POLICY PAPER 2

PRODUCTION PROSPECTS AND CONSTRAINTS TO HIGHER PRODUCTIVITY OF PULSES IN MADHYA PRADESH

Edited by:

C.C.Maji
Rasheed Sulaiman V.
S.P.Pant

NATIONAL CENTRE FOR AGRICULTURAL ECONOMICS AND POLICY RESEARCH (I.C.A.R.)

NCAP has recently been established by the Indian Council of Agricultural Research (ICAR) with a view to upgrading agricultural economics research through integration of economics input in planning, designing, and evaluation of agricultural research programmes and strengthening the competence in agricultural policy analysis within the Council. The Centre is assigned a leadership role in this area not only for various ICAR Institutes but also for the State Agricultural Universities. With a view to making agricultural research a more effective instrument for agricultural and rural change and strengthening the policy making and planning machinery the Centre will undertake and sponsor research in agricultural economics relating to the problems of regional and national importance.

NCAP Policy Papers disseminate results of NCAP or NCAP/ICAR sponsored research. All the manuscripts undergo peer review and editing and highlight policy conclusions.

PRODUCTION PROSPECTS AND CONSTRAINTS TO HIGHER PRODUCTIVITY OF PULSES IN MADHYA PRADESH

S.P.Pant

Edited by:

C.C.Maji
Rasheed Sulaiman V.

Policy Paper 2

NATIONAL
CENTRE FOR
AGRICULTURAL ECONOMICS AND
POLICY RESEARCH (NCAP)
NEW DELHI - 110 012
INDIA.

NCAP Policy Paper 2

Production Prospects and Constraints to Higher Productivity of Pulses in Madhya Pradesh

First Published
March 1995

Published by
Dr.C.C.Maji
Director, NCAP

Laser Typeset at
Computer Cell, NCAP

Printed at
Ashok Computers, New Delhi-12
(Tel.578 2601)

CONTENTS

TABLES

ILLUSTRATIONS

FOREWORD

Pulses constitute an important source of protein, for the majority of the population of the country. Production and productivity of most of the pulse crops have either declined or at best stagnated over the last two decades resulting in a sharp reduction in the per capita availability of pulses. Serious concerns have been expressed over the depressing pulse scenario and several explanations have been offered. The need for generation of new varieties/technologies responsive to the modern inputs with more stability especially in the rainfed areas has been emphasized.

Madhya Pradesh, being the major pulse growing state in India, has a lot to contribute towards increasing pulse production and productivity in the country. With a view to examining various dimensions of the problems this study was conducted by Institute of Development Studies, Bhopal with the financial support of the Indian Council of Agricultural Research. The original report submitted by the author has been abridged, up-dated and edited highlighting policy implications for the benefit of researchers, planners and the policy makers.

March 1995
New Delhi

C.C.Maji
Director

PREFACE

Pulses remains one of the weak spots in Indian Agriculture even now. It received the desired attention of research and extension systems only during the last decade. Nevertheless, success still eludes pulses. This stagnation in pulse production and productivity should be viewed seriously not only from the point of security and quality of food for our people, especially the poor and the rural population, but also from the soaring import bill and imbalance in the cropping pattern. By the turn of the century, production of about 20 million tonnes would be required to meet our consumption requirement. Production capacity is expected to remain behind the projected demand creating wide gap and causing deficiency in protein intake through pulses. Shortage of pulses will thus continue to be a cause of concern in the near future. A diagnosis of the magnitude and dimensions of the problems inhibiting production and productivity of pulses is thus essential for devising appropriate policy directions.

The present policy paper is based on a study entitled Production Prospects and Constraints to Raising Productivity of Pulses in Madhya Pradesh initiated in the year 1988 as an *ad-hoc* research project of Indian Council of Agricultural Research (ICAR). The detailed study report was submitted to ICAR in 1992. As decided by the Council, the National Centre for Agricultural Economics and Policy Research (NCAP) undertook the responsibility to abridge, analyse and synthesise the findings of the report for policy conclusions.

We have analysed the said report keeping in view the latest developments and have extracted the major policy issues. We have also given our own perspectives to these issues. During the editing process some of the earlier conclusions might have been revised in the light of currently available information.

