NFSM districts, moong has the highest net returns per hectare (22452 rupees). The net returns per quintal (2106 rupees) are also highest for moong in comparison with other pulses - urad and pea. Urad is the only common pulse crop in both the districts. The net returns per hectare and per quintal from urad in NFSM district (14991 rupees) are higher by about 78% and 39% respectively, as compared to the non-NFSM districts (3233 and 907 rupees respectively). Overall, for total pulses, the net returns per hectare are 17600 rupees in NFSM district (11% higher) compared to 15735 rupees in non-NFSM districts whereas the net returns per quintal are 1419 rupees in NFSM district, which are about 23% lower compared to the non-NFSM districts (1748 rupees) (Table 8.23).

Table 8.23: **Profitability of Pulses in NFSM and non-NFSM districts of UP.**

in Rs.

Crops	NFSM District: Lalitpur		Non-NFSM District: Allahabad		% Difference between Dist.	
	Net returns per hectare	Net returns per qtl	Net returns per hectare	Net returns per qtl	Net returns per hectare	Net returns per qtl
Gram			9872	1245		
Arhar			13331	2047		
Moong	22452	2106				
Urad	14991	1483	3233	907	78	39
Masur			22472	1884		
Pea	20448	1266				
Total Pulses	17600	1419	15735	1748	11	-23

3. Profitability of Pulses in NFSM and non-NFSM districts – By Size Groups (Table 8.24)

Total Pulses: For total pulses, there are higher net returns per hectare in the NFSM district compared to non-NFSM districts in all the size groups except the small size groups (Table 8.24). The large farmers do not grow pulses in NFSM district. Overall, for all farmers group, net returns per hectare in NFSM and non-NFSM districts are, respectively, 17600 rupees and 15735 rupees - 11% higher in the NFSM district.

The net returns per quintal in NFSM are lower in all the size groups as compared to the non-NFSM districts (Table 8.24). The percentage differences are about 22% lower for all the size groups in NFSM district than the non-NFSM districts. Overall, for all farmers, the net returns per quintal in NFSM and non-NFSM districts are 1419 rupees and 1748 rupees respectively - 23% lower in the NFSM district.

Table 8.24: Profitability of Pulses in NFSM and non-NFSM districts of UP - By Size Groups

in Rs.

Crops and Size Groups	NFSM District: Lalitpur		Non-NFSM District: Allahabad		% Difference between Districts	
	Net returns per hectare	Net returns per qtl	Net returns per hectare	Net returns per qtl	Net returns per hectare	Net returns per qtl
Gram						
Marginal						
Small			16153	1265		
Medium			10446	1276		
Large			764	253		
Total			9872	1245		
Arhar						
Marginal						
Small			11190	2016		
Medium			13689	2054		
Large			700	1400		
Total			13331	2047		
Moong						
Marginal						
Small	16206	1620				
Medium	22699	2003				
Large						
Total	22452	2106				
Urad						
Marginal	11729	1357				
Small	14516	1431				
Medium	15676	1528	2987	872	80.9	43.0
Large			6520	1115		
Total	14991	1483	3233	907	78.4	38.8
Masur						
Marginal			15723	1597		
Small			26620	1902		
Medium			22316	1892		
Large			25424	1792		
Total			22472	1884		
Pea						
Marginal	26492	1237				
Small	22781	1343				
Medium	18806	1232				
Large						
Total	20448	1266				
Total Pulses						
Marginal	17794	1280	15723	1597	11.6	-24.7
Small	17539	1470	20170	1788	-15.0	-21.6
Medium	17480	1409	15753	1758	9.9	-24.8
Large			11063	1494		
Total	17600	1419	15735	1748	10.6	-23.2

4. Profitability of Pulse Farming – Before and After NFSM (Table 8.25)

The net returns per hectare have been higher by 14% in the NFSM district than the non-NFSM district even before the implementation of NFSM. However, the net returns per quintal were substantially lower (29%) showing much lower level of productivity in the NFSM district (Table 8.25). The implementation of NFSM does not seem to have affected the scenario very much. The net returns per hectare are still higher by 13% in

2008-09 but the net returns per quintal are lower only by 15%, which shows narrowing of the gap in the two districts.

Table 8.25: Profitability of Pulse Farming – Before and After NFSM- UP.

in Rs.

Size Group	% Difference between Districts		% Difference: Years wise			
			NFSM District: Lalitpur		Non-NFSM District: Allahabad	
	Net returns per hectare	Net returns per qtl	Net returns per hectare	Net returns per qtl	Net returns per hectare	Net returns per qtl
Marginal						
2006-07	-7	-44				
2007-08	3	-28	8	14	-2	2
2008-09	33	-5	17	5	-20	-14
Average	12	-25				
Small						
2006-07	-62	-47				
2007-08	9	-17	30	21	-27	-3
2008-09	-5	-9	18	28	37	19
Average	-15	-22				
Medium						
2006-07	18	-26				
2007-08	2	-30	16	12	39	15
2008-09	11	-19	18	16	7	6
Average	10	-25				
Large						
2006-07						
2007-08					45	24
2008-09					41	8
Average						
Total						
2006-07	14	-29				
2007-08	5	-28	20	15	33	14
2008-09	13	-15	19	19	9	6
Average	11	-23				

Bihar

1. Profitability of Pulses vis-à-vis Other Major Crops (Tables 8.26 & 8.27)

NFSM District (Patna): There are lower net returns per hectare from pulses compared to other major crops, rice, and wheat, in all the size groups in both NFSM and non-NFSM districts (Table 8.26). In the NFSM district, net returns per hectare for total pulses and other major crops are highest for large farmers (20031 rupees and 24881 rupees respectively) and lowest for marginal/small farmers (15300 and 19324 rupees respectively). Overall, in the NFSM district, the net returns per hectare are 16977 rupees and 21118 rupees for pulses and other major crops respectively – about 20% less for pulses.

The net returns per quintal are significantly higher for pulses as compared to other major crops in all the size groups. Large farmers get the highest net returns per quintal for the

pulses and other major crops - 1457 rupees and 814 rupees respectively (Table 8.26). Marginal farmers get the lowest net returns per quintal for pulses and other major crops - 1132 rupees and 677 rupees respectively. The percentage difference in net returns per quintal for pulses, compared to other major crops, is in the range of 67% to 79% for marginal and large size groups respectively. Overall, for all the size groups, net returns per quintal from pulses and other crops are 1263 and 717 rupees respectively - about 76% for pulses.

NON-NFSM District (Kishanganj): The net returns per hectare and net returns per quintal in the Non-NFSM district follow almost a similar pattern to that of the NFSM district. There are lower net returns per hectare from pulses crops compared to other major crops, rice, and wheat, in all the size groups and significant high net returns per quintal from pulses crops as compared to other major crops in non-NFSM (Table 8.27). The marginal farmers group is getting the lowest net returns per hectare for both, the pulses crops and other crops and the highest net returns per hectare are recorded by the large farmers. Overall, in the non-NFSM district, the net returns per hectare are 16723 rupees and 22700 rupees for pulses and other crops respectively - 26% lower for pulses.

The net returns per quintal are significantly higher for the pulses than other major crops in all the size groups. As in the NFSM district, large farmers have recorded the highest net returns per quintal (2104 and 929 rupees respectively) for the pulses and other major crops. The lowest net returns per quintal accrued to the marginal farmers (1666 and 762 rupees respectively). The percentage difference between pulses and other crops are very high - in the range of 115% to 126% for small and large size groups respectively. Overall, for all the size groups, the net returns per quintal from pulses crop are 1829 rupees - about 119% higher than other crops.

Table 8.26: Profitability of Pulses vis-à-vis Other Major Crops – Bihar: NFSM District (Patna)

in Rs.

Size Group	Total pulses		Total major crops		% Difference	
	Net returns per hectare	Net returns per qtl	Net returns per hectare	Net returns per qtl	Net returns per hectare	Net returns per qtl
Marginal	15300	1132	20068	677	-24	67
Small	18069	1271	19324	714	-6	78
Medium	18836	1391	24690	794	-24	75
Large	20031	1457	24881	814	-19	79
Total	16977	1263	21118	717	-20	76

Table 8.27: Profitability of Pulses vis-à-vis Other Major Crops – Bihar: NON-NFSM District (Kishanganj)

in Rs.

Size Group	Total pulses		Total major crops		% Difference	
	Net returns per hectare	Net returns per qtl	Net returns per hectare	Net returns per qtl	Net returns per hectare	Net returns per qtl
Marginal	15121	1666	20576	762	-27	119
Small	16598	1800	22765	834	-27	116
Medium	18060	1968	24441	891	-26	121
Large	19147	2104	25442	929	-25	126
Total	16723	1829	22700	833	-26	119

2. Profitability of Pulses in NFSM and non-NFSM districts (Table 8.28)

Gram and masur are the major pulse crops grown in NFSM district while moong and masur are the major crops grown in the non-NFSM district. As can be seen, masur is the only common pulse crop in both the districts. Masur yields 11% higher net returns per hectare in the NFSM district as compared to the non-NFSM district. Net returns per quintal are almost equal in both the districts (Table 8.28). Overall, for total pulses, the net returns per hectare are 16977 rupees in the NFSM district (1.50 % higher) compared to 16723 rupees in the non-NFSM district, whereas the net returns per quintal are 1263 rupees in NFSM district, which is about 45% lower compared to the non-NFSM district (1828.67 rupees).

Table 8.28: Profitability of Pulses in NFSM and non-NFSM districts of Bihar

in Rs.

Crops	NFSM District: Patna		Non-NFSM District: Kishanganj		% Difference between Dist.	
	Net returns per hectare	Net returns per qtl	Net returns per hectare	Net returns per qtl	Net returns per hectare	Net returns per qtl
Gram	11882	1045				
Moong			13818	2174		
Masur	22074	1482	19628	1483	11	-0.1
Total Pulses	16977	1263	16723	1829	1	-45

3. Profitability of Pulses in NFSM and non-NFSM districts – By Size Groups (Table 8.29)

Masur: Masur is the only common pulse crop that is grown in both NFSM as well as non-NFSM districts. In the NFSM district, both the net returns per hectare and net returns per quintal, are highest for the large farmers (25128 and 1721 rupees respectively) and lowest for marginal farmers (19157 and 1315 rupees respectively) (Table 8.29). In non-NFSM districts also, the net returns per hectare and net returns per quintal follow the same pattern as in the NFSM district. They are highest for the large size groups (22112 and 1670 rupees respectively) and lowest for marginal size groups (17476 and 1324 rupees respectively). Comparing the two districts, there is higher net

returns per hectare in NFSM districts for all the size groups. The percentage difference is in the range of 9% to 16% across size groups. The net returns per quintal are almost same in both the districts in all the size groups (Table 8.29). Overall the net returns per hectare are 22074 and 19628 rupees respectively - 11% higher in the NFSM district and the net returns per quintal are1482 and 1483 rupees respectively – almost same in the two districts.

Total Pulses: In all the size groups there is marginally higher net returns per hectare in the NFSM district as compared to the non-NFSM district whereas the net returns per quintal in the NFSM district are significantly lower in all the size groups. Again, it has been noticed that in all the other pulse crops the large farmers are getting the highest net returns per hectare and highest net returns per quintal in NFSM and non-NFSM districts, except gram crop (Table 8.29). Overall, for all farmers, the net returns per hectare in NFSM and non-NFSM district are, respectively, 16977 rupees and 16723 rupees - 1% higher in the NFSM district. The net returns per quintal in NFSM and non-NFSM district are 1263 rupees and 1829 rupees respectively - with 45% lower in the NFSM district.

Table 8.29: Profitability of Pulses in NFSM and non-NFSM districts of Bihar - By Size Groups

in Rs.

Crops and Size Groups	NFSM District: Patna		Non-NFSM District: Kishanganj		% Difference between District	
	Net returns per hectare	Net returns per qtl	Net returns per hectare	Net returns per qtl	Net returns per hectare	Net returns per qtl
Gram						
Marginal	11443	950				
Small	24956	1047				
Medium	13801	1144				
Large	14935	1193				
Total	11882	1045				
Moong						
Marginal			12766	2009		
Small			13353	2103		
Medium			14757	2457		
Large			16183	2538		
Total			13818	2174		
Masur						
Marginal	19157	1315	17476	1324	9	-1
Small	23515	1496	19843	1498	16	0
Medium	23871	1638	21364	1613	11	2
Large	25128	1721	22112	1670	12	3
Total	22074	1482	19628	1483	11	0
Total Pulses						
Marginal	15300	1132	15121	1666	1	-47
Small	18069	1271	16598	1800	8	-42
Medium	18836	1391	18060	1968	4	-42
Large	20031	1457	19147	2104	4	-44
Total	16977	1263	16723	1829	1	-45

4. Profitability of Pulse Farming – Before and After NFSM (Table 8.30)

For the total pulses sector, there is improvement in net returns per hectare and net returns per quintal in both NFSM and non-NFSM districts in 2007-08 and 2008-09 over the previous years, respectively, 2006-07 and 2007-08 for all the size groups. Considering the NFSM district these percentage increases in 2007-08 over the year 2006-07 and in the year 2008-09 over the year 2007-08 in net returns per hectare are, respectively, 33% and 16% for marginal, 23% and 31% for small, 24% and 17% for medium, 41 % and 21% for large and 40% and 21% for total size groups (Table 8.30). It can be easily seen that the percentage increase in 2008-09 (with respect to previous year) is less than that in 2007-08, except for small size groups. The corresponding percentage increase in net returns per quintal in 2007-08 over the year 2006-07 and in the year 2008-09 over the year 2007-08 are respectively, 27% and 11% for marginal, 19% and 11% for small, 19% and 12% for medium, 29% and 19% for large and 22% and 12% for total size groups. Here also the percentage increase in 2008-09 with respect to previous year is less than that in 2007-08 in all the size groups. It can be noticed from table, given below, that in the non-NFSM district also the net returns per hectare and net returns per quintal, both, in spite being higher in the year 2008-09 with respect to past year's corresponding figures, the percentage increase in 2008-09 is less than that in 2007-08 in all the size groups.

Comparing NFSM district with non-NFSM district, there is less net returns per quintal in NFSM district in all the years (2006-07, 2007-08, and 2008-09) for all the size groups than the non-NFSM district (Table 8.30). It is notable that the percentage differences in net returns per quintal between NFSM and non-NFSM districts are decreasing over the time though the net returns per quintal remains always higher in non-NFSM districts. There are higher net returns per hectare in NFSM district in all the size groups compared to corresponding size groups in non-NFSM district. From the year 2007-08, the percentage difference in net returns per hectare in NFSM district is positive and has further increased in 2008-09, which shows that the NFSM scheme perhaps has a positive impact in terms of increasing net returns per hectare in the NFSM district.

Summing up, the net returns per hectare and the net returns per quintal in the NFSM district were substantially lower than the non-NFSM district in 2006-07, -17% and -55% respectively. After the implementation of the NFSM scheme, the net returns per hectare have increased substantially, reaching 12% higher than the non-NFSM district. The

difference in net return per quintal also has come down to -38% showing a narrowing of the gap between the two districts.

Table 8.30: Profitability of Pulse Farming – Before and After NFSM- Bihar

in Rs.

Size Group	% Difference between Districts		% Difference: Years wise			
			NFSM District: Patna		Non-NFSM District: Kishanganj	
	Net returns per hectare	Net returns per qtl	Net returns per hectare	Net returns per qtl	Net returns per hectare	Net returns per qtl
Marginal						
2006-07	-11	-62				
2007-08	2	-45	33	27	17	13
2008-09	9	-39	16	11	8	6
Average	1	-47				
Small						
2006-07	-1	-48				
2007-08	3	-41	23	19	18	13
2008-09	18	-38	31	11	11	9
Average	8	-42				
Medium						
2006-07	-2	-48				
2007-08	4	-40	24	19	17	12
2008-09	9	-37	17	12	11	9
Average	4	-42				
Large						
2006-07	-13	-63				
2007-08	6	-45	41	29	18	14
2008-09	14	-32	21	19	10	9
Average	4	-44				
Total						
2006-07	-17	-55				
2007-08	2	-44	40	22	17	13
2008-09	12	-38	21	12	10	8
Average	1	-45				

Punjab

1. Profitability of Pulses vis-à-vis Other Major Crops (Tables 8.31 & 8.32)

NFSM District (Ferozpur): There are significantly lower net returns per hectare in all the size groups from pulses compared to other major crops in NFSM district (Table 8.31). The percentage difference in net returns per hectare in NFSM district from pulses crops with respect other crops is in the range of -13% to -72% for large size groups and marginal size groups, respectively. Overall, for all size groups, net returns per hectare from pulses crop are 37105 rupees and those from other major crops are 44495 rupees – lower for pulses by 17%

The net returns per quintal are significantly higher for pulses compared to other crops in all the size groups. They are highest in large size group (3459 rupees) and lowest for the marginal size group (1191 rupees) for total pulses (Table 8.31). Overall, for all size

groups, net returns per quintal from pulses are 3400 rupees - about 288% higher compared to other major crops (877 rupees).

NON-NFSM District (Moga): Similar to the NFSM district, there are lower net returns in the non-NFSM district from pulses crops as compared to other crops (Table 8.32). The percentage difference in net returns per hectare in non-NFSM district from pulses crops with respect to other crops is about -60% in all the reported farmer groups. Overall, for all size groups, the net returns per hectare from pulses crop are 18700 rupees and those from other major crops are 47147 rupees - about 60% lower for pulses. Summer moong is the only pulse crop in Moga district.

Net returns per quintal follow a similar pattern in both NFSM and non-NFSM districts. The net returns per quintal are significantly higher for the total pulses compared to other crops in all the size groups (Table 8.32). Overall, for all size groups, net returns per quintal from pulses crop are 1377 rupees - almost 54% higher compared to other major crops (892 rupees).

Table 8.31: Profitability of Pulses vis-à-vis Other Major Crops –Punjab: NFSM District: Ferozepur

in Rs.

Size Group	**Total pulses**		**Total major crops**		**% Difference**	
	Net returns per hectare	**Net returns per qtl**	**Net returns per hectare**	**Net returns per qtl**	**Net returns per hectare**	**Net returns per qtl**
Marginal	12526	1191	44861	891	-72	34
Small	16320	1348	44136	876	-63	54
Medium	38430	3414	44209	868	-13	293
Large	39039	3459	44773	874	-13	296
Total	37105	3400	44495	877	-17	288

Table 8.32: Profitability of Pulses vis-à-vis Other Major Crops – Punjab: NON-NFSM District: Moga

in Rs.

Size Group	Total pulses		Total major crops		% Difference	
	Net returns per hectare	Net returns per qtl	Net returns per hectare	Net returns per qtl	Net returns per hectare	Net returns per qtl
Marginal						
Small						
Medium	19199	1408	47136	894	-59	57
Large	18202	1347	47157	891	-61	51
Total	18700	1377	47147	892	-60	54

2. Profitability of Pulses in NFSM and non-NFSM districts (Table 8.33)

Summer moong is the only common pulse crop in both the NFSM and non-NFSM districts. In addition to summer moong kharif moong and gram are grown is the NFSM district. For summer moong, the net returns per hectare for all size groups are lower in the NFSM district. The net returns per hectare in NFSM district for summer moong

(16052 rupees) are lower by 16% as compared to the non-NFSM district. For total pulses the net returns per hectare are 37105 rupees in NFSM district as compared to 18700 rupees in non-NFSM district - 50% higher (Table 8.33).

The net returns per quintal are also lower in the NFSM district. The net returns per quintal are about 1306 rupees, which is about 5% lower than the non-NFSM district (1377 rupees).

Table 8.33: Profitability of Pulses in NFSM and non-NFSM districts of Punjab

in Rs.

Crops	NFSM District: Ferozepur		Non-NFSM District: Moga		% Difference between Dist.	
	Net returns per hectare	Net returns per qtl	Net returns per hectare	Net returns per qtl	Net returns per hectare	Net returns per qtl
Summer Moong	16052	1306	18700	1377	-16	-5
Kharif Moong	9855	1074				
Gram	11198	1020				
Total Pulses	37105	3400	18700	1377	50	59

3. Profitability of Pulses in NFSM and non-NFSM districts – By Size Groups (Table 8.34)

Summer Moong: Net returns per hectare for the summer moong crop in NFSM district are comparatively less than that of in non-NFSM district for all the size groups (Table 8.34). In the NFSM district net returns per hectare are lowest in marginal size group, 12526 rupees and highest in the large size group, 17876 rupees. Overall, in NFSM district, the net returns per hectare are 16052 rupees, which are 16% lower than that of in non-NFSM district (18700 rupees).

Net returns per quintal for the moong crop in NFSM district are also a little lower than those in non-NFSM district for all the size groups. Overall, the net returns per quintal in the NFSM district (1306 rupees) are 5% lower than the non-NFSM (1377 rupees) district (Table 8.34).

Total Pulses: There are higher net returns per hectare and net returns per quintal in the NFSM district compared to non-NFSM district in all the size groups (Table 8.34). Overall for all farmers group net returns per hectare in NFSM and non-NFSM district are, respectively, 37105 rupees and 18700 rupees – higher in the NFSM district by 50%.

The net returns per quintal in the NFSM district are also higher in all the size groups compared to non-NFSM district. Overall, for all farmers, net returns per quintal in NFSM and non-NFSM districts are 3400 rupees and 1377 rupees respectively - which is 59% higher in the NFSM district.

Table 8.34: Profitability of Pulses in NFSM and non-NFSM districts of Punjab- By Size Groups

in Rs.

Crops and Size Groups	NFSM District: Ferozepur		Non-NFSM District: Moga		% Difference between District	
	Net returns per hectare	Net returns per qtl	Net returns per hectare	Net returns per qtl	Net returns per hectare	Net returns per qtl
summer moong						
Marginal	12526	1191				
Small	16320	1348				
Medium	17487	1329	19199	1408	-10	-6
Large	17876	1356	18202	1347	-2	1
Total	16052	1306	18700	1377	-16	-5
kharif moong						
Marginal						
Small						
Medium	10041	1086				
Large	9668	1062				
Total	9855	1074				
Gram						
Marginal						
Small						
Medium	10901	999				
Large	11494	1041				
Total	11198	1020				
Total Pulses						
Marginal	12526	1191				
Small	16320	1348				
Medium	38430	3414	19199	1408	50	59
Large	39039	3459	18202	1347	53	61
Total	37105	3400	18700	1377	50	59

4. Profitability of Pulse Farming – Before and After NFSM (Table 8.35)

In all the three years, the net returns per hectare and per quintal were substantially higher in the NFSM district than the non-NFSM district for all the size groups. The percentage growth over the previous year has substantially slowed down in 2008-09, as compared to 2007-08, in both the districts (Table 8.35). This could also partly be due to the drought conditions in the 2008-09. However, the growth rate in the NFSM district is much lower than the non-NFSM district, possibly due to the base effect.

Table 8.35: Profitability of Pulse Farming – Before and After NFSM- Punjab

in Rs.

Size Group	% Difference between Districts		% Difference: Years wise			
			NFSM District: Ferozepur		Non-NFSM District: Moga	
	Net returns per hectare	Net returns per qtl	Net returns per hectare	Net returns per qtl	Net returns per hectare	Net returns per qtl
Marginal						
2006-07						
2007-08			32	6		
2008-09			-5	3		
Average						
Small						
2006-07						
2007-08			30	10		
2008-09			31	18		
Average						
Medium						
2006-07	52	61				
2007-08	49	59	15	5	23	11
2008-09	49	57	2	0	2	5
Average	50	59				
Large						
2006-07	56	62				
2007-08	52	60	23	12	35	19
2008-09	53	61	1	-2	-1	-3
Average	53	61				
Total						
2006-07	51	61				
2007-08	48	59	22	9	29	15
2008-09	50	59	3	0	1	1
Average	50	59				

Table 8.36: Profitability of Pulses vis-à-vis Other Major Crops- Summary

State	District	Profitability	Interpretation
Maharashtra	NFSM Districts	NRPHP>NRPHOC	Higher per hectare returns from pulses
		NRPQP>>NRPQOC	Much Higher price realization for pulses
		Inference	**Per hectare profitability of pulses is higher possibly because of higher price realization**
	Non-NFSM Districts	NRPHP<<NRPHOC	Much lower per hectare returns from pulses
		NRPQP>>NRPQOC	Much Higher price realization for pulses
		Inference	**Per hectare profitability of pulses is lower despite higher price realization, showing a very adverse contribution of area and yield**
Rajasthan	NFSM Districts	NRPHP>NRPHOC	Higher per hectare returns from pulses
		NRPQP>>NRPQOC	Much Higher price realization for pulses
		Inference	**Per hectare profitability of pulses is higher possibly because of higher price realization**
	Non-NFSM Districts	NRPHP>NRPHOC	Higher per hectare returns from pulses
		NRPQP>NRPQOC	Higher price realization for pulses
		Inference	**Per hectare profitability of pulses is higher possibly because of higher price realization**
Andhra Pradesh	NFSM Districts	NRPHP>NRPHOC	Higher per hectare returns from pulses
		NRPQP>NRPQOC	Higher price realization for pulses
		Inference	**Per hectare profitability of pulses is higher possibly because of higher price realization**
	Non-NFSM Districts	NRPHP>NRPHOC	Higher per hectare returns from pulses
		NRPQP>NRPQOC	Higher price realization for pulses
		Inference	**Per hectare profitability of pulses is higher possibly because of higher price realization**
Uttar Pradesh	NFSM Districts	NRPHP>NRPHOC	Higher per hectare returns from pulses
		NRPQP>NRPQOC	Higher price realization for pulses
		Inference	**Per hectare profitability of pulses is higher possibly because of higher price realization**
	Non-NFSM Districts	NRPHP<NRPHOC	Lower per hectare returns from pulses
		NRPQP>NRPQOC	Higher price realization for pulses
		Inference	**Per hectare profitability of pulses is lower despite higher price realization, showing a adverse contribution of area and yield**
Bihar	NFSM Districts	NRPHP<NRPHOC	Lower per hectare returns from pulses
		NRPQP>NRPQOC	Higher price realization for pulses
		Inference	**Per hectare profitability of pulses is lower despite higher price realization, showing a adverse contribution of area and yield**
	Non-NFSM Districts	NRPHP<NRPHOC	Lower per hectare returns from pulses
		NRPQP>NRPQOC	Higher price realization for pulses
		Inference	**Per hectare profitability of pulses is lower despite higher price realization, showing a adverse contribution of area and yield**

NRPHP and NRPHOC denote net returns per hectare of pulses and other crops respectively
NRPQP and NRPQOC denote net returns per quintal of pulses and other crops respectively

Table 8.37: Profitability of Pulses in NFSM District vis-à-vis non-NFSM District- Summary

State	Crop	Profitability	Interpretation
Maharashtra	Moong	NRPHN<=NRPHNO	Slightly lower per hectare returns in NFSM district
		NRPQN>NRPQNO	Higher price realization in NFSM district
		Inference	**Per hectare profitability in NFSM district is lower despite higher price realization**
	Arhar	NRPHN>>NRPHNO	Much higher per hectare returns in NFSM district
		NRPQN>>NRPQNO	Much higher price realization in NFSM district
		Inference	**Per hectare profitability in NFSM district is much higher probably because of much higher price realization**
	Gram	NRPHN>NRPHNO	Higher per hectare returns in NFSM district
		NRPQN=NRPQNO	Prices are almost equal in the two districts
		Inference	**Per hectare profitability in NFSM district is higher perhaps because of contribution from area and yield**
	Total Pulses	NRPHN>NRPHNO	Higher per hectare returns in NFSM district
		NRPQN>NRPQNO	Higher price realization in NFSM district
		Inference	**Per hectare profitability in NFSM district is higher possibly because higher price**
Rajasthan	Moong	NRPHN<NRPHNO	Lower per hectare returns in NFSM district
		NRPQN>NRPQNO	Higher price realization in NFSM district
		Inference	**Per hectare profitability in NFSM district is lower despite higher price realization showing poor contribution of area and yield**
	Gram	NRPHN<NRPHNO	Lower per hectare returns from pulses
		NRPQN<NRPQNO	Lower price realization in NFSM district
		Inference	**Per hectare profitability in NFSM district is lower possibly because of poor contribution from all the factors - area, yield and price**
	Total Pulses	NRPHN<NRPHNO	Lower per hectare returns from pulses
		NRPQN<NRPQNO	Lower price realization in NFSM district
		Inference	**Per hectare profitability in NFSM district is lower possibly because of poor contribution from all the factors - area, yield and price**
Andhra Pradesh	Gram	NRPHN>>NRPHNO	Much higher per hectare returns in NFSM district
		NRPQN>NRPQNO	Higher price realization in NFSM district
		Inference	**Per hectare profitability in NFSM district is much higher possibly because of higher price along with other factors**
	Arhar	NRPHN<<NRPHNO	Much lower per hectare returns in NFSM district
		NRPQN<<NRPQNO	Much lower price realization in NFSM district
		Inference	**Per hectare profitability in NFSM district is much lower possibly because of much lower price along with poor contribution of area and yield**
	Total Pulses	NRPHN>>NRPHNO	Much higher per hectare returns in NFSM district
		NRPQN<<NRPQNO	Much lower price realization in NFSM district
		Inference	**Per hectare profitability in NFSM district is much higher despite a much lower price realization indicating a very good contribution from area and yield**

State	Crop	Profitability	Interpretation
Haryana	Gram	NRPHN>NRPHNO	Higher per hectare returns in NFSM district
		NRPQN<NRPQNO	Lower price realization in NFSM district
		Inference	**Per hectare profitability in NFSM district is higher despite lower price, perhaps indicating a good contribution from area and yield**
	Moong	NRPHN>NRPHNO	Higher per hectare returns in NFSM district
		NRPQN<NRPQNO	Lower price realization in NFSM district
		Inference	**Per hectare profitability in NFSM district is higher despite lower price, perhaps indicating a good contribution from area and yield**
	Total Pulses	NRPHN>NRPHNO	Higher per hectare returns in NFSM district
		NRPQN<NRPQNO	Lower price realization in NFSM district
		Inference	**Per hectare profitability in NFSM district is higher despite lower price, perhaps indicating a good contribution from area and yield**
Uttar Pradesh	Urad	NRPHN>NRPHNO	Higher per hectare returns in NFSM district
		NRPQN>NRPQNO	Higher price realization in NFSM district
		Inference	**Per hectare profitability in NFSM district is higher possibly because of higher price**
	Total Pulses	NRPHN>NRPHNO	Higher per hectare returns in NFSM district
		NRPQN<NRPQNO	Lower price realization in NFSM district
		Inference	**Per hectare profitability in NFSM district is higher despite lower price, perhaps indicating a good contribution from area and yield**

NRPHN and NRPHNO denote net returns per hectare of pulses in NFSM and Non-NFSM districts respectively
NRPQN and NRPQNO denote net returns per quintal of pulses in NFSM and Non-NFSM districts respectively

Chapter 9
Technology Adoption

Pulses are highly susceptible to pests and as a result development, extension and adoption of improved (pest-resistant or high-yielding) varieties is very important in pulse cultivation. In this Chapter, we analyze the technology adoption patterns in various states. A brief summary of the Chapter is followed by a detailed analysis across states.

Summary of the Chapter

More than 80% of the farmers in the sampled districts across different states are aware of the improved varieties (IV) of pulses, except in Bihar where only 50% reported awareness (Table 9.1). The main source of knowledge about IV s in the NFSM district is 'extension agent' except in Andhra Pradesh where the main source is 'neighbours' (Table 9.1). As compared to NFSM district, the level of awareness is lower in the non-NFSM district in most of the states, the lowest being in Bihar (38%). As is to be expected, the role of extension agent is much stronger in the NFSM districts, as compared to the non-NFSM districts (Table 9.2).

The percentage of households reporting area under IV s and the percentage of area under IV s to total cropped area is also higher in the NFSM districts than the non-NFSM districts in all the states except Bihar (Tables 9.3 and 9.4). 75% of the sample farmers in the NFSM districts of all the states, except Bihar, have followed at least one recommended practice for the IV s (Table 9.5). Sowing and seed practices, followed by fertilizer practices, are followed by most of the farmers (Table 9.5). As expected, the percentage of farmers not following even one recommended practice is much higher in non-NFSM districts of all the states, except Bihar. As for the problems in using the IV s of gram, the farmers have reported non-availability, expensiveness, inadequate pest resistance, need for other complementary inputs and lower yield of IV s as the major problems. In the case of moong, need for other complementary inputs, lower yield, and inadequate pest resistance (non-NFSM districts) have been cited as the major problems. For arhar, expensiveness, lower yield, inadequate pest resistance, and non-availability

(non-NFSM districts) are the major problems. For urad, expensiveness, non-availability, lower yield, and need for other complementary inputs are the major problems.

Technology Adoption in the States

Rajasthan: In the NFSM district, about 90% of the sample households reported adoption of improved varieties (IV) of moong and moth. 87% and 94% of total area under these crops respectively is under the IV s. But the adoption under gram is quite low, with only 33% of the households reporting adoption and the area under IV s is only 26%. All the sample farmers are aware of IV s. The main source of knowledge is extension agent (38%) followed by newspapers (32%) and neighbours (24%) (Table 9.1). As for improved farm practices, all the sample farmers followed one at least one recommended practice. All the sample farmers followed sowing practices, while seed practices were followed by 82% of the farmers mainly in the small, medium, and large size groups (Table 9.5). Other practices were followed by about 62% of the farmers. In response to problems with IV s of moong, 44% of the farmers reported inadequate pest resistance as the most serious problem (Table 9.7). Availability-related problems (not available, not available on time, and expensive) ranked next followed by lower-than-expected-yield in the next place. In the case of moth, inadequate pest resistance and availability-related issues emerged as the major problems followed by the lower-than-expected-yield. Another major problem reported by a majority of the farmers is the requirement of large doses of other inputs. In the case of gram, requirement of large doses of inputs is the major reported problem followed by availability-related problems. The lower yield levels do not figure as major problem In the case of gram. Among the suggested solutions for all these major corps, timely availability of IV s of seeds ranks first followed by cheaper availability of seeds or subsidy (Table 9.9).

In non-NFSM district, all the farmers in all the size groups possessed knowledge about the improved varieties (IV). Unlike in the NFSM district, the major source of this knowledge is neighbours (62%) followed by extension agent (26%) and newspapers (10%) (Table 9.2). It is noticeable that in both NFSM and non-NFSM districts that a very small proportion of marginal and small farmers reported extension agent as their major source of knowledge about IV s. This perhaps suggests some underlying bias of the existing extension system against smaller size groups. All the sample households

reported adoption of IV s and the total area under pulses in the district is under IV s. All the farmers have reported to have followed one recommended practice or the other (Table 9.6). All the farmers in all the size groups followed sowing and seed practices. Other practices have also been followed by about two-thirds of the farmers. In all the major crops- moong, moth and gram, lower-than-expected-yield, inadequate pest resistance and large doses of other inputs are the major problems with the IV s that have been reported by the farmers (Table 9.8). Availability of seeds at cheaper prices, timely availability of seeds and subsidy are the major solutions suggested by the sample farmers to overcome the abovementioned problems with IV s (Table 9.10).

Maharashtra: In the NFSM district, about 78% and 74% of the sample households reported adoption of improved varieties (IV) of moong and gram respectively. Overall, the awareness is about 84% in the district (Table 9.1). 94% and 96% of total area under these crops respectively is under the IV s (Table 9.3). But the adoption under arhar is quite low, with only 30% of the households reporting adoption but the area under IV s is about 76%. 84% of the sample farmers are aware of IV s. The main source of knowledge is extension agent (50%) followed by neighbours (43%) (Table 9.1). As for improved farm practices, about 75% of the sample farmers followed at least one recommended practice In the case of moong and gram (Table 9.5). The practices followed in moong mainly related to sowing (74%), seed practices (68%), and fertilizer application (70%). The organic manure and plant protection practices are relatively less popular. However, In the case of arhar the adoption rate of improved practices is quite low (30%). In response to problems with IV s of moong, 34% of the farmers reported expensiveness of improved varieties as the most serious problem (Table 9.7). Large doses of inputs ranked next (32%) followed by availability-related problems (not available, not available on time) and lower-than-expected-yield. In the case of gram, expensiveness of the seeds, lower yield and large doses of input have been cited as the major problems. Another major problem reported by farmers is the availability-related problems. In the case of arhar also, similar pattern is discernible. Among the suggested solutions for all these major corps, subsidy for IV s ranks first followed by cheaper availability of seeds and timely availability (Table 9.9).

In non-NFSM district, 78% of the sample farmers reported knowledge about the improved varieties (IV) (Table 9.2). As in the NFSM district, the major source of this

knowledge is extension agent (56%) followed by neighbours (44%). More than 60% of the sample households reported adoption of IV s In the case of gram and arhar (Table 9.4). The area under IV s is 100% In the case of gram while In the case of arhar it is about 81%. However, In the case of moong, the percentage of households reporting area under IV s is low (30%) but 87% of the area is under IV s. More than 60% of the sample households reported to have followed one recommended practice or the other In the case of gram and arhar (Table 9.6). However, In the case of moong this percentage is quite low at 32%. Most of the farmers in all the size groups followed sowing, seed and fertilizer practices. In the case of gram and arhar, expensiveness and non-availability on time have been reported as the major problems with IV s (Table 9.8). This is followed by the lower-than-expected-yield. In the case of moong, large doses of other inputs, lower-than-expected-yield and inadequate pest resistance have been cited as the major problems with the IV s. Availability of seeds at cheaper prices, timely availability of seeds and subsidy are the major solutions suggested by the sample farmers to overcome the abovementioned problems with IV s (Table 9.10).

Haryana: All the farmers (100%) of the sample farmers are aware of IV s. The main source of knowledge is extension agent (94% in NFSM and 46% in non-NFSM)) followed by neighbours (38% in non-NFSM) (Table 9.1 & Table 9.2). All the sample households reported adoption of improved varieties (IV) of moong and gram respectively in both the districts. 100% of the area under these crops is under the IV s (Table 9.3). As for improved farm practices, all the sample farmers followed at least one recommended practice In the case of gram in both the districts. The practices followed mainly related to sowing (100%), seed practices (100%) (Table 9.5). The organic manure and plant protection practices and fertilizer application are relatively less popular. In the case of moong, also a similar pattern has been observed. Except for fertilizer application and manure application, other practices have been followed by all the farmers in both the districts.

In response to problems with IV s of gram, 70% of the farmers in both the districts reported inadequate pest resistance as the major problem (Table 9.7 & Table 9.8). Lower-than-expected-yield and large doses of inputs ranked next. It is noteworthy that the availability-related issues did not figure as major problems in Haryana unlike in Gujarat and Maharashtra. In the case of moong, it is similar to the pattern of gram in the

NFSM district. However, in the non-NFSM district, inadequate pest resistance is the major problem followed by availability-related problems and, lower-than expected yield and larger doses of inputs (Table 9.8). Pod borer (more than 95%) is the major pest problem in both the districts followed by pod fly (about 40%).

Among the suggested solutions, for gram timely availability of seeds followed by subsidy are the major suggestions in NFSM district whereas in the non-NFSM districts, it is subsidy that is important, followed by timely and cheaper availability. In the case of moong, farmers in the NFSM district have suggested only cheaper availability of seeds to improve IV adoption (Table 9.9). In the non-NFSM districts, subsidy is more important than cheaper or timely availability of seeds (Table 9.10). Summing up, availability of seeds at cheaper prices, timely availability of seeds and subsidy are the major solutions suggested by the sample farmers to overcome the abovementioned problems with IV s.

Andhra Pradesh: In the NFSM district, all the sample farmers are aware of IV s. The main source of knowledge is neighbours (72%) followed by extension agent (28%) (Table 9.1). All the sample households reported adoption of improved varieties (IV) of gram and arhar. The entire area under these crops respectively is under the IV s. As for improved farm practices, 84% of the sample farmers followed at least one recommended practice. 40% of the sample farmers followed sowing practices, while seed practices were followed by 28% of the farmers mainly in the medium and large size groups (Table 9.5). Other practices were followed by about 16% of the farmers. In response to problems with IV s of gram, 78% of the farmers reported lack of timely availability as the most serious problem (Table 9.7). Inadequate pest resistance ranked next (73%) followed by expensive seeds in the next place (40%). Among the suggested solutions, timely availability of IV s of seeds ranks first followed by cheaper availability of seeds and subsidy (Table 9.9).

In the non-NFSM district, 88% the sample farmers possessed knowledge about the improved varieties (IV) (Table 9.2). As in the NFSM districts, the major source of this knowledge is neighbours (56%) followed by extension agents (40%) and newspapers (4%). All the households reporting awareness have adopted IV s. 95% of the total area under pulses in the district is under IV s (Table 9.4). Only 56% of the sample farmers

have reported to have followed one recommended practice or the other, showing a lower rate of adoption of recommended practices in the district (Table 9.6). 42% of the farmers followed sowing practices. This percentage In the case of marginal farmers is only 20%. Seed practices have been followed by 22% of the farmers while other practices have been followed by about 14%. Lower-than-expected-yield (43%), expensive seeds (37%), inadequate pest resistance (30%), and large doses of other inputs (27%) are the major problems with the IVS that have been reported by the farmers (Table 9.8). Availability of seeds at cheaper prices, and subsidy provision are the major solutions suggested by the sample farmers to overcome the abovementioned problems with IV s (Table 9.10).

Bihar: In the NFSM district, only about 25% of the sample households reported adoption of improved varieties (IV) of masur and gram while 33% of arhar households reported adoption of IV s. The area under IVs is quite low with about 18% of total area under these crops being under the IV s (Table 9.3). About 50% of the sample farmers are aware of IV s (Table 9.1). The awareness improves with the landholding size group. The main source of knowledge is extension agent (48%) followed by neighbours (36%) and newspapers (16%) (Table 9.1). The role of extension agent appears lowest (33%) in the marginal category and increases with the size group. As for improved farm practices, 28% of the sample households did not follow any of the recommended practices (Table 9.5). 28% of the farmers followed sowing practices, while seed practices were followed by 44% % of the farmers. Other practices were not followed by any of the farmers. In response to problems with IV s, farmers mainly reported availability-related problems (not available, not available on time, and expensive) as the most serious problem. 48% and 40% respectively reported ‘not available on time’ and ‘not available at all’ as the major problems (Table 9.7). Among the suggested solutions for all these major corps, cheaper availability of seeds ranks first (44%) followed by timely availability of seeds (36%) and subsidy (20%) (Table 9.9).