This policy paper is addressed to all those concerned with the development of pulses in particular and agriculture in general. We hope that this report will be of use in understanding the constraints in pulse production and developing appropriate strategies towards the development of this important crop.

New Delhi, India
March 1995

C.C.Maji
Rasheed Sulaiman V
Editors

ACKNOWLEDGEMENT

The author acknowledges the professional help received from Dr. K.K.Sharma, (Department of Genetics and Plant Breeding, JNKVV, Jabalpur), Dr. R.C.Thakur and Dr. R.K.Joshi (All India Co-ordinated Pulse Improvement Project) and officials of the Directorate of Agricuture, Madhya Pradesh for the succesfful completion of the study.

1 SUMMARY

India is the largest producer of pulses in the world, both in quantity and variety. Once a net exporter it is presently one of the largest importers of pulses. Pulses are the primary source of protein for the poor and the vegetarians who constitute the majority of Indian population. While the traditional cropping pattern almost always included a pulse crop either as a mixed crop or in rotation, the commercialisation of agriculture has encouraged the practice of sole-cropping. Over the period from 1951 to 1992, the net per capita per day availability of pulses has fallen from 60.7 grams to 33.4 grams. This is despite increases of area, production and yield of pulses during the same period. It is significant to note that almost all these increases had taken place during the first decade i.e. from 1950-51 to 1960-61 and that area, production and yield of pulses have either stagnated or declined since then. It is palpable that growth in production and productivity of pulses has lagged far behind the population growth during the past three decades. By the turn of the century production of about 20 million tonnes would be required to meet the consumption requirement of about 16.04 million tonnes. The country has to make a much more vigorous effort to bridge this gap and save the foreign exchange required to meet the demand through imports.

Historically , Madhya Pradesh has been the major pulse producing state in the country. The primary purpose of this study is to diagnose of the dimensions and magnitude of the problems inhibiting production and productivity of pulses in the chief pulse producing state of Madhya Pradesh.

A retrospect of pulse production at the all-India level reveals that the area under pulses as a proportion of Total Cropped Area (TCA) started falling even in the pre-HYV era. The decline has been accentuated as the HYV technology gathered momentum and advanced further. Pulses also did not get its due share of increase in the irrigated area. In the HYV period the irrigated area under pulses even registered a fall and all the additional irrigated area went to non-pulse crops.

Although area, production and productivity of pulses showed positive growth during the last four decades (ie 1949-50 to 1991-92) their performance was rather poor and insignificant as compared to crops like wheat and rice. There is a wide variation both in the mean yield and yield variability in the ten major pulse producing states of the country. The mean yield per hectare ranges from a low of 347.0 kg in Karnataka to a high of 875.0 kg in Uttar Pradesh. The coefficient of variation in the mean yield ranges from 4.22 percent in Orissa to 28.28 percent in Gujarat.

In Madhya Pradesh, Haryana and Bihar, which showed high yield with high variability, attempts should be made to reduce variability. In the state of Uttar Pradesh having high yield and low variability, the strategy should be to induce area expansion. In the low yield but high variability states of Rajasthan, Maharashtra, Karnataka, Andhra Pradesh and Gujarat (together contributing 35 percent of production and occupying 45.4 percent area) technologies that raise productivity and at the same time reduce yield variability need to be developed for large scale adoption. In the state of Orissa, having low yield and low variability, attempt should be made for increasing productivity through generation of technologies which are less sensitive to weather aberrations that cause yield variability. Similar analysis needs to be conducted separately for all pulses and also in the more disaggregated districts and block levels, for orienting the development programme in pulses to suit the local conditions.

Madhya Pradesh ranked first both in terms of area(19.8 percent) and production(20.9 percent) of pulses in India. Over 20 percent of the Gross Cropped Area (GCA) of Madhya Pradesh is under pulses. Though ranked first in terms of area and production, it ranked sixth after Uttar Pradesh, Bihar, Haryana, West Bengal and Gujarat in terms of average yield.