In non-NFSM districts, only about 19% of the sample households reported adoption of improved varieties (IV) of masur while In the case of gram and arhar this percentage is 42% and 67% respectively. The area under IV s is quite low with about 27% of masur area and 32% of the gram area under the IV s. This percentage is slightly higher than that of the NFSM district. Only 38% of the sample farmers are aware of IV s (Table 9.2). The awareness improves with the landholding size group. The main source of knowledge is

extension agent (37%) followed by neighbours (30%) and newspapers (27%). As for improved farm practices, about 95% of the sample households followed at least one of the recommended practices. 53% of the farmers followed seed practices, while sowing practices were followed by 42% % of the farmers (Table 9.6). Other practices were not followed by any of the farmers. In response to problems with IV s, farmers mainly reported availability-related problems (not available, not available on time, and expensive) as the most serious problem. 40% and 44% reported “not available on time” and “not available at all” respectively as the major problems (Table 9.8). About 18% reported expensive seeds as the major problem. Among the suggested solutions for all these major corps, timely availability of seeds (47%) ranks first followed by cheaper availability of seeds (42%) and subsidy (14%) (Table 9.10).

Uttar Pradesh: In the NFSM district, all the sample households (100%) reported adoption of improved varieties (IV) of urad and pea (Table 9.3). 100% of the area under these crops respectively is under the IV s. But the adoption under moong is quite low, with only 16% of the households reporting adoption. All the sample farmers are aware of IV s. The main source of knowledge is extension agent (72%) followed by neighbours (24%) (Table 9.1). As for improved farm practices, 88% of the sample farmers followed at least one recommended practice. 88% of the sample farmers followed sowing practices, while seed practices were followed by 56% of the farmers (Table 9.5). Other practices were also followed by about 50% of the farmers.

In response to problems with IV s of urad, 80% of the farmers reported availability-related problems (not available) as the most serious problem followed next by expensiveness of the seed varieties (20%) (Table 9.7). In the case of moong, the pattern is slightly different. 57% of the farmers reported expensiveness of the seed varieties as the most serious problem followed next by availability-related problems (43%). In the case of pea, the pattern is similar to that of urad. 78% of the farmers reported availability-related problems (not available) as the most serious problem followed next by expensiveness of the seed varieties (22%). Among the suggested solutions for all these major corps, cheaper availability of seeds ranks first followed by subsidy and timely availability of seeds (Table 9.9).

In the non-NFSM district, about 71% of the sample households reported adoption of improved varieties (IV) (Table 9.4). Almost the entire area under pulses in this district is under IV s, except for masur which shows 97% of IV area. All the sample farmers are aware of IV s (Table 9.1). The main source of knowledge is neighbours (60%) followed by extension agent (30%) and newspapers (10%). As for improved farm practices, about 92% of the sample households followed at least one of the recommended practices (Table 9.6). 92% of the farmers followed seed practices, while sowing practices were followed by 90% of the farmers. Other practices were also followed by 90% of the farmers. Therefore, in this district, the recommended farm practices appear to have been widely followed.

In response to problems with IVs of urad, 74% of the farmers reported availability-related problems (not available) as the most serious problem followed next by expensiveness of the seed varieties (26%) (Table 9.8). In the case of arhar, masur and gram the pattern is similar to that of urad. In the case of arhar 72% of the farmers reported availability-related problems (not available) as the most serious problem followed next by expensiveness of the seed varieties (28%). In the case of masur, these corresponding percentages are 68% and 32%. In the case of masur, the corresponding percentages are 76% and 24%. Among the suggested solutions for all these major corps, cheaper availability of seeds ranks first followed by subsidy and timely availability of seeds (Table 9.10).

Punjab: In the NFSM district, all the sample households reported adoption of improved varieties (IV) of summer moong, kharif moong, and gram (Table 9.3). 100% of total area under these crops is under the IV s. 100% of the sample farmers are aware of IV s. The main source of knowledge is extension agent (50%) followed by newspapers (36%) and neighbours (14%) (Table 9.1). As for improved farm practices, all the sample farmers followed at least one recommended practice In the case of moong (summer and kharif) and gram. The practices followed mainly related to fertilizer application (100% for all three crops), seed practices (100% for moong and 88% for gram) and sowing practices (92% for moong and 86% for gram) and plant protection measures (88% to 98%) (Table 9.5). It is evident that this district shows a relatively high level of adoption of recommended practices in pulses cultivation.

In response to problems with IV s of kharif moong, 24% of the farmers ranked much-lower-yield-than-expected as the most serious problem followed closely by expensiveness of the seeds (20%), inadequate pest resistance (19%) and large doses of input usage (18%) (Table 9.7). It is notable that availability-related problems (not available, not available on time) have not been reported as major problems. In the case of summer moong, 30% of the farmers ranked inadequate pest resistance as the most serious problem followed closely by large doses of input usage (25%), much-lower-yield-than-expected (18%) and expensiveness of the seeds (15%). It is notable that availability-related problems (not available, not available on time) have not been reported as major problems. In the case of gram, 33% of the farmers ranked much-lower-yield-than-expected as the most serious problem followed closely by expensiveness of the seeds (27%) and inadequate pest resistance (25%). Non-availability of IV seeds has been reported by 7% of the sample farmers. Among the suggested solutions for all these major corps, subsidy for IV s ranks first followed by cheaper availability of seeds and timely availability (Table 9.9).

In the non-NFSM district, all the sample households reported adoption of improved varieties (IV) of summer moong and 100% of total area under the crop is under the IV s (Table 9.4). 100% of the sample farmers are aware of IV s (Table 9.2). The main source of knowledge is extension agent (56%) followed by newspapers (44%). As for improved farm practices, all the sample farmers followed at least one recommended practice. The practices followed mainly related to fertilizer application (100%), seed practices (100%) and sowing practices (90%) and plant protection measures (86%) (Table 9.6). It is evident that this district also shows a relatively high level of adoption of recommended practices in pulses cultivation.

In response to problems with IV s of summer moong, 41% of the farmers ranked large doses of input usage as the most serious problem followed by inadequate pest resistance (18%), much-lower-yield-than-expected (14%) and expensiveness of the seeds (11%) (Table 9.8). It is notable that availability-related problems (not available, not available on time) have not been reported as major problems. Among the suggested solutions for all these major corps, subsidy (34%) for IV s ranks first followed by timely availability of seeds (32%) and cheaper availability (27%) (Table 9.10).

Table 9.1: **Percentages of farmers reporting knowledge of IVs and Sources of knowledge - NFSM Districts in different states**

State	% of farmers aware of improved varieties	Sources of knowledge				
		Extension Agent	Neighbours	Newspaper/Media	Other	Total
Rajasthan	100	38	24	32	6	100
Maharashtra	84	50	43	2	5	100
Haryana	100	94	6	0	0	100
AP	100	28	72			100
Bihar	50	48	36	16		100
UP	100	72	24		4	100
Punjab	100	50	14	36		100

Table 9.2: **Percentages of farmers reporting knowledge of IVs and Sources of knowledge - non-NFSM Districts in different states**

State	% of farmers aware of improved varieties	Sources of knowledge				
		Extension Agent	Neighbours	Newspaper/Media	Other	Total
Rajasthan	100	26	62	10	2	100
Maharashtra	78	56	44			100
Haryana	100	46	38		16	100
AP	88	40	56	4		100
Bihar	38	37	30	27	7	100
UP	100	30	60	10		100
Punjab	100	56		44		100

Table 9.3: **Percentage of household reporting area under IVs - NFSM Districts in different states**

Crops	State	RAJ	MHR	HRY	AP	BHR	UP	PB
Moong	% HHLDs reporting area under Ivs		78				16	
	% of area under improved varieties		94	100			100	
Gram	% HHLDs reporting area under Ivs		74					100
	% of area under improved varieties		96	100				100
Arhar	% HHLDs reporting area under Ivs		30					
	% of area under improved varieties		76					
Urad	% HHLDs reporting area under Ivs						100	
	% of area under improved varieties						100	
Pea	% HHLDs reporting area under Ivs						100	
	% of area under improved varieties						100	
Summer Moong	% HHLDs reporting area under Ivs							100
	% of area under improved varieties							100
Kharif Moong	% HHLDs reporting area under Ivs							100
	% of area under improved varieties							100
Overall	% HHLDs reporting area under Ivs	72			100	30	72	
	% of area under improved varieties	65			100	18	100	

Table 9.4: **Percentage of household reporting area under IVs - non-NFSM Districts in different states**

Crops	State	RAJ	MHR	HRY	AP	BHR	UP	PB
Moong	% HHLDs reporting area under Ivs		30					
	% of area under improved varieties		87	100				
Gram	% HHLDs reporting area under Ivs		60				42	
	% of area under improved varieties		100	100			100	
Arhar	% HHLDs reporting area under Ivs		66				34	
	% of area under improved varieties		81				100	
Urad	% HHLDs reporting area under Ivs						34	
	% of area under improved varieties						100	
Masur	% HHLDs reporting area under Ivs						100	
	% of area under improved varieties						97	
Summer Moong	% HHLDs reporting area under Ivs							100
	% of area under improved varieties							100
Overall	% HHLDs reporting area under Ivs	100			100	34	71	
	% of area under improved varieties	100			95	27	98	

Table 9.5: **Recommended practices adopted by the farmers for IVs - NFSM Districts in different states**

State	Crop Reported	Followed some practice						Not follower any practice
		Sowing practices	Seed practices	Others	Organic Manure	Chemical Fertilizer	Plant Protection	
AP.	Overall Pulses	40	28	16				16
BHR	Overall Pulses	28	44					28
HRY	Gram	100	100		46	98	98	
HRY	Moong	100	100		33	33	100	
MHR	Gram	70	56		26	70	46	26
MHR	Moong	74	68		46	70	48	22
MHR	Arhar	26	26		12	28	22	70
PB	Gram	86	88			100	98	
PB	Kharif Moong	93	100			100	93	
PB	Summer Moong	92	100			100	88	
RAJ	Overall Pulses	100	82	62				
UP.	Overall Pulses	88	56	50				12

Table 9.6: **Recommended practices adopted by the farmers for IVs - non-NFSM Districts in different states**

State	Crop Reported	Followed some practice						Not follower any practice
		Sowing practices	Seed practices	Others	Organic Manure	Chemical Fertilizer	Plant Protection	
AP.	Overall Pulses	42	22	14				44
BHR	Overall Pulses	42	53					5
HRY	Gram	100	100		66	90	100	
HRY	Moong	100	100		31	59	100	
MHR	Gram	60	52		22	54	24	40
MHR	Moong	32	26		28	30	18	68
MHR	Arhar	64	60		44	58	34	36
PB	Summer Moong	90	100			100	86	0
RAJ	Overall Pulses	100	100	66				0
UP.	Overall Pulses	92	90	90				8

Table 9.7: Percentage of households reporting problems with improved varieties - NFSM Districts in different states

Problems	States	RAJ			MHR			HRY		AP.	BHR	UP.			PB		
	Crops	Gram	Moong	Moth	Gram	Moong	Arhar	Gram	Moong	Gram	Overall Pulses	Moong	Pea	Urad	Gram	Kharif Moong	Summer Moong
Not available at all	Rank1	0	2	15		19	20	2			40				7		
	Rank2	14	25	13	11	11	30	0			32					9	
	Rank3	21	6	4	26	26	10	0			20				20	30	36
Available but not on time	Rank1	2	0	15	14	21		4		78	48	43	78	80			
	Rank2	28	33	22	21	11		8			36	57	22	20	6	10	
	Rank3	16	2	4	7	14	30	24			8				12	16	15
Very expensive	Rank1	26	17	20	58	34	33	4		40	12	57	22	20	27	20	15
	Rank2	26	21	13	13	34	33	8			32	43	78	80	18	24	26
	Rank3	19	6	22	10	13	8	16			36				20	13	7
Need large doses of other inputs	Rank1	40	15	13	10	32	27	6							10	18	25
	Rank2	19	8	20	27	26	9	18	50						23	40	45
	Rank3	12	21	24	23	6	9	32	50		16				31	25	30
Much lower yield than expected	Rank1	19	23	17	26	6	22	14		27					33	24	18
	Rank2	12	8	17	19	25	22	48	50						23	29	26
	Rank3	19	46	30	10	31	33	20	50		20	57	78	76	21	38	56
Pest resistance not adequate	Rank1	14	44	20	3	14	20	70	100	73					25	19	30
	Rank2	2	4	15	10	4	10	18							18	29	25
	Rank3	14	19	15	23	11		8				43	22	24	35	35	35

Table 9.8: Percentage of households reporting problems with improved varieties - non-NFSM Districts in different states

Problems	States	RAJ			MHR			HRY		AP.	BHR	UP.				PB
	Crops	Gram	Moong	Urad	Gram	Moong	Arhar	Gram	Moong	Arhar	Overall Pulses	Gram	Masur	Arhar	Urad	Summer Moong
Not available at all	Rank1	0	0	0	14	18	21				40					
	Rank2	0	0	0	24		10				27					
	Rank3	5	0	0	10		28		7		13					26
Available but not on time	Rank1	5	0	0	29	9	24		22	10	44	76	68	72	74	
	Rank2	0	17	4	14	18	21		7		28	24	32	28	26	
	Rank3	11	17	9	29	27	17	16	15		17					
Very expensive	Rank1	0	17	15	24	9	24	8	26	37	18	24	32	28	26	11
	Rank2	11	0	4	33	18	28	36	19		12	76	68	72	74	
	Rank3	11	25	23	19	27	24	24	7		18					16
Need large doses of other inputs	Rank1	42	17	23		36	17	18	4	27						41
	Rank2	0	17	11	14	27	3	10	37		25					34
	Rank3	47	25	40	10	18	14	22	7		27	81		78		25
Much lower yield than expected	Rank1	42	58	45	29	18	7	4	7	43	14					14
	Rank2	37	25	43	5	27	31	40	22		14					26
	Rank3	16	17	4	29	9	7	24	33			19	76	22	68	46
Pest resistance not adequate	Rank1	11	8	17	5	18	7	70	41	30						18
	Rank2	53	42	38	10	9	7	14	15		7					42
	Rank3	11	17	23	5	18	10	14	30		14		24		32	16

Table 9.9: Percentage of households suggesting solutions- NFSM Districts in different states

Suggestions	RAJ			MHR			HRY		AP	BHR	U. P.	PB		
	Gram	Moong	Moth	Gram	Moong	Arhar	Gram	Moong	Gram	Overall Pulses	Overall Pulses	Gram	Kharif Moong	Summer Moong
Cheaper availability of seeds	28	29	30	28	38	25	22	100	16	44	72	27	33	29
Timely availability of seeds	53	46	39	19	27	18	44		71	36	6	25	32	29
Subsidy	19	25	30	53	41	55	34		9	20	22	51	46	40
Any Others(Specify)	0	0	0						4					

Table 9.10: Percentage of households suggesting solutions - non-NFSM Districts in different states

Suggestions	RAJ			MHR			HRY		AP.	BHR	UP.	PB
	Gram	Moong	Urad	Gram	Moong	Arhar	Gram	Moong	Arhar	Overall Pulses	Overall Pulses	Summer Moong
Cheaper availability of seeds	74	33	66	24	18	45	12	33	48	42	80	27
Timely availability of seeds	21	33	21	29	64	34	26	11	12	47	4	32
Subsidy	5	33	13	48	18	21	62	56	48	14	16	34
Any Others(Specify)	0	0	0						20			

Chapter 10
Marketing

Along with input supply, output marketing also plays a crucial role in farmers' decision-making about the crop mix. Marketing, particularly the state support in marketing, assumes even more importance In the case of pulses as pulses are vulnerable to abiotic and biotic stresses and are generally gown on marginal lands. In this chapter, we analyze the aspects related to marketing in the study A summary of the Chapter is followed by a detailed description of marketing in each of the states.

Summary of the Chapter

Majority of the households (>50%) are marketing through the regulated market and majority of production (>50%) is being marketed through regulated market in almost all the states, except Rajasthan. The next important channel of marketing is commission agent. Village market is prominent only in Rajasthan. The notable feature is that there is absolutely no procurement of pulses by NAFED in any of the sample districts – NFSM or non-NFSM in any of the states.

Pulses Marketing in the States

Rajasthan: In the NFSM district, majority of the households (52%) are selling moong in the village market followed by the regulated market (40%) (Table 10.1). Bulk of the sale, ranging from 56% to 64% of the total production, is made in the village market during the two years of analysis i.e. 2007-08 and 2008-09. The share of the regulated market was about 36% in 2007-08 but fell to 31% in 2008-09 (Table 10.2). The higher proportion of sale in the village market may be because the price received in the village market is almost equal to the price in the regulated market (Table 10.5). Thus, selling in the village market is profitable to the farmers as it also precludes several other transaction costs because of transportation, market fees etc.

A similar situation exists In the case of moth. About 50% of the produce is marketed through village market and 41% through regulated market (Table 10.1). Majority of the produce is sold in the village market followed by the regulated market. It is noticeable

that there is an increase in the percentage of production sold in the village market from 50% in 2007-08 to 61% in 2008-09 and a corresponding decrease in the share of the regulated market from 38% to 31% (Table 10.2). This drop is noticed despite the fact that the price received in the regulated market is higher than that in the village market by about 64 rupees (Table 10.5). This is probably due to other transaction costs because of transportation, market fees etc.

In the case of gram, the situation is similar. 49% and 42% of the produce is marketed in village market and regulated market respectively (Table 10.1). However, in terms of quantity sold, regulated market is the main channel with 50 per cent of the output marketed through this channel. However, there is a substantial increase in the output marketed through village market from 37% in 2007-08 to 47% in 2008-09 (Table 10.2). This increasing share of village market is due to the negligible price difference between the two channels (Table 10.5). **There is absolutely no procurement by any public agency for any crop from the sample farmers during the study period.**

In the NON-NFSM district, In the case of moong, there is a distinct shift away from the regulated market to the village market. In 2007-08 about 55% of the households marketed their produce through the regulated market but this percentage fell to just 25% by 2008-09 (Table 10.3). However, in the case of urad and gram, regulated market is the main source of marketing with a share of more than 50%. In the case of urad, the situation remained unchanged from 2007-08 to 2008-09. However, in the case of gram, there is a substantial reduction in the share of regulated market.

As for the quantity sold, in the case of moong, the proportion of output marketed through various channels underwent a major change between 2007-08 and 2008-09. The percentage marketed through regulated market fell from 63% to 37% while in the village market the percentage increased from 37% to 63% (Table 10.4). This could be mainly because of the negligible difference between the village market and the regulated market price (Table 10.6). However, in urad and gram, the regulated markets command a significant share (more than 65%). There is no government procurement in this district, as in the case of NFSM district.

Maharashtra: In NFSM district, majority of the households (51%) are selling moong in the regulated market followed by the commission agent (33%) (Table 10.1). Only a small proportion of the households (about 15%) are marketing through the village market. Bulk of the sale, ranging from 47% to 51% of the total production, is made in the regulated market during the two years of analysis i.e. 2007-08 and 2008-09. The share of commission agent was about 42% in 2007-08 but fell to 38% in 2008-09 (Table 10.2). The higher proportion of sale in the regulated market as compared to the village market may be because the price received in the former is much higher than that in the latter (Table 10.5).

A similar situation exists In the case of gram. The percentage of farmers selling in regulated market is more than 50% and their dependence on commission agents is about 33% (Table 10.1). Major portion of the production is sold in the regulated market followed by the commission agent. About 48%-57% of the production is marketed through the regulated market and 36%-44% through the commission agent (Table 10.2). It is noticeable that there is an increase in the percentage of production sold in the regulated market from 48% in 2007-08 to 57% in 2008-09 and a corresponding decrease in the share of the commission agent from 44% to 36% (Table 10.2). This drop is attributable the fact that the price received in the regulated market is higher (Table 10.5).

The situation is similar in arhar too. 71%-75% of the households market through the regulated market and 13%-21% of the households market through the commission agent (Table 10.1). In terms of quantity sold, regulated market is the main channel with 78%-85% of the output marketed through this channel. There is a substantial increase in the output marketed through this from 78% in 2007-08 to 85% in 2008-09, with a corresponding decline in the share of the commission agent from 19% to 10% (Table 10.2). **There is absolutely no procurement by any public agency for any crop from the sample farmers during the study period.**

In the non-NFSM districts, in the case of all three crops, there is a predominant presence of regulated market in this district with more than 90% of the households marketing through this channel (Table 10.3). There is virtually no marketing through the village market. As for quantity sold, as in the case of households marketing, a very large proportion of output is marketed through the regulated market. The percentage marketed

through regulated market is about 92% In the case of moong, 96% In the case of gram and arhar (Table 10.4). There is no government procurement in this district, as in the case of NFSM district.