The share of pulses in GCA of Madhya Pradesh remained around 20 percent during the Pre-HYV and Post-HYV periods . In case of cereals, the proportion in GCA declined in the HYV period despite rapid growth of HYV coverage. The oilseeds group was the largest beneficiary during the HYV period.

The share of pulses in the Gross Irrigated Area (GIA) in 1989-90 is only 12.8 percent in Madhya Pradesh whereas cereals still command the major share. However, the decreasing share of cereals and the simultaneous increasing share of pulses in GIA are clear indication of the rising interest of farmers in pulse crops.

About a dozen different pulse crops are grown in Madhya Pradesh. However, pigeonpea in kharif and chickpea(bengalgram) in rabi are the most important ones, followed by blackgram(uradbean) in kharif and lentil in rabi. Pigeonpea and chickpea together account for 60 percent of the area and 74 percent of the production of total pulses. While the area under kharif pulses is declining the rabi pulse area is on the increase.

Except blackgram in kharif , all pulses performed better in the eighties as compared to their performance in the seventies. In terms of production and yield, pigeonpea and lentil performed very well though the area under pigeonpea showed a negative growth. On the other hand, even though the yield of chickpea had shown a nominal negative growth the area recorded a significantly high growth rate. Thus growth performance of the pulses in general showed a conflicting scenario.

A comparison of state-wise growth in pulse production and the coefficients of variations in the eighties reveals the association of high growth, positive or negative, with high variability. Similarly, states with moderate growth such as Madhya Pradesh, Karnataka and Andhra Pradesh showed moderate variability. The share of Madhya Pradesh did not increase in blackgram, lentil, kharif pulses and as well as in total pulses for which all India production increased during the period from 1970-71 to 1989-90. In lentil and blackgram, though production increased, their share in all India production actually decreased, more so in blackgram. However, in total rabi pulses and chickpea, where all India production showed a decrease, the share of Madhya Pradesh has increased. Madhya Pradesh thus commands a comparative advantage in chickpea and blackgram. With little or more effort the share of Madhya Pradesh in blackgram can be increased.

An analysis of production stability for the different states reveals that Madhya Pradesh ensures long-run production stability without losing its comparative advantage. Madhya Pradesh is thus one of the most important regions where pulse development programmes are likely to succeed in the long run. Other states that command attention in this context are Bihar and Uttar Pradesh wherein, like Madhya Pradesh, the production is large and any small increase in production adds substantially to output. A more rigorous analysis may be needed at the disaggregated level to identify districts where the pulse development programme may be harnessed to increase productivity with stability.

Pigeonpea stands first both in terms of return per rupee of operating expenses and surplus over operating expenses. But being a long duration crop spilling over to another season it does not permit a second crop in the rabi season. The area under pigeonpea thus declined during the last two decades. Although more profitable than other crops, area expansion under pigeonpea is restricted by high variability in yield as well as non-availability of seeds of short duration varieties that permit a second crop in pigeonpea fields.

Soyabean is the next best rewarding kharifcrop and this explains its rapid growth in Madhya Pradesh. Blackgram (urad) is the least rewarding pulse crop in Madhya Pradesh and it is getting replaced by soyabean even in the traditionally urad producing areas. Soyabean is thus the major crop competing with pulses in the kharif season.

Lentil is the most rewarding crop in the rabi season in terms of returns per rupee of operating expenses. The surplus over operating expenses for lentil is, however, less as compared to that for wheat and chickpea. The cultivation of lentil is restricted to specific areas, though it is now expanding. Chickpea is the next rewarding crop in terms of returns per rupee of operating expenses and hence its area is also expanding. However , year to year variations in yield are high in both chickpea and lentil. Moreover, wheat is the staple cereal and it gives higher surplus over operating expenses. Wheat thus continues to be preferred as long as farmers can mobilise 50- 100 percent more finance as operating expenses for wheat cultivation as compared to growing chickpea and lentil.

Thus soyabean is the major competing crop for pulses in

The relative price support to pulses has been constantly on the rise after 1982-83. The rising support price ratios for pulses reflect the policy intention to promote pulse cultivation. However , pulse production did not rise commensurate with the increase in the support prices. Either the price signals did not reach the farmers or the farmers ,did not respond to these signals probably due to absence of procurement system or some other reasons.

Though the growth in the wholesale prices of pulses in Madhya Pradesh during the seventies and the eighties was the highest as compared to its competing crops (cereals and oilseeds) , the price variability in pulses was also the largest. The high annual fluctuations in price of pulses indicating a higher risk might have turned the farmers away from pulses and in favour of other competing crops like oilseeds and cereals which did not exhibit price fluctuations as high as that observed in pulses. Procurement of pulses from the farmers during the peak marketing season at the support/procurement prices and channelising the produce through the Public Distribution System(PDS) will be the right step to protect the interests of both the consumers as well as the producers.

The growth of Farm Harvest Price (FHP) after 1982-83 also showed a favourable price regime in pulses in Madhya Pradesh, compared to cereals like jowar, maize and wheat, where it is negative. The more favourable price regime for pulses especially after 1982-83 failed to evoke a commensurate response. It may be inferred that production response to price in pulses is rather weak and non-price factors such as high-yielding technology/ modern varieties, better infra-structures including adequate procurement system are more important for accelerating pulse production in general and in Madhya Pradesh in particular. Development of farm plans under various resource situations involving enterprise-mix with maximisation of income as an objective subject to minimum income variance for the different districts and educating the farmers on this aspect would be of great help to the farmers in making appropriate decisions.

Non-availability of seeds of high-yielding varieties in the desired quantities is perhaps one of the major constraints in the expansion of pulses. Although more than 200 improved varieties of pulses have been released since 1970's, its impact hardly gets reflected in the yield . The rate of growth of yield of pulses was 0.03 percent over the past four decades. Varieties with better yield advantage and desirable characteristics to suit the varied agro-climatic conditions need to be developed in pulses.

The fertiliser use in pulses was very low with chickpea receiving the highest priority and pigeonpea the least. Use of fertilisers, especially in kharif pulses, was low. The distortion in fertiliser subsidy/pricing policy making the phosphatic and potassic fertilisers more costly relative to the nitrogenous fertiliser also contributed to the adverse impact on the growth of pulse crops. The impact of such an imbalance in fertiliser use would be more severe in pulses as phosphorous is considered the most important nutrient for pulses. Measures to correct the distortions in fertiliser policy and to educate the farmers on the use of balanced fertilisers as well as on the techniques to improve fertiliser use efficiency are urgently called for.

Although efforts to popularise Rhizobium inoculants have been going on for a long time and several public and private sector units are manufacturing them , the adoption of these biofertilisers is found to be very negligible. Blaming the poor transport and storage facilities for the ineffectiveness in the field does not make much sense as these are to be expected in its adoption. The final testing ground of any technology is in the farmer's field. Strict Quality Control Standards need to be enforced in the manufacture and sale of these inoculants.

In pulses there are a number of diseases , insects and pests which cause heavy losses resulting in poor production. Though several resistant/tolerant varieties are being developed by research institutions the spread of such varieties in the farmers' fields is very limited. The main reason could be our weak seed production programme. Cheaper and effective pesticides to combat the pests in pulses thus needs to be developed .

Furthermore, there is hardly any visible technological change in pulse farming in the country. This clearly shows that technological stagnation is primarily responsible for the backwardness of pulses not only in Madhya Pradesh but in the country as a whole.

Agricultural markets in Madhya Pradesh could not be termed efficient as the price differentials over different locations exceeded the transportation costs. Lack of an effective system of market intelligence and existence of different grades and qualities contributed to these spatial imperfections. Appropriate reporting with quality differences and graded produce could go a long way to reduce the high price differentials, spatial as well as temporal.

There are about 10,000 Dal mills in the country out of which one thousand are in Madhya Pradesh alone. The industry in Madhya Pradesh continues to be as traditional as ever with no technical improvements in the process. The major problems of present day mills are low recovery, separation of whole pulse from dehusked whole pulse, high cost of milling, especially due to oil treatment, frequent breakdowns and high cost of maintenance. Though modern and efficient methods of milling have been developed by government institutions, manufacturers are not coming forward to fabricate these new designs on commercial scale. It is high time that Government organisations like agro-industries corporations in different states initiate actions to commercially manufacture these improved pulse milling machineries.