Haryana: In the NFSM district, all the households (100%) in the NFSM district of Bhiwani are marketing their pulse produce in the village market (Table 10.1). In the non-NFSM district, about 89% are marketing in the village market while 12% of the households (7% in the regulated market and 5% through commission agent) are marketing through other channels (Table 10.3). In the case of gram, the quantity sold in the village market is higher in the non-NFSM district as compared to the NFSM district market (Tables 10.5 & 10.6). However, the price received in the NFSM district is higher. In the case of moong, the quantity sold and the price received are much lower in the NFSM district as compared to the non-NFSM district (Tables 10.5 & 10.6). **There is absolutely no procurement by NAFED for either crop in both the districts during the study period.**

Bihar: In the NFSM district, majority of the households (74%) are selling to the commission agent. Only a small proportion of the households (about 26%) are marketing through the village market (Table 10.1). Majority of the production is sold through the commission agent (86%) followed by village market (Table 10.2). **There is absolutely no procurement by any public agency for any crop from the sample farmers during the study period.** In the non-NFSM district, village market is the predominant channel with 70% of the households marketing through this channel (Table 10.3). About 30% of the households market through other channels. A very large proportion of output is marketed through the village market. The percentage marketed through this channel is about 82%. **There is no government procurement in this district, as in the case of NFSM district.**

Uttar Pradesh: In the NFSM district, all the households are selling in the regulated market (Table 10.1). About 86% of the urad, 92% of the moong and 83% of peas are sold through the regulated market in this district (Table 10.2). **There is absolutely no procurement by any public agency for any crop from the sample farmers during the study period.** In the non-NFSM district, the entire marketing is done only in the village market in this district (Table 10.3). The entire marketed surplus of urad, moong,

masur and gram is disposed off in the village market (Table 10.4). **There is no procurement by any public agency for any crop from the sample farmers during the study period.**

Punjab: In the NFSM district, for moong (summer and kharif) majority of the households (47%-52%) are selling in the regulated market followed by the commission agent (22%-33%) followed by village market (7% to 16%) (Table 10.1). A similar situation exists In the case of gram. About 48%-52% of the households market through the regulated market and 27%-30% through the commission agent. About 6% to 8% of the farmers also sell in the village market. **There is absolutely no procurement by NAFED for any crop from the sample farmers during the study period.** In the non-NFSM district about 50% of the households are selling moong (summer) in the regulated market followed by the commission agent (27%-38%) followed by village market (9% to 13%) (Table 10.3).

Table 10.1: Percentage of the total households marketing through various channels - NFSM Districts in different states

State	Crops	Village market		Commission agent		Regulated market		Govt. agency (NAFED)		Others		Total	
		2007-08	2008-09	2007-08	2008-09	2007-08	2008-09	2007-08	2008-09	2007-08	2008-09	2007-08	2008-09
BHR	Overall Pulses		26		74								100
HRY	Overall Pulses		100										100
MHR	Gram	14	14	32	34	54	51					100	100
MHR	Moong	15	16	33	33	51	51					100	100
MHR	Arhar	7	13	21	13	71	75					100	100
PB	Gram	8	6	30	27	48	52			14	15	100	100
PB	Kh Moong	16	12	22	27	49	49			14	12	100	100
PB	Smr Moong	10	7	28	33	47	52			16	9	100	100
RAJ	Gram		49		7		42				2		100
RAJ	Moong	53	52	6	6	38	40			2	2	100	100
RAJ	Moth		50		7		41				2		100
UP.	Overall Pulses						100						100

Table 10.2: Percentage of quantity sold through various channels - NFSM Districts in different states

State	Year	Crops	Village Market	Comm. Agent	Regulated market	Govt. Agency	Others	Total
RAJ	2007-08	Moong	56	6	36		2	100
RAJ	2007-08	Moth	50	7	38		4	100
RAJ	2007-08	Gram	37	11	51		1	100
RAJ	2008-09	Moong	64	3	31		2	100
RAJ	2008-09	Moth	61	3	31		6	100
RAJ	2008-09	Gram	47	5	47		1	100
MHR	2007-08	Moong	11	42	47			100
MHR	2007-08	Gram	7	44	48			100
MHR	2007-08	Arhar	3	19	78			100
MHR	2008-09	Moong	10	38	51			100
MHR	2008-09	Gram	7	36	57			100
MHR	2008-09	Arhar	6	10	85			100
HRY	2009-10	Gram	100					100
HRY	2009-10	Moong	100					100
BHR	2008-09	Masur	14	86				100
BHR	2008-09	Gram	14	86				100
UP	2008-09	Urad			86		14	100
UP	2008-09	Moong			92		8	100
UP	2008-09	Pea			83		17	100
PB	2007-08	Smr Moong	4	41	54		2	100
PB	2007-08	Kh Moong	6	38	54		2	100
PB	2007-08	Gram	3	40	53		4	100
PB	2008-09	Smr Moong	3	44	51		2	100
PB	2008-09	Kh Moong	5	35	57		3	100
PB	2008-09	Gram	1	46	49		4	100

Table 10.3: Percentage of the total households marketing through various channels – Non-NFSM Districts in different states

State	**Crop**	**Village market**		**Commission agent**		**Regulated market**		**Govt agency (NAFED)**		**Others**		**Total**	
		2007-08	2008-09	2007-08	2008-09	2007-08	2008-09	2007-08	2008-09	2007-08	2008-09	2007-08	2008-09
AP.	Arhar						100						100
BHR	Overall Pulses		70								30		100
HRY	Overall Pulses		89		5		7						101
MHR	Gram			9	5	91	95					100	100
MHR	Moong			8	6	92	94					100	100
MHR	Arhar			7	14	93	86					100	100
PB	Smr Moong	13	9	27	38	50	48			11	5	100	100
RAJ	Gram	32	47	5		64	53					100	100
RAJ	Moong	45	75			55	25					100	100
RAJ	Urad	43	43	2	2	55	55					100	100
UP.	Overall Pulses		100										100

Table 10.4: Percentage of quantity sold through various channels – Non-NFSM Districts in different states

State	Year	Crops	Village Market	Comm. Agent	Regulated market	Govt. Agency	Others	Total
RAJ	2007-08	Moong	37	0	63			100
RAJ	2007-08	Urad	20	0	80			100
RAJ	2007-08	Gram	13	2	85			100
RAJ	2008-09	Moong	63	0	37			100
RAJ	2008-09	Urad	17	0	83			100
RAJ	2008-09	Gram	32	0	68			100
MHR	2007-08	Moong		9	91			100
MHR	2007-08	Gram		3	97			100
MHR	2007-08	Arhar		2	98			100
MHR	2008-09	Moong		7	93			100
MHR	2008-09	Gram		4	96			100
MHR	2008-09	Arhar		7	93			100
HRY	2009-10	Gram	90	1	9			100
HRY	2009-10	Moong	93	7	0			100
AP	2008-09	Arhar			100			100
BHR	2008-09	Masur	82				18	100
BHR	2008-09	Moong	82				18	100
UP	2008-09	Urad	100					100
UP	2008-09	Moong	100					100
UP	2008-09	Masur	100					100
UP	2008-09	Gram	100					100
PB	2007-08	Smr Moong	10	39	48		3	100
PB	2008-09	Smr Moong	11	41	47		2	100

Table 10.5: Actual quantity sold and prices received through various channels - NFSM Districts

(Qty in qtls and price in Rs/qtl)

State	Year	Crops	Village Market		Comm. Agent		Regulated market		Govt. Agency		Others		Total	
			Qty Sold	Price	Qty Sold	Price	Qty Sold	Price	Qty Sold	Price	Qty Sold	Price	Qty Sold	Price
RAJ	2007-08	Moong	414	4341	44	4275	270	4413			18	4400	746	4371
RAJ	2007-08	Moth	370	4330	49	4313	282	4317			33	4400	733	4347
RAJ	2007-08	Gram	419	1923	120	1825	574	1927			15	1720	1128	1849
RAJ	2008-09	Moong	373	5939	19	5900	182	5923			9	6000	582	5924
RAJ	2008-09	Moth	299	5887	14	5950	150	5951			27	5900	489	5912
RAJ	2008-09	Gram	476	2196	48	2125	469	2208			14	2200	1007	2182
MHR	2007-08	Moong	31	3152	118	3841	134	3860					283	3766
MHR	2007-08	Gram	44	2566	265	2115	287	2285					596	2226
MHR	2007-08	Arhar	2	2500	13	2769	54	2828					69	2803
MHR	2008-09	Moong	35	3884	128	4145	171	4219					333	4172
MHR	2008-09	Gram	50	2601	266	2512	423	2531					739	2528
MHR	2008-09	Arhar	4	2914	6	3133	52	3053					62	3063
HRY	2009-10	Gram	242	2202									242	2202
HRY	2009-10	Moong	4	3500									4	3500
BHR	2008-09	Masur	52	2012	307	3733							359	3485
BHR	2008-09	Gram	30	2423	185	2423							215	2423
UP	2008-09	Urad					796	2427			127	2200	923	2396
UP	2008-09	Moong					72	3216			6	2974	78	3197
UP	2008-09	Pea					898	2258			189	2139	1086	2053
PB	2007-08	Smr Moong	18	2216	209	2433	277	2435			8	2304	512	2347
PB	2007-08	Kh Moong	11	2395	69	2481	96	2494			3	2429	180	2450
PB	2007-08	Gram	5	2478	62	2540	83	2517			6	2462	157	2499
PB	2008-09	Smr Moong	17	2393	226	2400	261	2429			10	2360	513	2396
PB	2008-09	Kh Moong	10	2410	64	2400	102	2442			5	2431	181	2421
PB	2008-09	Gram	2	2427	71	2439	77	2454			6	2417	156	2434

Table 10.6: Actual quantity sold and prices received through various channels – non-NFSM districts

(Qty in qtls and price in Rs/qtl)

State	Year	Crops	Village Market		Comm. Agent		Regulated market		Govt. Agency		Others		Total	
			Qty Sold	Price	Qty Sold	Price	Qty Sold	Price	Qty Sold	Price	Qty Sold	Price	Qty Sold	Price
RAJ	2007-08	Moong	34	4300			56	4308					90	4304
RAJ	2007-08	Urad	59	3970	1	3950	241	3923					300	3953
RAJ	2007-08	Gram	25	2160	5	2200	161	2190					191	2182
RAJ	2008-09	Moong	38	5888			22	5900					59	5894
RAJ	2008-09	Urad	75	4920	1	4900	360	4901					436	4917
RAJ	2008-09	Gram	38	2068			79	2129					117	2098
MHR	2007-08	Moong			10	3700	103	3672					114	3674
MHR	2007-08	Gram			10	2263	288	2189					298	2191
MHR	2007-08	Arhar			5	2589	188	2746					192	2742
MHR	2008-09	Moong			10	3700	128	4101					138	4072
MHR	2008-09	Gram			11	2400	260	2450					271	2448
MHR	2008-09	Arhar			11	3068	155	3060					166	3061
HRY	2009-10	Gram	272	2094	3	3075	28	2167					302	2111
HRY	2009-10	Moong	53	4632	4	2000	0	0					57	4447
BHR	2008-09	Masur	76	3600							17	3600	92	3600
BHR	2008-09	Moong	49	5500							10	5500	59	5500
UP	2008-09	Urad	84	2391									84	2391
UP	2008-09	Moong	140	2935									140	2935
UP	2008-09	Masur	1074	2682									1074	2682
UP	2008-09	Gram	136	2385									136	2385
PB	2007-08	Smr Moong	106	2392	430	2366	534	2442			32	2393	1103	2398
PB	2008-09	Smr Moong	114	2336	438	2483	499	2462			21	2380	1073	2415

Chapter 11
Farmers' Perceptions

In this Chapter we discuss the farmers' perception of the various aspects of pulses cultivation such as their reasons for growing pulses or shifting away from pulses, the problems and constraints that they face including the pest problems, their suggestions for improving pulses production, their willingness to increase pulses farming if assured price support is provided etc. A brief summary of the Chapter is given below followed a more detailed discussion of farmers' perceptions related to various aspects of pulses cultivation in the study states.

Summary of the Chapter

Reasons for growing pulses vary across state widely but are mostly the same in the NFSM and the Non-NFSM districts within a state, except UP (Table 11.1). In Maharashtra, Haryana, and the NFSM districts of UP, profitability is the main reason for growing pulses while in Rajasthan, Haryana, and non-NFSM districts of UP, lack of irrigation is the major problem. In Bihar, home consumption and inferior land quality are the reasons for growing pulses. In Punjab, pulses are mainly grown to make use of fallow lands.

Criteria used while opting to grow pulses are again different in each state but are largely the same within a state across NFSM and non-NFSM districts. In Maharashtra, monsoon plays a major role. In Haryana Rajasthan and UP, the inferior land quality or soil suitability play a major role in farmers' decision while in Punjab the availability of fallow lands is a major consideration.

The main reason for relatively lesser area under pulses in most states (Haryana, Bihar, UP and non-NFSM district of Rajasthan) is pest problems (Table 11.3). In other states, the lower level and higher instability of pulses vis-à-vis other crops and lower profitability are the main reasons.

Inferior quality lands are mainly used for growing coarse cereals in most of the states except Maharashtra where pulses are mainly grown on inferior quality lands (Table 11.4.1). As for problems with growing pulses on inferior quality lands, low yield is stated as the most serious problem in all the states along with poor grain quality in Rajasthan, UP and Bihar (Table 11.4.2). Farmers in most of the states reported that low yield is the main reason for their shifting away from pulses farming to other crops. This is followed by absence of assured market (Table 11.5). Pod Borer is the most serious pest problem afflicting the pulse crops in the sample districts all the states except UP where pod fly is the major problem (Table 11.6.1). Moong is the crop affected most by the pest problems followed by gram and arhar (Table 11.6.2). As for major problems encountered in growing pulses, higher pest incidence and lower yield have been cited as the major problems in majority of the states (Table 11.7). In response to their willingness to grow more pulses if provided with higher MSP, it is interesting to note that only in the non-NFSM districts (and in UP) all the respondents answered in the affirmative. This is indicative of the fact that non-price factors such as lower yield and yield instability are still important determinants of farmers' willingness to grow pulses (Table 11.8). This is also confirmed by the suggestions made by the farmers to improve pulses cultivation (Table 11.9). Farmers in most of the states suggested improving irrigation facilities and making high-yielding varieties available as important. Assured procurement with MSP has been suggested only in Punjab and the non-NFSM districts of Maharashtra and Bihar.

Farmers' Perceptions in the States

11.1 Reasons for Growing Pulses

Rajasthan: In the NFSM district, about 92% of the sample farmers reported that they grow pulses because of poor irrigation facilities (50%) and inferior quality of lands (42%) – the factor that makes pulses the only option for farmers (Table 11.1). Lack of irrigation is the main factor among the small and medium categories as 75% and 60% of the farmers in these categories reported irrigation as the major constraint. Irrigation does not appear to be a major binding constraint for large farmers. In the non-NFSM district, lack of irrigation (46%) and inferior quality of lands have been cited as the major reasons for growing pulses (Table 11.1). Lack of irrigation has been cited across all the size

groups but inferior quality of land has been cited mainly by the marginal and small farmers.

Maharashtra: In NFSM district about 92% of the sample farmers reported that they grow pulses because of profitability (74%) and lack of irrigation & home consumption (12% each) (Table 11.1). In the non-NFSM district, profitability (48%) and home consumption (46%) have been cited as the major reasons for growing pulses (Table 11.1). Home consumption has been cited mainly by the marginal farmers (about 71% of this category cited this as the major reason for growing pulses).

Haryana: In NFSM districts, about 36% of the sample farmers reported that they grow pulses because of profitability, home consumption (28%) and lack of irrigation (24%) (Table 11.1). In the non-NFSM district, profitability (66%) and lack of irrigation (22%) have been cited as the major reasons for growing pulses (Table 11.1). Inferior quality of land has been cited by about 10% of the households in both the districts.

Bihar: In NFSM districts, about 64% of the sample farmers reported that they grow pulses because of home consumption needs followed by lack of irrigation & inferior quality of land (14% each). Profitability has been ranked important only by the large farmers (8% of the total households) (Table 11.1). In the non-NFSM district also home consumption ranked first (28%) followed by inferior quality of land (24%) and profitability (20%). It is notable that profitability ranks much higher as a reason for growing pulses in this district as compared to the NFSM district. This is because in this district few medium farmers also, along with the large farmers, ranked profitability as one of the reasons for growing pulses.

Uttar Pradesh: In NFSM district, soil suitability (40%), profitability (32%), inferior quality of land (16%) and lack of irrigation facilities (12%) have been reported as the major reasons for growing pulses. In the Non-NFSM district, lack of irrigation (76%) is the predominant reason followed by profitability (14%) and inferior quality of land (10%) as reported by the sample farmers (Table 11.1).

Punjab: In NFSM district about 40% of the sample farmers reported that they grow pulses because of fallow land, profitability (22%), inferior quality of land (16%) and home consumption (14%). In the non-NFSM district also, fallow land (54%), profitability (34%) and home consumption (12%) have been cited as the major reasons for growing pulses (Table 11.1).

Table 11.1: Reasons for growing pulses - NFSM and non-NFSM Districts (% of farmers)

States =>	RAJ		MHR		HRY		BHR		UP		PB	
Reasons	NFSM	NON-NFSM	NFSM	NON-NFSM	NFSM	NON-NFSM	NFSM	NON-NFSM	NFSM	NON-NFSM	NFSM	NON-NFSM
Home consumption	2	4	12	46	28	2	64	28			14	12
Animal feed					0	0		16				
Inferior quality of land	42	44	2	4	12	10	14	24	16	10	16	
Lack of irrigation	50	46	12	2	24	22	14	12	12	76	8	
Profitability	6	6	74	48	36	66	8	20	32	14	22	34
Suitability of Soil									40			
Fallow Land											40	54
Others												
Total	100	100	100	100	100	100	100	100	100	100	100	100

11.2 Criteria Used While Opting to Grow Pulses

Rajasthan: Inferior quality of land, rainfall deficiency and soil suitability are the three characteristics that influenced farmers' decision to grow pulses. This holds true in NFSM and non-NFSM districts (Table 11.2).

Maharashtra: Rainfall deficiency (68% in NFSM and 58% in non-NFSM) and soil suitability (20% and 26%) are the main criteria that influenced farmers' decision to grow pulses. In the non-NFSM district home consumption has also been cited as one factor (10%) (Table 11.2).

Haryana: Soil suitability (46% in NFSM and 76% in non-NFSM) and inferior quality of land (20% and 14%) are the main criteria that influenced farmers' decision to grow pulses. In the NFSM districts, home consumption has also been cited as one of the factors (14%). About 8% of the households in both the districts have cited extent of irrigation as one of the factors too (Table 11.2).

Andhra Pradesh: Soil suitability and inferior quality of land are the main criteria that influenced farmers' decision to grow pulses in the NFSM district. In the non-NFSM districts also, the same factors were reported as important. Home consumption requirement has been cited as important in this district by the farmers.

Bihar: Home consumption requirement (54% in NFSM and 44% in non-NFSM) and extent of irrigation (18% in each of the districts) are the main criteria that influenced farmers' decision to grow pulses. Other factors are inferior quality of land, rainfall and soil fertility (Table 11.2).

Uttar Pradesh: Soil suitability (50% in NFSM and 40% in non-NFSM), inferior quality of land (40% and 36%) and extent of irrigation (10% and 24%) are the main criteria that influenced farmers' decision to grow pulses (Table 11.2).

Punjab: Fallow land (40%), soil suitability (22%), inferior quality of land (16%) and home requirement (14%) are the main criteria that influenced farmers' decision to grow pulses. In the non-NFSM district fallow land (54%), soil suitability (34%), and home requirement (12%) are the major criteria influencing farmers' decision to grow pulses (Table 11.2).

Table 11.2: Criteria used while opting to grow pulses - NFSM and non-NFSM Districts

States =>	RAJ		MHR		HRY		BHR		UP.		PB	
Reasons	NFSM	NON-NFSM	NF SM	NON-NFSM	NF SM	NON-NFSM	NF SM	NON-NFSM	NF SM	NON-NFSM	NF SM	NON-NFSM
Rainfall	24	46	68	58	8	0	8	12				
Soil suitability	26	16	20	26	46	76	12	8	50	40	22	34
Home requirement	6	0	6	10	14	2	54	44			14	12
Inferior quality of land	44	36	2	4	20	14	8	18	40	36	16	
Extent of irrigation	0	2	4	2	8	8	18	18	10	24	8	
Fallow Land											40	54
Others	0	0			4	0						
Total	100	100	100	100	100	100	100	100	100	100	100	100

11.3 Reasons for Less Area under Pulses compared to Cereals

Rajasthan: In the NFSM district, lower yield (62%) and low profitability (18%) are the main reasons. In non-NFSM district, pest problems (54%) and instability (36%) are the major reasons. This finding when combined with the higher net returns of pulses in the non-NFSM district shows that, although the profitability from pulse farming is lower in the NFSM district it is nonetheless stable while in the non-NFSM district the profitability is higher but unstable (Table 11.3).

Maharashtra: In the NFSM districts, yield instability (28%), lower profitability (22%) and pest problem (20%) have been cited as the major reasons while in the non-NFSM district, lower profitability (46%), low yield (32%) and yield instability (14%) have been cited as the major reasons. Therefore, pulse farming appears to be suffering from lower profitability and higher instability in both the districts (Table 11.3).

Haryana: In the NFSM district, pest problems (44%), lower profitability (24%), low yield (16%) and instability (14%) have been cited as the major reasons while in the non-NFSM district, pest problem (44%), low yield (36%) and lower profitability (14%), have been cited as the major reasons. Therefore, pulse farming appears to be suffering from pest problems, lower profitability, low yield and higher instability in both the districts. As for the reasons for not growing pulses on irrigated lands, low yield has been mainly cited as the major reason by about 60% of the households in the NFSM district and 62% in the non-NFSM district. The other major reason mentioned is the lack of assured market (22% in NFSM and 18% in non-NFSM) (Table 11.3).