A national apex body of pulse processors needs to be organised to develop and promote innovative approaches in processing, packaging and storing of pulses. Similarly, collection, compilation and dissemination of scientific and trade information through the above organisation can be of great help to the pulse processors. The National Pulse Development Programme (NPDP) introduced in 1985-86 is making steady progress, but the coverage in terms of pulse producers is insignificant. Further, the programme has been spread too thinly over the state with the result that the impact, if at all, will be visible only after a long time.

The Extension machinery finds it extremely difficult to do a very thorough job in pulses. One of the possible ways to improve this situation is to organize pulse farmers and focusing the available resources as well as educational efforts through these organizations of pulse farmers. This will definitely improve the situation by way of equitable distribution of official assistance, improved interactions between the farmers and the extension workers. Moreover , it enhances people's participation.

Increase in pulse production has to come either through expansion of area or through an increase in productivity, or both. Expansion of area is possible by substitution, by reduction in kharif fallows and by increase in double cropping. Substitution is always a gradual process and its prospects for pulses in the short run is rather limited. Though kharif fallows are still high in Madhya Pradesh, soyabean is expected to keep pulses out of race in the share of kharif fallows brought under the plough. What is urgently needed is a pulse technology / variety which is as good as that of soyabean. In case of pigeonpea the early maturing varieties which also permit double cropping needs to be popularised. As far as rabi pulses are concerned, chickpea and lentil may still continue to benefit with increase in double cropped area. However, rapeseed and mustard are also competing for this area. The scope for major expansion of area under pulses in the short run is thus limited.

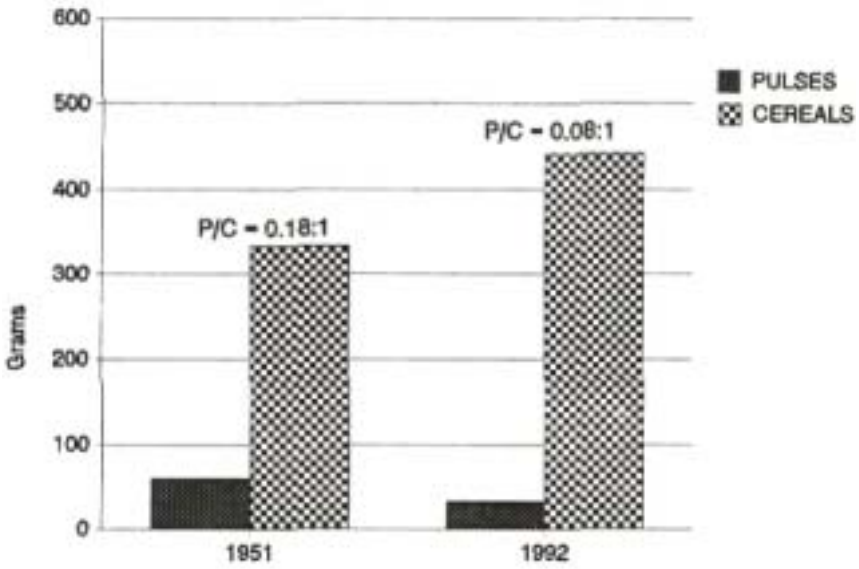
Bringing more area under pulses in the long run depends upon a favourable price regime (with less variability) and through technological breakthroughs that make higher yields realised on the fanners' fields. At present wide gaps exist between the yields of improved varieties on the research farms and those obtained on the farmer's field. The new production technologies might not have reached the farmers in a meaningful way or they might be inappropriate to the agro-ecological and socio-economic conditions of the farmers. These aspects need further in-depth investigation.