Andhra Pradesh: In the NFSM district pest problems, lower profitability, yield instability, low yields and marketing problems have been cited as the major reasons while in the non-NFSM district, low yields, pest problems, yield or price instability and low profitability have been cited as cited as the major reasons. Therefore, pulse farming appears to be suffering from lower profitability and higher instability in both the districts.

Bihar: In both the districts, pest problems ranked as the most important reason (30% in NFSM and 28% in non-NFSM) for low area under pulses. In the NFSM district, lower profitability (24%) and lower yield (20%) have been ranked as the other major problems. In the non-NFSM district, lower yield (24%), yield instability (20%) and marketing (16%) have been cited as the major reasons. Therefore, pulse farming appears to be suffering from lower profitability, lower yield and higher yield instability in both the districts (Table 11.3).

Uttar Pradesh: In the NFSM district, pest problems (38%), marketing problems (16%), low yield (10%) and yield instability (8%) have been cited as the major reasons while in the non-NFSM district, pest problems (24%), yield instability (18%), low yield (16%) and marketing (14%) have been reported as the major reasons. Therefore, pulse farming appears to be suffering from lower yield, higher instability and marketing problems in both the districts (Table 11.3).

Punjab: In the NFSM district, yield instability (44%), lower yield (24%), lower profitability (16%) and pest problem (16%) have been cited as the major reasons while in the non-NFSM district, yield instability (56%), pest problem (24%), lower yield (14%) and lower profitability (6%) and have been cited as the major reasons. Therefore, pulse farming appears to be suffering from higher instability and pest problems in both the districts (Table 11.3).

Table 11.3: Reasons for low area under pulses - NFSM and non-NFSM Districts

States =>	RAJ		MHR		HRY		BHR		UP.		PB	
Reasons	NFSM	NON-NFSM	NF SM	NON-NFSM	NF SM	NON-NFSM	NF SM	NON-NFSM	NF SM	NON-NFSM	NF SM	NON-NFSM
Low profitability	18	0	22	46	24	14	24	12		6	16	6
Low yield	62	10	14	32	16	36	20	24	10	16	24	14
Instability	12	36	28	14	14	6	12	20	8	18	44	56
Marketing problem	4	0	16	2	2	0	14	16	16	14		
Pest problems	4	54	20	6	44	44	30	28	38	24	16	24
Others	0	0			0	0			28	22		
Total	100	100	100	100	100	100	100	100	100	100	100	100

11.4 Crops Grown on Inferior Lands

Rajasthan: In both the districts, coarse cereals are grown on marginal lands (Table 11.4.1). As for the problem of growing pulses on inferior quality lands, 44 per cent of the farmers in the NFSM district have listed low yield as a major problem while 62% of the farmers in non-NFSM district have listed low yield and poor grain quality as major problems (Table 11.4.2).

Maharashtra: In the NFSM district pulses (38%), oilseeds (28%) and vegetables (28%) are generally grown marginal lands. In the non-NFSM district pulses (40%), coarse cereals (26%) and vegetables (16%) are generally grown marginal lands (Table 11.4.1).
As for the problem of growing pulses on inferior quality lands, 47 per cent of the farmers in the NFSM district have listed low yield as a major problem followed by 18% who cited poor grain quality as the major problem. 34% have listed both factors as problems. 58% of the

farmers in non-NFSM district have listed low yield followed by poor grain quality (28%) as major problems (Table 11.4.2).

Haryana: In the NFSM district coarse cereals (60%), superior cereals (16%) and pulses & oilseeds (10% each) are generally grown marginal lands. In the non-NFSM district coarse cereals (62%), pulses (22%) and superior cereals (10%) are generally grown marginal lands (Table 11.4.1).

As for the problem of growing pulses on inferior quality lands, 52 per cent of the farmers in the NFSM district have listed low yield as a major problem followed by 46% who have listed both low yield and poor grain quality as problems. 44% of the farmers in non-NFSM district have listed low yield as the problem while an equal proportion of farmers have cited both factors as responsible (Table 11.4.2).

Andhra Pradesh: In the NFSM districts, pulses and superior cereals are generally grown marginal lands. In the non-NFSM districts, pulses and superior cereals are generally grown marginal lands.

As for the problem of growing pulses on inferior quality lands, farmers in the NFSM district have listed low yield as a major problem followed by poor grain quality as the major problem. Farmers in non-NFSM district have listed low yield followed by poor grain quality as major problems.

Bihar: In the NFSM district coarse cereals (44%), oilseeds (24%) and pulses (14%) are generally grown marginal lands. In the non-NFSM district coarse cereals (32%), superior cereals (26%), pulses (18%) and oilseeds (12%) are generally grown marginal lands (Table 11.4.1).

As for the problem of growing pulses on inferior quality lands, 48 per cent of the farmers in the NFSM district have listed low poor grain quality as the major problem followed by 28% who cited yield as the major problem. 24% have listed both factors as problems. 48% of the farmers in non-NFSM district have listed both factors as the major reason followed by poor grain quality (28%) and low yield (24%) as major problems (Table 11.4.2).

Uttar Pradesh: In the NFSM district pulses is the only crop grown on inferior quality lands. In the non-NFSM district pulses (80%), coarse cereals (10%) and oilseeds (10%) are generally grown marginal lands (Table 11.4.1).

As for the problem of growing pulses on inferior quality lands, 22 per cent of the farmers in the NFSM district have listed low yield as a major problem followed by 26% who cited poor grain quality as the major problem. 52% have listed both factors as problems. 16% of the farmers in non-NFSM district have listed low yield followed by poor grain quality (8%) as major problems. An overwhelming 76% have listed both factors as problems (Table 11.4.2).

Punjab: In the NFSM district pulses (80%), superior cereals (20%) are generally grown on inferior quality lands (Table 11.4.1).

As for the problem of growing pulses on inferior quality lands, 63 per cent of the farmers in the NFSM district have listed low yield as a major problem followed by 37% who cited poor grain quality as a major problem (Table 11.4.2).

Table 11.4.1: Crops grown on inferior quality land - NFSM and non-NFSM Districts

States =>	RAJ		MHR		HRY		BHR		UP.		PB	
Reasons	NFSM	NON-NFSM	NFSM	NON-NFSM	NFSM	NON-NFSM	NFSM	NON-NFSM	NFSM	NON-NFSM	NFSM	NON-NFSM
Superior cereals	6	6		10	16	10	6	26			20	
Coarse cereals	74	86	6	26	60	62	44	32		10		
Pulses	20	8	38	40	10	22	14	18	100	80	80	
Oilseeds	0	0	28	8	10	4	24	12		10		
Vegetables	0	0	28	16	0	0	12	8				
Any others	0	0			4	2		4				
Total	100	100	100	100	100	100	100	100	100	100	100	

Table 11.4.2: Problems of growing pulses on inferior quality lands- NFSM and non-NFSM Districts

States =>	RAJ		MHR		HRY		BHR		UP		PB	
Reasons	NFSM	NON-NFSM	NFSM	NON-NFSM	NFSM	NON-NFSM	NFSM	NON-NFSM	NFSM	NON-NFSM	NFSM	NON-NFSM
Yield is low	44	12	47	58	52	44	28	24	22	16	63	
Grain quality is poor	14	26	18	28	2	12	48	28	26	8	37	
Both 1 and 2	42	62	34	15	46	44	24	48	52	76		
Total	100	100	100	100	100	100	100	100	100	100	100	

11.5 Reasons for Shifting from Pulses

Rajasthan: In the NFSM district, low yield (38%) and lack of assured market (34%) have been reported as the main reasons for shifting away from pulses cultivation. In the non-NFSM district also lack of assured market (56%) has been cited as the major reason and also the unstable yield of the improved varieties (34%) (Table 11.5).

Maharashtra: In the NFSM district, lack of assured market (43%) and uncertainty in yield (26%) have been reported as the main reasons for shifting away from pulses cultivation. In the non-NFSM districts also, lack of assured market has been cited as the major reason and also the unstable yield of the improved varieties (Table 11.5).

Haryana: In the NFSM district, low yield (60%) and lack of assured market (22%) have been reported as the main reasons for shifting away from pulses cultivation. In the non-NFSM district also low yield (62%) and lack of assured market (18%) has been cited as the major reason (Table 11.5).

Bihar: In the NFSM district, low yield (44%), uncertainty in yield (26%), low price (12%) and large input usage (10%) have been reported as the main reasons for shifting away from pulses cultivation. In the non-NFSM district low price (24%), unstable yield of the improved varieties (20%), low yield (18%) and lack of assured market (16%) have been cited as the major reasons (Table 11.5).

Uttar Pradesh: In the NFSM district- low yield, low price, uncertain yield of IV s - have each been cited as the major reasons by about 22% of the households. In the Non-NFSM district, low yield (40%), low price (20%), lack of assured market (20%), uncertain yield of IV s (20%) have been reported as the main reasons for shifting away from pulses cultivation (Table 11.5).

Punjab: In the NFSM district, low yield (56%), low price realization (30%) and uncertainty in yield (14%) have been reported as the main reasons for shifting away from pulses cultivation. In the non-NFSM district also low yield (42%), low price realization (38%) and uncertainty in yield (20%) have been cited as the major reasons (Table 11.5).

Table 11.5: Reasons for shifting from pulses to other crops- NFSM and non-NFSM Districts

States =>	RAJ		MHR		HRY		BHR		UP		PB	
Reasons	NFSM	NON-NFSM	NFSM	NON-NFSM	NFSM	NON-NFSM	NFSM	NON-NFSM	NFSM	NON-NFSM	NFSM	NON-NFSM
Yield is low	38	6		15	60	62	44	18	22	40	56	42
Price realization is low	12	0	9	15	2	4	12	24	22	20	30	38
No assured market	34	56	43	15	22	18	8	16	11	20		
Yield of improved varieties is uncertain	14	34	26	18	10	6	26	20	22	20	14	20
Large doses of other inputs required	2	4	22	36	6	10	10	14				
Any other	0	0			0	0		8	22			
Total	100	100	100	100	100	100	100	100	100	100	100	100

11.6 Major Pest Problems

Rajasthan: The major pest problem is pod borer – 100 % of the households in both the districts reported this problem. Pod fly (94% in NFSM district and 44 % in non-NFSM district) is also a major pest problem followed by root rot (50% in non-NFSM) (Table 11.6.1). All the major pulse crops are affected in the NFSM district. In the non-NFSM district, mainly moong and urad are affected by pod borer and pod fly whereas gram is affected by root rot (Table 11.6.2).

Maharashtra: The major pest problems in NFSM district are pod fly (88% of the total households), pod borer (72%) and wilt (32%). In the non-NFSM district the major pest problems are caused by pod borer (78% of the total households), pod fly (68%) and wilt (38%) (Table 11.6.1). All the three major pulse crops – moong, gram and arhar are affected by these pests in both the districts (Table 11.6.2).

Haryana: The major pest problem in NFSM district are pod borer (98% of the total households), and pod fly (42%). In the non-NFSM districts also, the major pest problems are caused by pod borer (96% of the total households) and pod fly (36%) (Table 11.6.1). Moong crop is mainly affected in both the districts (Table 11.6.2).

Andhra Pradesh: The major pest problems in NFSM district are pod borer (46% of the total households) and wilt (32%). In the non-NFSM district the major pest problems are caused by pod borer (60% of the total households) and wilt (42%) (Table 11.6.1). Both the major pulse crops – gram and arhar are affected by these pests in these districts (Table 11.6.2).

Bihar: The major pest problems in NFSM district are pod borer (28% of the total households), root rot (24%), pod fly (18%), wilt (16%), and nematodes (14%). In the non-NFSM districts, the major pest problems are caused by pod borer (28% of the total households), pod fly (24%), wilt (18%), root rot (16%), and nematodes (14%) (Table

11.6.1). All the three major pulse crops – moong, gram, masur, and arhar are affected by these pests in both the districts (Table 11.6.2).

Uttar Pradesh: The major pest problems in NFSM districts are pod fly (96% of the total households) and wilt (20%). In the non-NFSM district the major pest problems are caused by pod fly (92%), wilt (16%), root rot (10%), pod borer (8%), and nematodes (8%) (Table 11.6.1).

Punjab: The major pest problems in NFSM district are thrip and tobacco caterpillar, which mainly affected the summer moong and kharif moong crops. In the non-NFSM district also thrip and tobacco caterpillar are the major pest problems, which mainly affected the summer moong. About 67% to 100% of area across size groups is affected by these pests. Pod fly, pod borer and wilt mainly affected gram and to a lesser extent kharif moong in the NFSM district. About 31% to 71% of the gram area across size groups is affected by these pests.

Table 11.6(a): Estimated yield loss due to pests -NFSM and non-NFSM districts

ESTIMATED YIELD LOSS DUE TO PESTS												
Type of Pest	RAJ		HRY-GRAM		HRY-MOONG		BHR		UP		PJ	
	NFSM	NON-NFSM	NFSM	NON-NFSM	NFSM	NON-NFSM	NFSM	NON-NFSM	NFSM	NON-NFSM	NFSM	NON-NFSM
Pod borer	20.8	24.8	119.6	143.2	40.0	70.8	19.0	24.0	3.5	4.6	15.8	
Pod fly	22.4	26.8					29.0	20.0	30.0	33.0		
Wilt							14.0	13.0	6.4	7.2	12.4	
Root rot		32.0					26.0	37.0	4.3	5.3		
Nematodes							10.0	21.0	4.0	6.0		
Thrip											13.0	6.0
Tobacco Caterpillar											9.5	5.3
Hairy Caterpillar											4.2	
Whitefly											6.3	
Yellow Mosaic Virus											8.5	
Note: Estimated yield loss is in Kg/Acre												

Table 11.6(b): Estimated yield loss due to pests -NFSM and non-NFSM districts (AP and MHR)

ESTIMATED YIELD LOSS DUE TO PESTS				
Type of Pest	AP		MHR	
	NFSM	NON-NFSM	NFSM	NON-NFSM
Pod borer	18.0	22.0	11.3	13.6
Pod fly			10.5	11.4
Wilt	15.0	15.0	10.1	12.6
Note: Estimated loss per Acre is in percentage terms. AP has reported crop loss whereas MHR has reported yield loss.				

Table 11.6.1: Major Pest Problem- NFSM and non-NFSM Districts

States =>	RAJ		MHR		HRY		AP		BHR		UP.		PB	
Reasons	NFSM	NON-NFSM	NFSM	NON-NFSM	NFSM	NON-NFSM	NFSM	NON-NFSM	NFSM	NON-NFSM	NFSM	NON-NFSM	NFSM	NON-NFSM
Pod borer	100	100	72	78	98	96	46	60	28	28	6	8		
Pod fly	94	44	88	68	42	36			18	24	96	92		
Wilt	0	0	32	38	4	4	32	42	16	18	20	16		
Root rot	0	50			2	12			24	16	12	10		
Nematodes	0	0			0	0			14	14	10	8		
Any other	54	68												
Average pest problem	41	44												

Table 11.6.2: Major Pest Problem- Crops Affected

States =>	RAJ		MHR		HRY		BHR	
Reasons	NFSM	NON-NFSM	NFSM	NON-NFSM	NFSM	NON-NFSM	NFSM	NON-NFSM
Pod borer	Moong, Moth	Moong, Urad	Moong, arhar, Gram	Moong, arhar, Gram		Moong	Gram	Gram
Pod fly	Moong, Moth, Gram	Moong, Urad	Moong, arhar, Gram	Moong, arhar, Gram	Moong	Moong	Arhar	Moong
Wilt			Moong, arhar, Gram	Moong, arhar, Gram		Moong	Gram	Moong
Root rot		Gram				Moong	Masur	Masur
Nematodes							Gram	Gram
Any other	Moong, Urad, Gram	Moong, Urad, Gram						

11.7 Major Problems in Cultivating Pulses

Rajasthan: In the NFSM districts, lower yield, lack of assured market, lack of irrigation facilities, pest incidence, and non-availability of improved varieties have been reported to be the major problems. In the non-NFSM districts, pest incidence, non-availability of improved seeds, lower yield, and lower market price have been cited as the major problems in pulse cultivation (Table 11.7).

Maharashtra: In the NFSM districts, lack of irrigation facilities, low market price realization, low yield, and lack of improved varieties are cited as the major problems in cultivating pulses. In the non-NFSM districts, low market price, lack of improved varieties, lack of irrigation facilities, lower yield and high pest incidence have been cited as the major reasons (Table 11.7).

Haryana: In the NFSM districts, high pest incidence (44%), lack of irrigation facilities (28%) and low market price (20%) have been cited as the major problems in cultivating pulses. In the non-NFSM districts, high pest incidence (50%), lack of irrigation facilities (26%), lower yield (18%) and lack of improved varieties have been cited as the major reasons (Table 11.7).

Andhra Pradesh: In the NFSM districts, high pest incidence, lack of irrigation facilities, lack of improved varieties and lower yield are cited as the major problems in cultivating pulses (Table 11.7).

Bihar: In the NFSM districts, lack of improved varieties, lower yield, and large doses of other inputs required are cited as the major problems in cultivating pulses. In the non-NFSM districts, all the factors have been cited as the major reasons with no single major predominant problem (Table 11.7).

Uttar Pradesh: In the NFSM districts, lack of improved varieties and lower yield are cited as the major problems in cultivating pulses. In the non-NFSM districts also, the same factors have been ranked high as the major reasons in cultivating pulses (Table 11.7).

Punjab: In both NFSM and non-NFSM districts, high pest incidence and unstable price have been cited as the major problems in cultivating pulses (Table 11.7).

Table 11.7: Percentage distribution of major problems in cultivating pulses- NFSM and non-NFSM districts

States =>	RAJ		MHR		HRY		AP.		BHR		UP.		PB	
Reasons	NFSM	NON-NFSM	NFSM	NON-NFSM	NFSM	NON-NFSM	NFSM	NON-NFSM	NFSM	NON-NFSM	NFSM	NON-NFSM	NFSM	NON-NFSM
Lack of irrigation facilities	10	14	48	22	28	26	10			29				
Lack of improved varieties	12	28	12	22	0	0	6	4	40	30	70	80		
Lower yield	38	14	16	18	8	18	64	72	24	34	30	20		
High pest incidence	16	34	11	12	44	50	14	16					46	32
Low market price	8	6	27	28	20	4	6	8						
Large doses of other inputs required	2	2							36	37				
No assured market/procurement			2	2		2								
Blue bulls	14	2												
Unstable prices													34	22
Others										21				

11.8 Effect of MSP on Willingness to Grow More Pulses

Rajasthan: All the farmers in both the districts have expressed willingness to grow more pulses if higher MSP is provided with assured procurement (Table 11.8).

Maharashtra: About 95% of the farmers in both the districts have expressed willingness to grow more pulses if higher MSP is provided with assured procurement (Table 11.8). However, this percentage is relatively low among the marginal farmers indicating the importance of non-price factors in decision-making in this category of farmers.

Haryana: About 96% of the farmers in the NFSM district and 66% in the non-NFSM district have expressed willingness to grow more pulses if higher MSP is provided with assured procurement (Table 11.8). However, this percentage is relatively low among the marginal farmers (especially in non-NFSM district) indicating the importance of non-price factors in decision-making in this category of farmers.

Andhra Pradesh: Only about 20% of the farmers in the NFSM district and 16% of the farmers in the non-NFSM district have expressed willingness to grow more pulses if higher MSP is provided with assured procurement (Table 11.8). However, this percentage is relatively high only among the large farmers indicating the importance of price factor in decision-making only in this category of farmers.

Bihar: About 60% of the farmers in the NFSM district and 52% in the non-NFSM district have expressed willingness to grow more pulses if higher MSP is provided with assured procurement (Table 11.8). However, this percentage is relatively low among the marginal farmers in the non-NFSM district perhaps indicating the importance of non-price factors in decision-making in this category of farmers.

Uttar Pradesh: All the farmers (100%) in both the districts have expressed willingness to grow more pulses if higher MSP is provided with assured procurement (Table 11.8).

Punjab: About 48% of the farmers in the NFSM district and about 40% in the non-NFSM district have expressed willingness to grow more pulses if higher MSP is provided with assured procurement (Table 11.8). This percentage is substantially higher among the marginal farmers of NFSM district.

Table 11.8: Farmers' willingness to grow pulses with assured market price- NFSM and non-NFSM Districts

States =>	RAJ		MHR		HRY		AP		BHR		UP.		PB	
Size Group	NFSM	NON-NFSM	NFSM	NON-NFSM	NFSM	NON-NFSM	NFSM	NON-NFSM	NFSM	NON-NFSM	NFSM	NON-NFSM	NFSM	NON-NFSM
Marginal	100	100	93	93	75	38	18	5	63	39	100	100	67	
Small	100	100	95	100	91	94	14	12	60	57	100	100	50	
Medium	100	100	100	85	100	54	21	15	58	58	100	100	57	43
Large	92	100	100	100	100	71	50	75	75	67			41	40
Total	94	100	96	94	96	66	20	16	60	52	100	100	48	40

11.9 Important Suggestions by the Farmers to Improve Pulse Production

Rajasthan: In the NFSM district improving irrigation facilities, assured procurement with MSP, making improved varieties of seeds available and checking blue bull menace are the important suggestions made by the farmers. In the non-NFSM district making available improved varieties, assured procurement, higher market price, improvement in irrigation facilities are some of the suggestions in the non-NFSM district (Table 11.9).

Maharashtra: In the NFSM district improving irrigation facilities, higher market price, making improved varieties of seeds available and providing extension service are the important suggestions made by the farmers. In the non-NFSM district improvement in irrigation facilities, higher market price, making available improved varieties and availability of pest-resistant varieties are some of the suggestions (Table 11.9).

Haryana: In the NFSM district improving irrigation facilities, making pest-resistant seeds available, assured procurement and higher market price are the important suggestions made by the farmers. In the non-NFSM district improvement in irrigation facilities, higher market price, making pest-resistant seeds available and assured procurement are some of the suggestions (Table 11.9).

Andhra Pradesh: In the NFSM districts, higher market price and assured procurement with MSP are the important suggestions made by the farmers (Table 11.9). It is interesting to note that the farmers in AP have expressed very little willingness to grow more pulses even if offered higher MSP as seen in the previous sub-section. But they have also suggested in an overwhelming proportion the provision of higher MSP with assured market as one of the ways to increase pulses production. These are contradictory and further research is needed on this.

Bihar: In the NFSM districts, making improved varieties and pest-resistant seeds available, assured procurement and better market price are the important suggestions made by the farmers. In the non-NFSM districts also, the same suggestions have been made (Table 11.9).

Uttar Pradesh: In the NFSM districts, making improved varieties and better market price are the important suggestions made by the farmers. In the non-NFSM districts, improving irrigation facilities, making improved varieties of seeds available and higher market price are ranked by the farmers (Table 11.9).

Punjab: In the NFSM districts, assured procurement with MSP (44%), higher market price (40%), availability of pest-resistant varieties (18%) and availability of high-yielding varieties (14%) are ranked first by the farmers. In the non-NFSM districts, assured procurement with MSP (50%), higher market price (36%), availability of pest-resistant varieties (20%) and availability of high-yielding varieties (16%) are ranked first by the farmers (Table 11.9).

Table 11.9: Percentage distribution of important suggestions from the farmers for cultivating pulses- NFSM and non-NFSM Districts

States =>	RAJ		MHR		HRY		AP.		BHR		UP.		PB	
Reasons	NFSM	NON-NFSM	NFSM	NON-NFSM	NFSM	NON-NFSM	NFSM	NON-NFSM	NFSM	NON-NFSM	NFSM	NON-NFSM	NFSM	NON-NFSM
Improving irrigation facilities	40	16	51	40	34	30	20		8	16		76		
Making available high-yielding varieties	20	20	20	16	0	2	6	4	36	24	80	16	14	16
Making available pest-resistant varieties	8	28	5	6	28	28	14	36	20	25			18	20
Assured procurement with MSP	10	26	2		28	4	90	22	24	33			44	50
Higher market price	2	10	25	38	10	32	88	72	12	32	20	8	40	36
Providing extension service			50											
Blue bulls	20													
Others						4								

Chapter 12
Impact of NFSM on Pulses Production

In this chapter, the impact of NFSM has been assessed in terms of the awareness about the programme, the assistance received under the programme, and the effect of the assistance in terms of increasing area or production under the pulses. A brief summary of the chapter is provided below followed by a more detailed description of the impact of NFSM, if any, in each of the states.

Summary of the Chapter

All the farmers are aware of and have derived benefits from NFSM in Rajasthan, Haryana, and AP. This percentage is slightly lower in Maharashtra and UP whereas in Punjab and Bihar this percentage is very low. The programme has been found useful by farmers only in Rajasthan and AP (Table 12.1.1). Assistance in the form of seeds is the most important in most of the states. Assistance in training is reported by two states – Rajasthan and Bihar (Table 12.1.2). Farmers in most of the states have reported higher yield as the most important benefit from NFSM followed by increased knowledge and reduced pest attacks (Table 12.1.3). As for impact on area and production, all the states except Haryana, have registered increase in area in 2008-09 of major crops – moong and gram compared to the previous two years. Only Haryana recorded a sizeable decline in both the crops. Similar is the case with production. All the crops except arhar showed an increase in production after the NFSM.

The increase in area and production are only for one year 2008-09. It is to be noted that the reference years for the study are 2006-07, 2007-08 and 2008-09, out of which the post-NFSM year period is a single year. It cannot be concluded based on data for a single year that the NFSM pulses programme is an unqualified success although the signs are encouraging. The increases in area and yield need to be sustained. If the programme continues to be successful, the reasons for its success need to be researched.

Impact of NFSM in the States

Following are the major components of the NFSM pulses programme.

Table 12.1: Major Initiatives under NFSM- Pulses

Production and distribution of breeder/foundation/certified seeds
INM - micronutrients/lime/gypsum
IPM
Provision of machinery - Seed drills, pump sets, sprinklers, cono weeder, knapsack sprayers
Pilot projects - ICRISAT technologies, blue bull menace
Farmers' training

12.1 Awareness about NFSM

Rajasthan: All the sample households are aware of the NFSM programme and all the households received assistance in one form or the other under the NFSM (Table 12.1.1). Assistance under seeds, INM and IPM are more widespread as compared to equipment provision and training (Table 12.1.2). Very few farmers reported demonstration of best practices under NFSM. A large proportion of more than 90 per cent of the sample farmers found NFSM useful (Table 12.1.1). As for the type of use, majority of the households reported increase in yield and increased knowledge about farming practices as useful (Table 12.1.3). Notably, only 10% of the total respondents have reported reduction in pest attacks as one of the uses of NFSM.

Maharashtra: About 76% of the sample households are aware of the NFSM programme and all these` households received assistance in one form or the other under the NFSM (Table 12.1.1). Assistance under seeds, INM and equipment has been received more as compared to other services (Table 12.1.2). None of the farmers reported demonstration of best practices under NFSM. About 66 per cent of the sample farmers found NFSM useful (Table 12.1.1). As for the type of use, majority of the households reported increase in yield (34%), increased knowledge about farming practices (28%), reduced pest attacks (22%) and reduced drudgery (16%) as useful (Table 12.1.3).

Haryana: All the sample households are aware of the NFSM programme and all these households received assistance in one form or the other under the NFSM (Table 12.1.1). Assistance under seeds, IPM and pesticide provision have been received more

as compared to other services (Table 12.1.2). None of the farmers reported demonstration of best practices under NFSM. About 52 per cent of the sample farmers found NFSM useful (Table 12.1.1). As for the type of use, majority of the households reported reduced pest attacks (90%), increase in yield (7%), and increased knowledge about farming practices (3%) as useful (Table 12.1.3).

Andhra Pradesh: All the sample households are aware of the NFSM programme and all these households received assistance in one form or the other under the NFSM (Table 12.1.1). Assistance under seeds has been availed by all the households while demonstration and training services have been availed by 12% and 14% of the households respectively (Table 12.1.2). All the sample farmers found NFSM useful (Table 12.1.1). As for the type of benefit, majority of the households reported increase in yield (66%), reduced pest attacks (54%) and increased knowledge about farming practices (36%) as useful (Table 12.1.3).

Bihar: About 48% of the sample households are aware of the NFSM programme and most of these` households (about 34%) received assistance in one form or the other under the NFSM (Table 12.1.1). Assistance for training (63%) and seeds (37%) are the major components under which assistance was received (Table 12.1.2). None of the farmers reported demonstration of best practices under NFSM. About 48 per cent of the sample farmers found NFSM useful (Table 12.1.1). As for the type of use, majority of the households reported increase in yield, reduced pest attacks, increased knowledge about farming practices and reduced drudgery as useful (Table 12.1.3).

Uttar Pradesh: About 90% of the sample households are aware of the NFSM programme and 64% of these` households received assistance in one form or the other under the NFSM (Table 12.1.1). Assistance under seeds, INM, equipment and training has been received more as compared to other services (Table 12.1.2). None of the farmers reported demonstration of best practices under NFSM. About 64 per cent of the sample farmers found NFSM useful (Table 12.1.1). As for the type of use, all the households reported increased knowledge about farming practices (100%), increase in yield (22%) and reduced pest attacks (9%) as useful (Table 12.1.3).

Punjab: Only 38% of the sample households are aware of the NFSM programme and all these households received assistance in one form or the other under the NFSM (Table 12.1.1). Assistance has been received mainly under seeds (40%), IPM (31%) and training (29%) (Table 12.1.2). None of the farmers reported demonstration of best practices under NFSM. About 38% per cent of the sample farmers found NFSM useful (Table 12.1.1). As for the type of use, majority of the households reported increase in yield (56%), increased knowledge about farming practices (44%) and reduced pest attacks (8%) as useful (Table 12.1.3).

Table 12.1.1: Impact of NFSM (% of sample households)

States	Aware	Assisted	Found Useful
RAJ	100	100	96
MHR	76	76	66
HRY	100	100	52
AP	100	100	100
BHR	48	34	48
UP	90	64	64
PB	38	38	38

Table 12.1.2: Type of Assistance (% of sample households)

States	Seeds	INM	IPM	Equipment like seed drills etc	Demonst ration	Training	Others	Total
RAJ	98	100	98	84	10	86		100
MHR	52	21	6	17		5		100
HRY	2	0	4	0	0	0	94 (Pesticides)	100
AP	100				12	14		100
BHR	37					63		100
UP	22	6		16		16	64	100
PB	40		31			29		100

Table 12.1.3: Type of Uses (% of sample households)

States	Higher yield	Reduced pest attacks	Reduced drudgery	Increased knowledge	Others
RAJ	100	10	2	94	44
MHR	34	22	16	28	
HRY	7	90	0	3	
AP	66	54	0	6	
BHR	42	30	14	14	
UP	22	9		100	
PB	56	8		44	

12.2 Area and Production Increase after NFSM

Rajasthan: There is an increase in area of all the three pulse crops – moong, moth and gram in 2008-09 over the previous two years (Table 12.2.1). The increase is visible in all the size groups, except medium category in gram and moth. However, production did not show a corresponding increase (Table 12.2.2). In fact, there is a

decline in moong (except medium farmer group) and moth while there is a very small increase in large farmer group for gram.

Maharashtra: There is a slight increase in area of moong and gram in 2008-09 over the previous two years (Table 12.2.1). In both these crops, the increase is mainly because of the large farmers who showed a substantial increase while in all other categories, the increase is insignificant or there is even a decline. In the case of arhar, there is a decline. This trend is aptly captured by total pulses where while all other size groups show a decline in area in 2008-09, large farmers show a substantial increase (43%) over the previous two years.

As regards production, there is increase In the case of moong and gram for all size groups but In the case of arhar, there is a decline (Table 12.2.2). The increase in production, despite a decline in area In the case of moong and gram shows that there is some improvement in yield levels of these crops. The production in 2008-09 of 'total pulses' shows substantial increase for large farmers (about 77%) while for other categories the increase is more moderate.

Haryana: There is a slight decrease in area of moong and gram in 2008-09 over the previous two years (Table 12.2.1). In both these crops, the decrease is mainly because of the large farmers who showed a substantial decrease while in all other categories the decrease is insignificant. As regards production also, there is a decrease In the case of moong and gram for all size groups except In the case of marginal farmers of gram (Table 12.2.2). The decrease in production, which is accompanied by a decline in area In the case of moong and gram, is mainly because of a decline in yield levels of these crops across all size groups except the large farmers.

Andhra Pradesh: There is an increase of about 23% in area under gram in 2008-09 as compared to the previous two years (Table 12.2.1). The increase is mainly because of the medium and large farmers who showed a substantial increase while in all other categories the increase is insignificant. As regards production, there is an increase for all size groups. The production in 2008-09 shows substantial increase of about 34% (Table 12.2.2).

Bihar: There is a slight increase in area (21%) of pulse crops in the district in 2008-09 over the previous two years (Table 12.2.1). In both the pulse crops, the increase is mainly because of the large farmers who showed a large increase. There is an increase in pulse production (31%) also (Table 12.2.2).

Uttar Pradesh: There is a slight increase in area of urad and pea in 2008-09 over the previous two years (Table 12.2.1). In the case of moong, there is a decline. As regards production, there is increase in the case of urad and pea for all size groups but in the case of moong, there is a decline (Table 12.2.2).

Punjab: Eighty per cent of the farmers feel that the area under pulses has increased in 2008-09 (after the NFSM) as compared to the previous two years. As for the extent of increase, 48% reported an increase of more than 10% while 30% have reported an increase of between 5% and 10%.

There is an increase in production of all the three pulse crops – summer and kharif moong and gram in 2008-09 over the previous two years (Table 12.2.2). Overall, there is a 30% increase in total pulse production in the district after NFSM. However, the increase in marginal farmer category is insignificant.

Table 12.2.1: Change in Area after NFSM (in percentage)

Size Group	Gram					
	RAJ	MHR	HRY	AP	BHR	PB
Marginal		-9	400	2	0	
Small	0	-7	-4	2	20	
Medium	-3	-7	-2	54	13	11
Large	27	66	-30	33	16	1
Total	23	12	-19	23	14	3

Size Group	Moong			
	RAJ	MHR	HRY	UP.
Marginal		15		
Small	22	-10		
Medium	21	-14	-14	-3
Large	25	38	-80	
Total	24	6	-53	-3

Size Group	Moth	Arhar	Masur	Pea	Urad	Summer Moong	Kharif Moong
	RAJ	MHR	BHR	UP.	UP.	PB	PB
Marginal		-47	33	14	3	11	
Small	20	23	33	7	1	25	
Medium	-2	-23	20	1	0.4	38	18
Large	22	-67	27			41	5
Total	20	-28	27	3	1	38	8

Size Group	Total						
	RAJ	MHR	HRY	AP	BHR	UP.	PB
Marginal		-0.3	400	2	18	7	11
Small	14	-6	-4	2	27	3	25
Medium	6	-12	-3	54	17	0	25
Large	25	43	-32	33	22		20
Total	22	6	-20	23	21	2	21

Table 12.2.2: Change in Production after NFSM (in percentage)

Size Group	Gram					
	RAJ	MHR	HRY	AP	BHR	PB
Marginal		14	317	26	13	
Small	-13	12	-17	12	35	
Medium	-21	18	-23	68	-27	17
Large	5	113	-18	35	31	6
Total	1	41	-18	34	29	8

Size Group	Moong			
	RAJ	MHR	HRY	UP.
Marginal		36		
Small	-44	5		
Medium	47	-1	-26	-1
Large	-6	53	-75	
Total	0	21	-54	-1

Size Group	Moth	Arhar	Masur	Pea	Urad	Summer Moong	Kharif Moong
	RAJ	MHR	BHR	UP.	UP.	PB	PB
Marginal		-33	40	19	12	11	
Small	-37	44	40	20	8	49	
Medium	-36	2	26	4	4	45	28
Large	-13	-58	34			47	10
Total	-15	-10	33	10	6	46	14

Size Group	Total						
	RAJ	MHR	HRY	AP	BHR	UP.	PB
Marginal		17	317	26	29	16	11
Small	-36	12	-17	12	38	14	49
Medium	-3	11	-23	68	6	4	34
Large	-3	77	-19	35	32		29
Total	-4	30	-19	34	31	8	30

Table 12.2.3: Increase in Area under pulses after NFSM: Farmer's Perception

Size Group	RAJ	MHR	AP	BHR	UP.	PB
Marginal		53	5	32	13	67
Small	50	47	6	53	26	100
Medium	30	40	50	58		79
Large	56	67	50	75		79
Total	50	50	18	48	16	80

Chapter 13
Summary and Conclusions

The main objective of the study is to analyze the factors underlying the growth process and identify the constraints for pulses production in the country. The study attempts a detailed analysis of growth pattern at the national and state levels using secondary data followed by an econometric analysis to identify the major determinants of production in each state. The secondary data analysis is supplemented with in-depth primary data surveys in seven states to assess the economics of pulses cultivation in various states, constraints faced by the farmers, their suggestions for improving pulses production and the impact of NFSM, if any, on the pulses production in the country. For methodological details of the study, see Chapter 4. Summarized below are the major findings of the study.

Secondary Data

The overall growth trends of pulses in India show that yield is the major contributory factor to production growth. The contribution of area growth is minimal. There was a deceleration in pulse production during the second sub-period (1987-96) but a major stagnation has set in during the third sub-period (1997-2007). The deceleration in the second sub-period indicates that the major pulses programs such as NPDP and other subsequent programs launched during this period have not yielded the desired results. A disaggregate analysis at the crop level shows that broad trends noted above conceal the heterogeneity at the individual crop level. Most of the abovementioned trends are mainly due to gram, which contributes about 35 to 43 per cent of the total pulse production in the country. For instance, positive production growth rate of 'total pulses' in the second sub-period is only due to gram. All other crops have shown a distinct deceleration or decline in the second sub-period. Similarly, the disproportionately large contribution of yield growth to growth in production overall (1975 to 2007) is again mainly due to gram. It is only in the case of gram that yield has contributed substantially while in all other crops area and yield show more or less equal contributions.

State-level analysis of individual pulse crops shows that there is wide variability across states even within the same sub-period. In any crop, the trends at the all-India level result from trends in few major states and not because of uniform trends in all the states. There are some worrying trends in the recent past (1997-2007). There is a decline in all three -

area, yield and production in major states like Rajasthan and UP. In the case of gram, there is a decline in Rajasthan, UP and MP (yield). In arhar there is a decline in UP and MP. In urad, there is a decline in Maharashtra and AP; in the case of moong, there is deceleration in Maharashtra, AP, and Karnataka and finally, in the case of masur there is a major decline in yield levels in Karnataka and Bihar.

The pattern in growth acceleration also shows trend similar to that of growth rates. Gram has shown distinct acceleration in the first phase (between sub-period 2 and sub-period 1) and deceleration in the second phase (between sub-period 3 and sub-period 2). The trend in the remaining crops is the reverse. Because of these offsetting trends and the overwhelming weight of gram, the overall acceleration of growth has remained insignificant in both phases.

A comparison of net returns and yield instability at two points of time (1997, 2007) using the cost of cultivation data shows that, contrary to general belief, the net returns from pulse cultivation are either equal to or better than other major crops. However, the higher returns at two points of time do not inform us about the movements in relative profitability between pulse and non-pulse crops over this period. To capture this dynamic effect and identify the determinants of pulses production, an econometric analysis has been carried out. The results show that the major determinants of area of most of the pulse crops are rainfall and relative price / profitability. The negative irrigation effect is generally not present, except In the case of moong. In gram and masur, irrigation has actually contributed positively to area growth in many states. The major determinants of yield are mainly the rainfall, fertilizer use and to a lesser extent irrigation. The marginal area effect is present only In the case of moong and urad. The yield instability also does not appear to be more in pulses as compared to other crops.

Primary Data

The results based on the primary data analysis have shown the following results

Profitability: The net returns per hectare are generally higher for pulses than for other crops in the sample districts of most states, except Bihar. The net returns per quintal (price realized) are higher for pulses in all the districts without exception. Between the NFSM and

the Non-NFSM districts, the net returns per quintal are lower in the NFSM district for most of the crops and states although the net returns per hectare are higher. This shows that the contribution of area and yield is better in the NFSM district as compared to the non-NFSM district in most of the states, although this cannot be attributed to the NFSM programme alone because of a very short period of our study. For pulses as a whole (total pulses) the net returns per hectare are higher in the NFSM districts of all the states as compared to the Non-NFSM districts, although differences exist at the individual crop level.

Technology Adoption: More than 80% of the farmers in the sampled districts of different states are aware of the improved varieties (IV) of pulses, except in Bihar. The main sources of knowledge about IV s in the NFSM district are *extension agent.* The level of awareness is generally lower in the Non-NFSM districts in most of the states. As is to be expected, the role of extension agent is much stronger in the NFSM district as compared to the Non-NFSM district. The percentage of households with area under IV s and the percentage of area under IV s to total cropped area are also higher in the NFSM districts than the Non-NFSM districts in all the states except Bihar. As expected, the percentage of farmers not following even one recommended practice is much higher in Non-NFSM districts of all the states, except Bihar. Sowing and seed practices, followed by fertilizer practices, are followed by most of the farmers. As for the problems in using the IV s, the farmers have reported non-availability, expensiveness, inadequate pest resistance, need for other complementary inputs and lower yield of IV s as the major problems.

Marketing: Majority of the households (>50%) are marketing through the regulated market and majority of production (>50%) is being marketed through regulated market in almost all the states, except Rajasthan. The next important channel of marketing is commission agent. Village market is prominent only in Rajasthan. The notable feature is that there is absolutely no procurement of pulses by NAFED in any of the sample districts – NFSM or non-NFSM in any of the states.

Farmers' Perceptions: Reasons for growing pulses vary across states widely but are mostly the same in the NFSM and the Non-NFSM districts within a state, except UP. Profitability, lack of irrigation, home consumption and inferior land quality are the reported reasons for growing pulses in most states. In Punjab, pulses are mainly grown to make use of fallow lands. Monsoon, inferior land quality or soil suitability plays a major role in

farmers' decision in growing pulses. Higher pest incidence and lower yield have been cited as the major problems in growing pulses in majority of the states. Farmers in most of the states reported that low yield and absence of assured market are the main reasons for their shifting away from pulses farming to other crops.

Pod Borer is the most serious pest problem afflicting the pulse crops in the sample districts all the states except UP where pod fly is the major problem. Moong is the crop affected most by the pest problems followed by gram and arhar. In response to their willingness to grow more pulses if provided with higher MSP, all the respondents in the non-NFSM districts answered in the affirmative showing that in the non-NFSM districts price factor is quite important. Farmers in most of the states suggested improving irrigation facilities and making high-yielding varieties available as important, showing that non-price factors such as lower yield and yield instability are still important determinants of farmers' willingness to grow pulses.

Impact of NFSM: All the farmers are aware of and have derived benefits from NFSM in Rajasthan, Haryana, and AP. This percentage is slightly lower in Maharashtra and UP whereas in Punjab and Bihar this percentage is very low. The programme has been found useful by farmers only in Rajasthan and AP. Assistance in the form of seeds is the most important in most of the states. Assistance in training is reported by two states – Rajasthan and Bihar. Farmers in most of the states have reported higher yield as the most important benefit derived from the NFSM programme followed by increased knowledge and reduced pest attacks. As for impact on area and production, all the states except Haryana, have registered increase in area in 2008-09 of major crops – moong and gram compared to the previous two years. Only Haryana recorded a sizeable decline in both the crops. Similar is the case with production. All the crops except arhar showed an increase in production after the NFSM.

Summing Up

The secondary data analysis shows that the major source of production growth is yield. NPDP and other programs have not been very effective for crops other than gram and masur. There is wide variability in growth pattern across states. In the last decade, some of the major states like Rajasthan and UP are showing decline in area or yield or both. This is a worrying feature. The major problems and the reasons for stagnation as spelt out by the

farmers in the primary studies are the following – non-availability and delay in provision of improved seeds, pest problems, higher prices of seeds even with subsidy, higher doses of inputs needed, lack of marketing facilities and absence of NAFED in marketing.

Policy Implications

Results of the econometric analysis show that one of the major determinants of area under pulses is the relative price/profitability. Therefore, providing assured price support through procurement should be useful in the short-run. However, the primary data surveys clearly show that non-price factors such as timely availability of improved seeds at affordable prices (or subsidy), improvement of irrigation facilities, marketing facilities including procurement by NAFED and extension for addressing pest problems are needed in the medium term to improve the pulses production scenario in the country. In the long run, development and dissemination of improved technology is very essential.

The contribution of area to production growth has been minimal so far. Therefore, efforts should be made to increase area under pulses through bringing some of the rainfed rice fallow lands (estimated at 9.4 million ha) in Chhattisgarh, MP, Jharkhand, Orissa, and West Bengal. Lastly, the statistical system needs a great deal of improvement. Data on some of the crucial inputs like fertilizer use and pesticide use is still not available at the crop level. Efforts should be made to make this data available in order to strengthen the research efforts.

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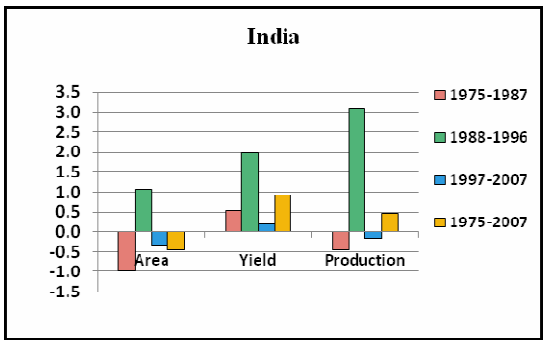
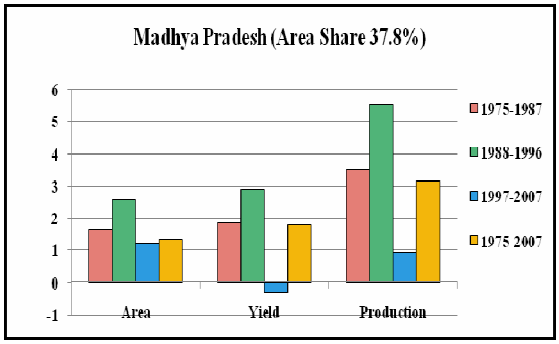
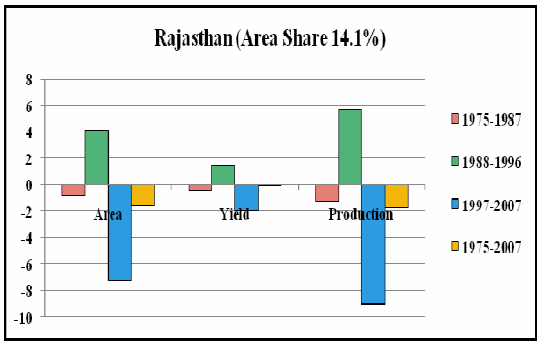
APPENDIX A – State wise Growth Patterns

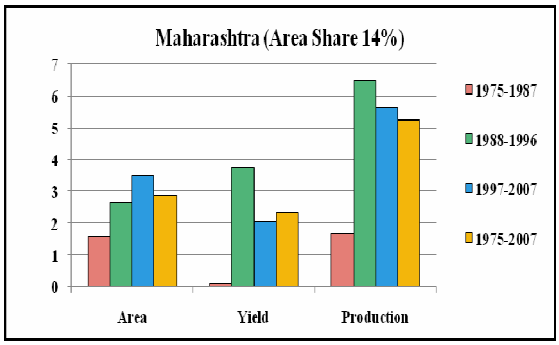
(figures on Y axis denote CAGR in %)

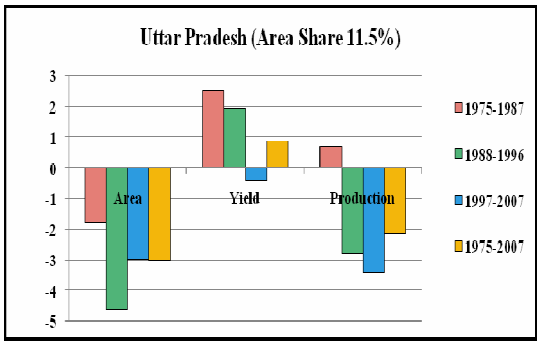
Period-wise Growth rates for area, yield and production for **Gram**

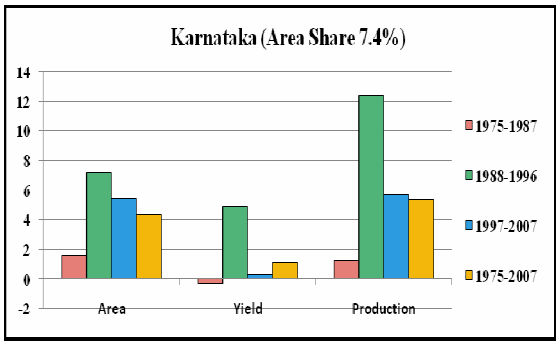


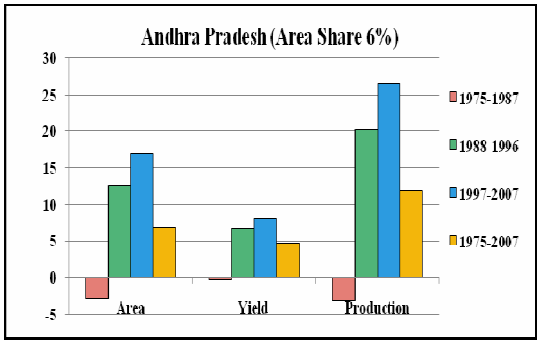




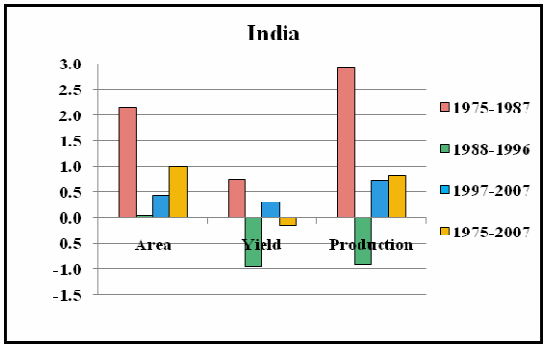


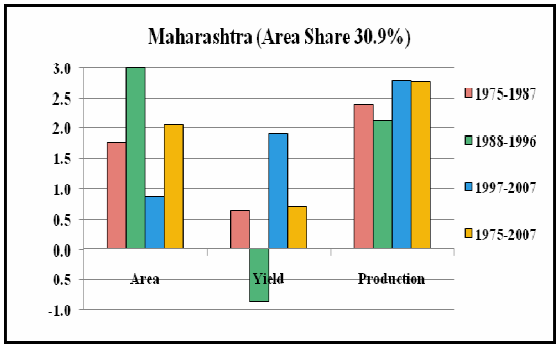


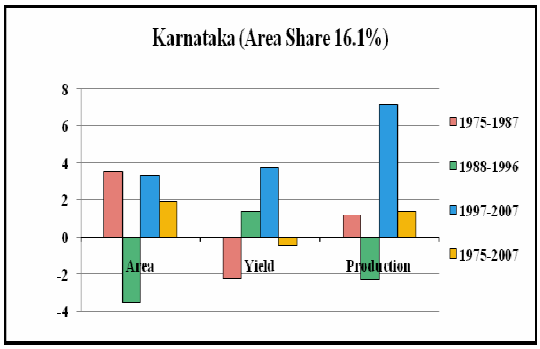


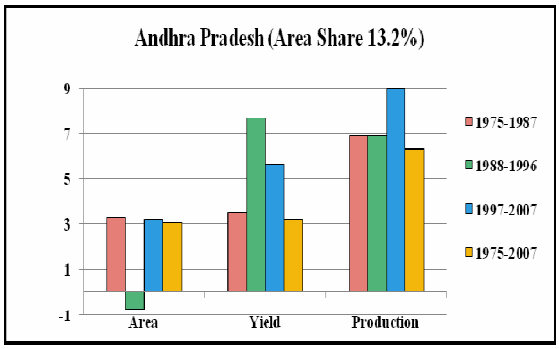


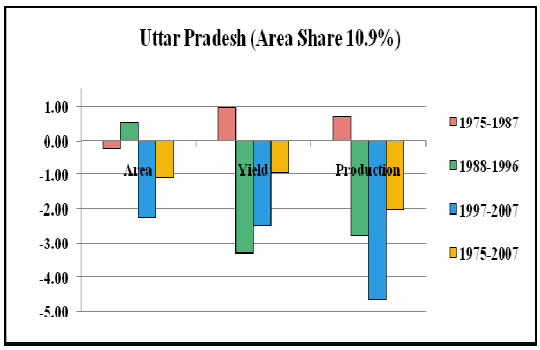
Period-wise Growth rates for area, yield and production for **Arhar**

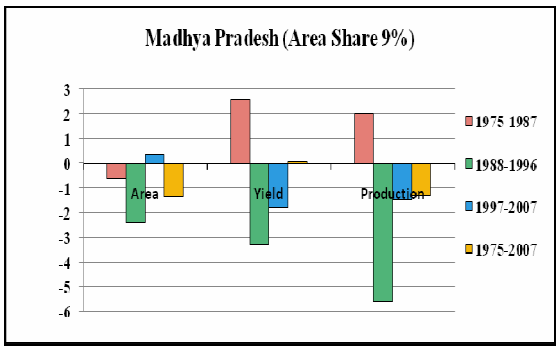


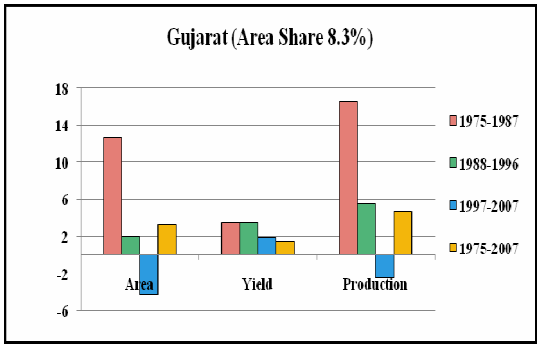




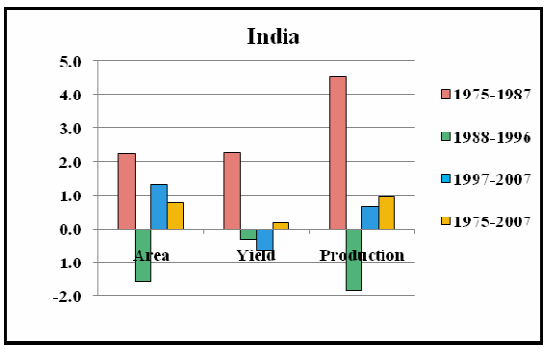


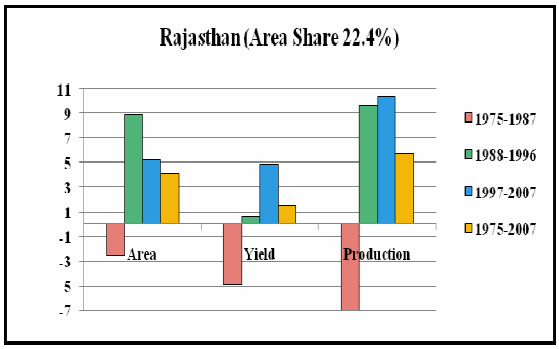


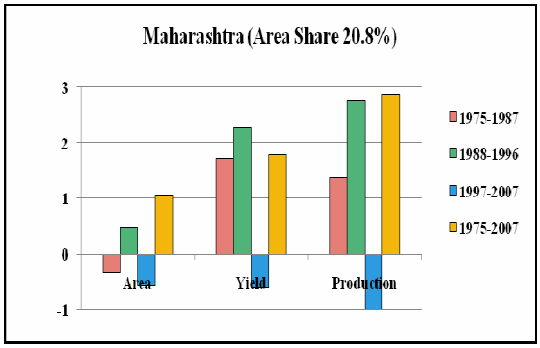


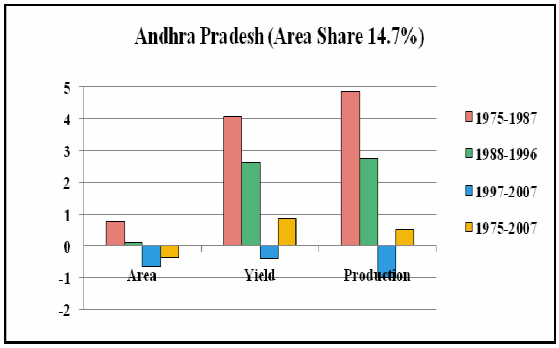


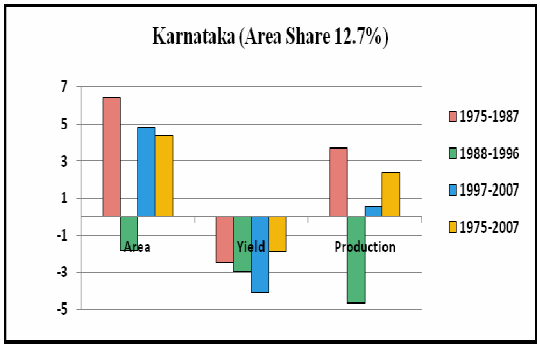
Period-wise Growth rates for area, yield and production for **Moong**

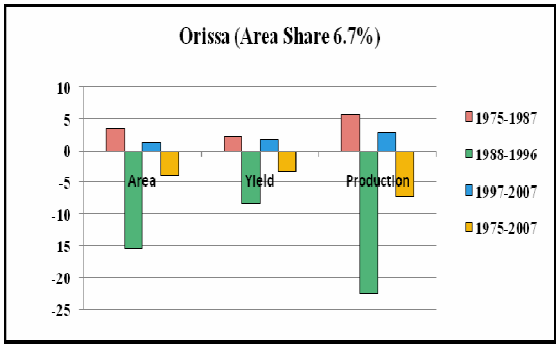


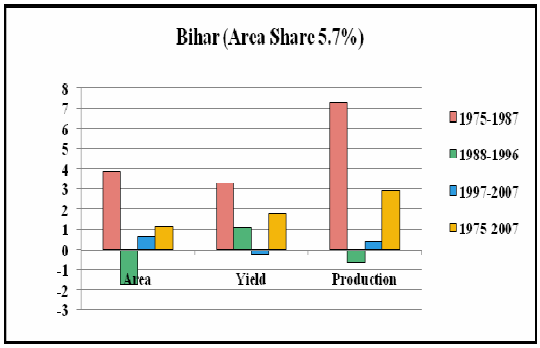


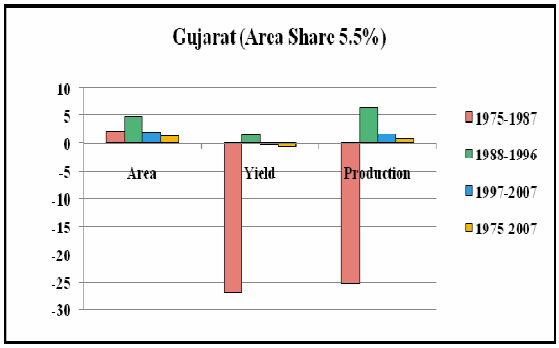


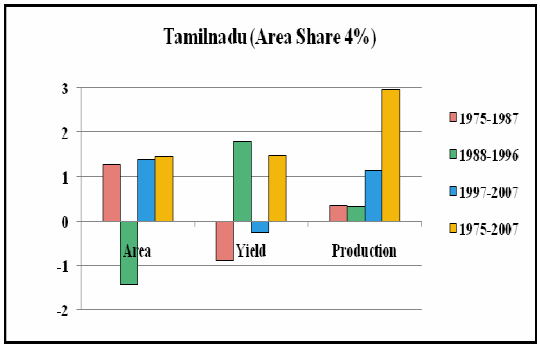




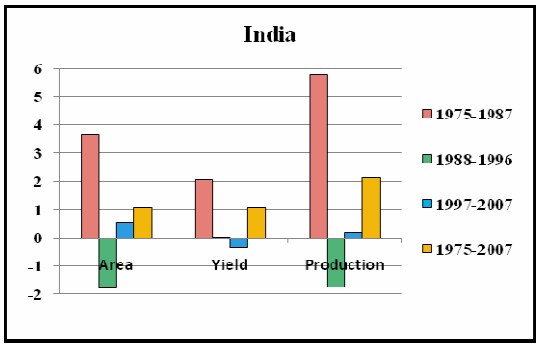


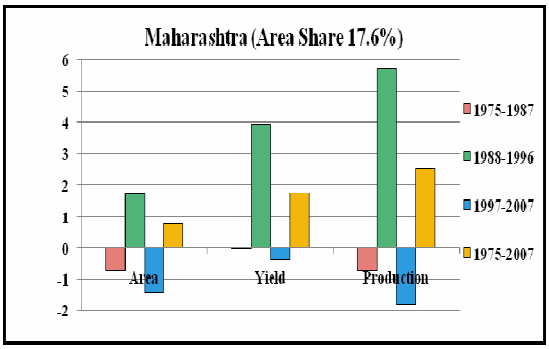


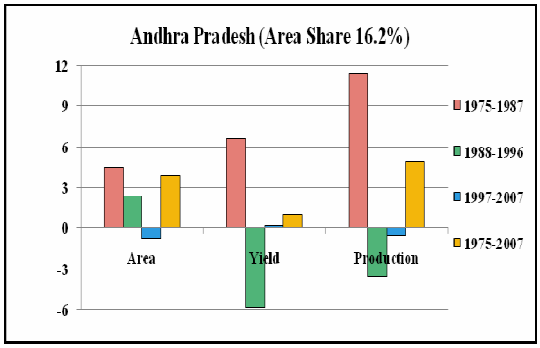


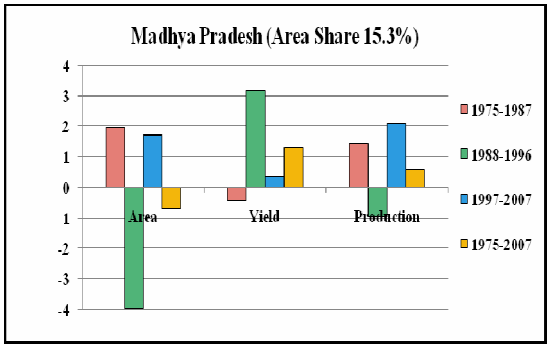


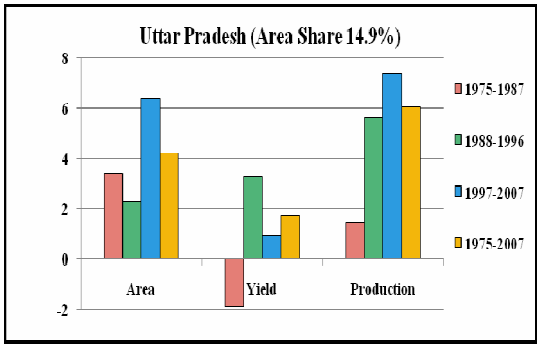
Period-wise Growth rates for area, yield and production for **Urad**

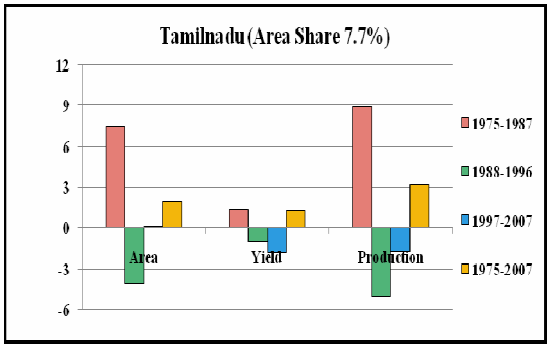


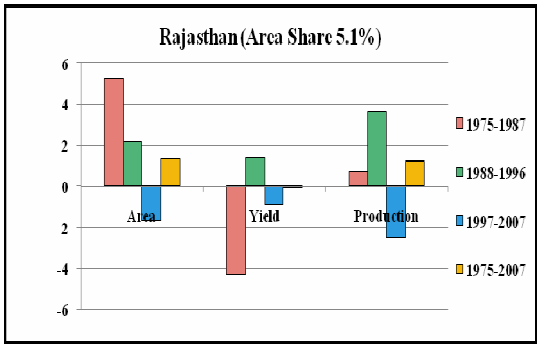


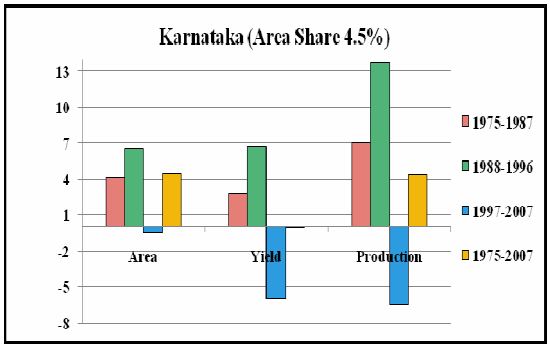


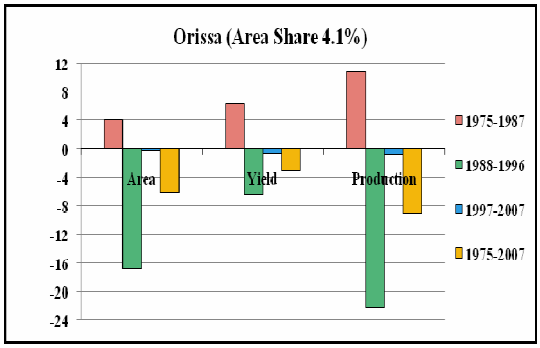


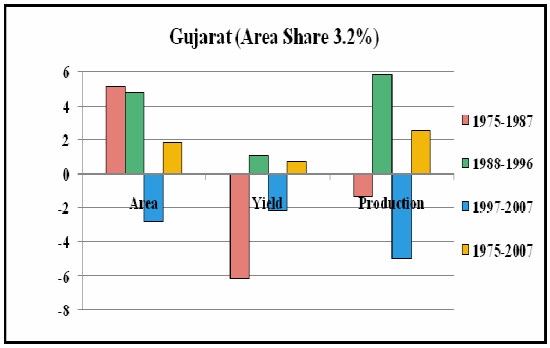




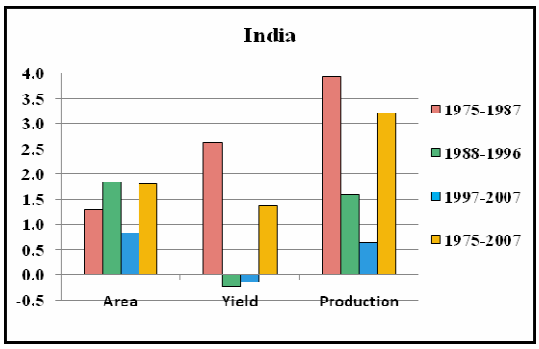


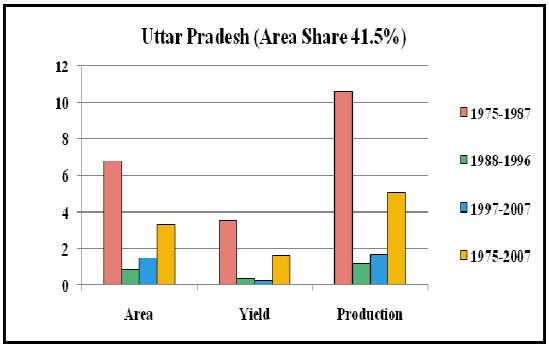


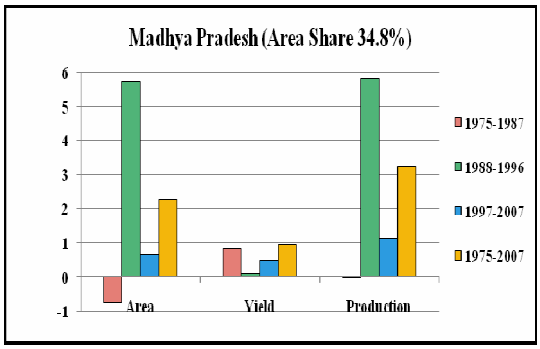


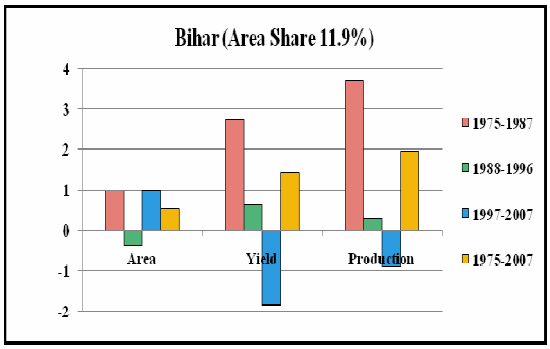


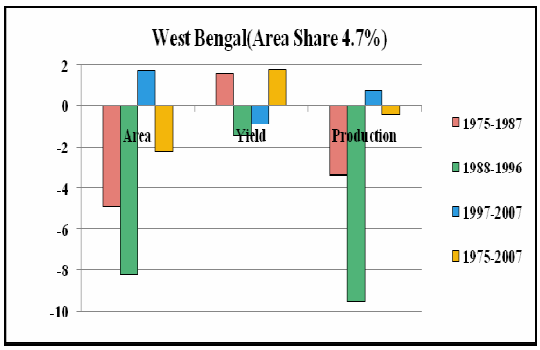
Period-wise Growth rates for area, yield and production for **Masur**

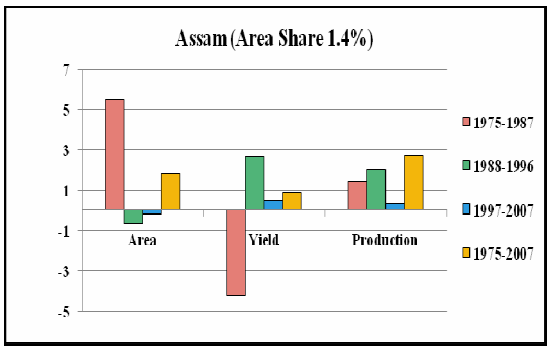


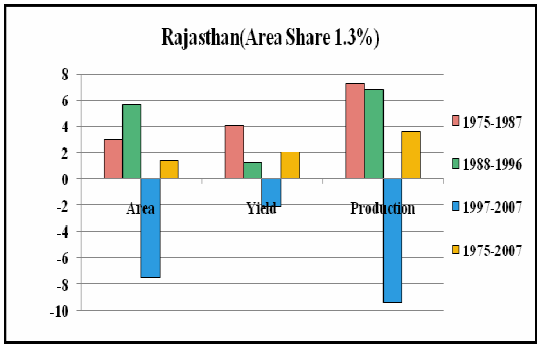












Action Taken on the Referee's Comments on the Draft Report

Comments on the report "Possibilities and Constraints in Pulses Production in India and Impact of NFSM, Submitted by Institute of Economic Growth, Delhi.

- **Titles of the Draft Report Examined:** Possibilities and Constraints in Pulses Production in India and Impact of NFSM.
- **Date of Receipt of the Draft Report**: 28-8-2012 (Dispatched from IEG on August 9, 2012).
- **Date of Dispatch of Comments:** 24-9-2012.
- **Date of incorporation of comments and Finalization of the Report:** 05-10-2012.
- **Comments on the Objectives of the Study.**

  The analysis are made as per the objectives of the study

- **Comments on the Methodology**

  The methodology adopted is appropriate and relevant.

  - **Comments on Analysis, Organisation and Presentation etc**

    There are several typographical errors and inconsistencies in the analysis part. They have been indicated below:

    - Analysis is presented under different sections. Normally, this should not be the practice. They should be presented under different Chapters.

    Response: Presentation has been changed as suggested

    - In page no.3, 61st NSS round has been mentioned. Mention the year along with this.

    Response: Year has been mentioned at the appropriate place

    - The components provided for pulses production under NFSM scheme should be provided in one of the tables, even though some reference towards this has been given in page no 141.

Response: A table outlining the major components of NFSM pulses programme has been added in chapter 12 (Impact of NFSM on Pulses Production)

- In page no. 4 Indian position in the world in respect of the pulses area has been given without referring to year.

Response: The time period refers to the last decade. It has been mentioned at the appropriate place in the report.

- In page no.5, Table 2.1, area proportion refers to which year?

Response: The proportions refer to the average share of area over the period 2000 to 2007. This has been mentioned at the appropriate place in the report.

- In page no. 11, 12 the line in second para has to be modified

Response: Comment not clear.

- In page no. 12, 1st line, say the data on pulse crop area, instead of simply saying as data on crop area.

Response: Correction carried out as appropriate

- Page. No. 15, Table 5.1 title should be in bold as well as in capital letters. This comment is applicable for several tables.

Response: Correction carried out as appropriate

- In the same table 5.1, the third period should be 1997-2007 instead of 1996-2007.

Response: Correction carried out

- Page no. 16, there should be line Below the Table Title.

Response: Correction carried out

- Page no. 17 and 155, the figures (graphs) have to be properly aligned.

Response: Alignment carried out to the extent possible

- Page no.17 and 155. Reference year for the shares of states should be indicated in figures.

Response: Reference period for the shares has been mentioned in Table 2.1. This reference period is applicable to all the charts on area shares.

- The figures on Y axis on page 17 and 115 should be mentioned as growth rates.

Response: Correction carried out as suggested

- The major comment on the analysis is that absence of absolute figures in the text. The analysis is entirely depending on percentages and growth rates without absolute figures.

Response: The tabulation scheme does include absolute figures also. All the AERC s have been asked to present absolute figures and compute the percentages and growth rates based on the absolute figures. Care has been taken to see that the absolute figures are not too small while calculating percentages, distributions, and growth rates. However, for reasons of brevity and comparability across states, absolute figures are not presented and the analysis is carried out using percentages and growth rates.

- From page no 22-26, stars are assigned to figures in tables. No explanation is given to such stars. The tables in these pages need refinement. The table title appears two times and the sub-heading state is missing above the list of states.

Response: Correction carried out as suggested

- What is the justification for the calculation of growth rates for four periods and growth acceleration for two periods?

Response: Growth rate is between two points of time. For instance, there are different rates at which growth occurred between 1975 and 1987 (sub-period I); 1988 and 1997 (sub-period II); and 1997 and 2007 (sub-period III). Let these be denoted by GR1, GR2, and GR3. Growth acceleration is the rate of change of the growth rates between two successive sub-periods. The growth acceleration for phase I is the rate of change from GR1 to GR2. Similarly, growth acceleration for phase II is the rate of change from GR2 to GR3. If there are n sub-periods, there will be n growth rates and n-1 rates of growth acceleration (or deceleration). Since the study period is divided into three sub-periods, growth acceleration has been calculated for two phases.

- Growth rates for the crops listed in the table 5.14 are already there under the period 1997-2007 in the previous tables. There is no need of presenting them again here.

Response: The reason for presenting these growth rates again here is to highlight the fact that some of the major states are showing disturbing growth trends in the recent decade, which has serious policy implications.

- The general comment on the secondary data analysis is that the authors could have attempted either period-wise or phase wise, growth rates or growth acceleration instead of examining the issues in both ways. Similarly, analysis should have been restricted to top ten states or top five states for each crop instead of 7 to 11 states for different crops or restricted to only sample study states.

Response: The point about growth rates and growth acceleration has already been addressed above. Instead of studying four/five major states for each crop, we have attempted to include all the states that together account for more than 80% of the cropped area. We hope that this level of detail has only enriched the analysis.

- The reference year for primary data collection should be given (page no 41)

Response: The reference year for the primary data surveys is already mentioned in Chapter 4, Section 2 (Primary Data Analysis)

- Under the cropping pattern there is no reference to horticulture crops even though the states of Maharashtra, Punjab and Haryana are prominently growing horticultural crops.

Response: The reports of the concerned AERC s did not report any area under these crops (possibly because the sample farmers did not report any area under these crops).

- There is no reference to actual land under different crops except the percentages. Absence of actual figures undermines the good analysis (page 41 to 57).

Response: Actual land under different crops: This point has already been covered in response to the suggestion about reporting absolute figures.

- It is not clear whether the analysis made on page no 46 is based on primary data or secondary data. This doubt arises because it has been mentioned that in the NFSM district about 33 % of GCA is under pulses in TE 2009 (see first sentence under section 7.2 page 46).

Response: These computations are based on the primary data. The GCA here refers to the total area under all the crops reported by the farmer.

- Some of the percentages mentioned in the test and table are not tallying. E.g. 33 percent and 61 per cent in table 7.1.1 (page 44 and 46).

Response: The figures in the table are correct and are correctly explained in the text. No correction appears necessary. For instance in table 7.1, it can be seen that there are three pulse crops grown in Rajasthan – moong, moth and gram. These three together account for about 66% of the GCA in small farmer group and 33% overall. This is what has been explained on page no 46 in the first few lines of paragraph 1.

- The percentages do not add up to 100 in many tables from page 44-46. This may be looked into.

Response: The correction was required in only few cases and carried out as suggested.

- In tables (page nos. 44-45) gross cropped area may be mentioned instead of total area.

Response: No correction required. This table refers to percentage distribution and therefore, 'total' is more appropriate.

- The sub-heading, i.e. farmers may be replaced with size group in tables 7.25 and 7.26.

Response: Correction carried out as suggested

- Nowhere in the table, the number of sample beneficiaries with land holding size has been mentioned.

Response: A table giving the number of farmers has been added in chapter 4, section 2 (Primary Data Analysis).

- Why the share of total pulses area is 90 per cent under irrigation in Rajasthan, where as in Haryana and AP it is 11 percent. It is also surprising to see that all the area under pulses is irrigated in AP. This finding goes against the fact that they are largely grown on un-irrigated lands.

Response: These results can be explained in the following way. In AP and Haryana, some major irrigated crops are grown - rice in AP and wheat in Haryana. Therefore the share of pulses in the GIA is lower in these states. On the other hand in Rajasthan, all the crops grown, except wheat, are dry crops. Therefore, the share of pulses in the GIA is higher in this state. Also, the irrigation facilities in AP are much better than in Rajasthan and pulses are mainly grown in the rabi season when rice is not competing for area. Therefore, the entire area under pulses is reported to have been irrigated in AP.

- Mention the unit of measurement i.e. Rs (tables 8.1 to 8.4).

Response: Correction carried out as suggested

- Fig in Rs. should come on top of the table than above the F group or Farmers Group (Tables 8.6 to 8.33).

Response: Correction carried out as suggested

- In Table 8.9 and 8.24. The crops and farmers group should come as sub-heading in column no.1.

Response: Correction carried out as suggested

- It has been said that in page no. 97 that the area under improved varieties is higher in NFSM areas than non-NFSM areas. Is it because of supply of improved varieties under the NFSM scheme?

Response: This need not be necessarily true since the NFSM pulses has many other components other than supply of improved varieties i.e. INM and IPM programmes, provision of farm machinery etc. All these programs can have psitive incentive effects for farmers to increase area under pulses.

- Page no 97 third para 6th line" b" may be inserted after followed i.e. by.

Response: Correction carried out as suggested

- In page no 110. column total should be given as 100.

Response: No correction required. This table refers not to distribution but to percentage shares. Therefore, the total need not add up to 100

- From page no.111 to 115, the marketing has been dealt with. This does not indicate the exact quantity of marketable surplus as well as the quantity marketed in various types of markets. The percentage quantity of marketed do not explain the actual marketing.

Response: The absolute quantities marketed in the NFSM and non-NFSM districts have been presented in Tables 10.5 and 10.6 respectively.

- Page no 111; the word moth may be deleted (last para first line).

Response: Correction carried out as suggested

- In page no 112. The output marketed in different years was indicated. But in table 10.2, year wise figures are not indicated.

Response: Correction carried out as suggested for which data is available

- In page no. 111. It has been said higher proportion of sale in the village than in the regulated markets. May be due to equal price in both the markets. In page no 113, Maharashtra case, it has been said higher proportion of sale in the regulated market than village market and said it may be due to higher prices in regulated markets. These explanations should be supported by facts rather than may be.

Response: The prices received in the NFSM and non-NFSM districts have been presented in Tables 10.5 and 10.6 respectively.

- From the analysis, it is evident that sale in regulated markets in the study area is better than other type of markets. Supportive evidence i.e. Density of regulated markets per 10000 gross cropped areas may be given for better understanding.

Response: The data is not collected/presented by the AREC s.

- The farmers perceptions have been presented under section11 are not in conformity with the findings presented in other sections. E.g. in page no. 55 in the case of Punjab, it was said all the area under pulses is irrigated. But in page no 119, it has been said pulses are mainly grown to make use of fallow lands.

Response: The marginal cost of irrigation is very low in Punjab because of hugely subsidized electricity and irrigation water. Also, it can be seen that the summer moong is the predominant pulse crop in Punjab. Because of the low marginal cost, the entire area under summer moong is irrigated rather than leaving it fallow. In the absence of the subsidies and the option to grow pulse crops, the farmers would prefer to leave the land fallow.

- The reasons for growing pulses and criteria used while opting to grown pulses are over lapping. E.g. Reasons indicated in table 11.1 for Punjab non-NSFM and the criteria used in table 11.2 for Punjab NON- NSFM are same.

Response: Although they largely overlap, they are not exactly the same. For instance in table 11.1, 34% of the farmers in Punjab's non-NFSM district have cited profitability as one of the major reasons for growing pulses whereas in table 11.2, 34% (similarity in the figures may be noted) of the farmers have indicated soil suitability as an important criterion while planting pulse crops.

- In page no 117 last para first line, the word `man' should be main.

Response: Correction carried out as suggested

- Page no 118. For Table 11.9, the bracket has to be closed.

Response: Correction carried out as suggested

- Under the table 11.1 page 121 - percentages should be mentioned after the table heading.

Response: Correction carried out as suggested

- Section 11.3, as may be inserted after pulses

Response: Comment not clear

- Cropping pattern has been already analyzed in page no 42 - what is the necessity again in page no 123.

Response: On page 42, cropping pattern has been analyzed while on page 123 reasons for less area under pulses, as reported by the farmers, are analyzed.

- The crops mentioned in page no 42 and 125 do no tally. For e g. In the case of Maharashtra, oil seeds and vegetable are not figured in page no 42, whereas in page no 125, they are figured.

Response: On page no 42 only the major kharif and rabi crops are mentioned. Oilseeds such as soybeans, sunflower are already mentioned in cropping pattern on page # 42. Vegetables are included in the 'others' category.

- At some places, on page no 118, it has been mentioned profit is the major reason for growing pulses. But in page no. 129 reasons for shifting area from pulses to other crops has been mentioned. Is it not contradictory? Even if shifting is taking place they should be explained with the actual data. At the same time, increase in area after NFSM has also been mentioned under the impact (Section 12)

Response: Profit (read higher price) can be one of the reasons for growing pulses. But there are other non-price factors which adversely affect growth in area under pulses or can even cause a shift in area away from pulses. These factors have been analyzed here. These are based on farmers' feedback. Turning to the NFSM programme, one way of assessing the impact of NFSM, if any, is by analyzing the increase (or decrease) in area and yield after the introduction of NFSM as compared to the previous years. These different sets of analyses – one dealing with farmers' response to specific queries about their reasons for growing pulses and why they shift away from pulses on the one hand and assessing

the increase in area and yield after the introduction of NFSM are not contradictory to each other.

- The problem of pests has been high lightened. It would have been better if some estimate on production decline is indicated due to this reason.

Response: Two additional tables 11.6(a) and 11.6(b) have been added and the estimated loss due to pests has been presented.

- The points mentioned in page no 134 are repetitions under reasons for growing pulses - see tables 11.1-,11.2,11.3 etc.

Response: Point valid. These sections largely overlap.

- What are the reasons for the lowest willingness of the farmers in AP as compared to other states to grow more pulses even if provided higher MSP? (Page 137).

- While the suggestions for MSP in the table 11.9 is overwhelming in the case of AP. Is it not a contradictory to the above point?

Response: It is interesting to note that the farmers in AP have expressed very little willingness to grow more pulses even if offered higher MSP but they have suggested in an overwhelming proportion the provision of higher MSP with assured market as one of the ways to increase pulses production. This is contradictory and needs further research.

- Page 143 to table 12.1.3) and Table 12.2.1 to 12.2.2), Mention percentages after the 12.1 table heading.

Response: Correction carried out as suggested

- It has been mentioned in page no 148 that during the second sub-period (1987-96) there has been a deceleration in pulse production despite of NPDP and other subsequent programmes. If this is the case, how come NFSM made positive impact and what factors have contributed for this and what factors are responsible for the failure of NPDP? They may be briefly mentioned.

Response: The increase in area and yield are only for one year 2008-09. It is to be noted that the reference years for the study are 2006-07, 2007-08 and 2008-09, out of which the post-NFSM year period is a single year. It cannot be concluded based on data for a single year that the NFSM pulses programme is an unqualified success although the signs are encouraging. The increases in area and yield need to be sustained for the programme to

be called a success. If the programme continues to be successful, the reasons for its success need to be researched.

- **View on acceptability of the Report**

The report can be accepted after incorporating the above comments. I also suggest that the report should be copy edited before submitting to the Ministry.