2 INTRODUCTION

India is the largest producer of pulses in the world, both in quantity and variety. Once a net exporter it is presently one of the largest importers of pulses. Pulses are the primary source of protein for the poor and the vegetarians who constitute the majority of Indian population. While the traditional cropping pattern almost always included a pulse crop either as a mixed crop or in rotation, the commercialisation of agriculture has encouraged the practice of sole-cropping. Cereal shortages of the mid-sixties and the green revolution accompanied with changes in the infrastructures and incentives including input supplies and price support systems in favour of major cereals altered the traditional cropping pattern against pulses. With decades of emphasis on research as well as production in superior cereals coupled with a near-total neglect of rainfed areas, pulses were driven out of not only the irrigated areas, but also the rainfed farming, and were relegated to the marginal lands. Furthermore, the weak infrastructural support for input supply, credit and marketing in the rainfed areas, the traditional home of pulses, also adversely affected the prospects for pulses. A vicious circle of low input use and low output thus got built in. Lack of processing and marketing facilities in pulses also contributed its share to the woes of pulse growers. The increasing shortage of pulses, resulted in the need for more and more import which, in turn has dampened the speed of rejuvenation of pulse sub-sector of agriculture sector.

It may be seen from Figure 1 that over the period from 1951 to 1992, the net per capita per day availability of pulses has fallen from 60.7 gms to 33.4 gms. On the contrary, the daily per capita availability of cereals has registered an increase from 334.2 gms to 443 gms during the same period leading to a fait in the pulse/cereal ratio from 0.18 gms to 0.08 gms, i.e. by 55 percent. This is despite increases of 24.36 percent, 61.71 percent and 29.93 percent in area, production and yield of pulses during the period under reference (Table 1).

Figure 1. Per capita net availability of cereals and pulses per day



Source: (1) Economic Survey 1993-94
(2) Agricultural Statistics at a Glance (1993) Directorate of Economics and Statistics, Ministry of Agriculture

Table 1. Area, production and yield of pulses in India

Year	Area (Mill. Ha)	Production (Mill. Tonnes)	Yield (Kg/ha)
1950-51	19.09	8.41	441
1960-61	23.56	12.70	539
1970-71	22.54	11.82	524
1980-81	22.46	10.63	473
1990-91	24.66	14.26	578
1991-92	22.54	12. 01	533
1992-93	23.74	13.60	573

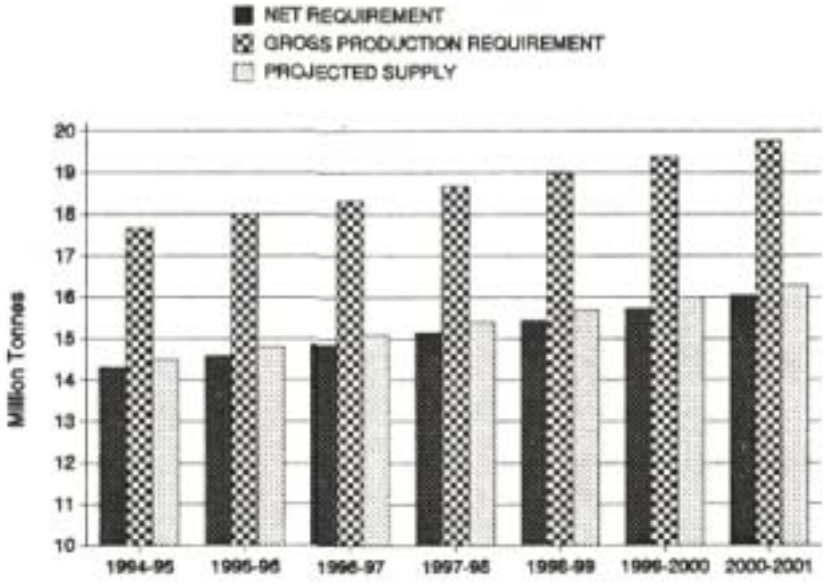
Source: Directorate of Economics and Statistics, Ministry of Agriculture, New Delhi.

It is significant to note that almost all these increases had taken place during the first decade i.e. from 1950-51 to 1960-61 and that area, production and yield of pulses have either stagnated or declined since then. This stagnation in pulse production and productivity should be viewed seriously not only from the point of security and quality of food for our people, especially the poor and the rural population, but also from the soaring import bill, imbalance and distribution in the cropping pattern and resource allocation among various sub-sectors of agriculture. It is palpable that growth in production and productivity of pulses has lagged far behind the population growth during the past three decades. In addition, though the consumption expenditure on pulses is higher in the rural than in the urban areas, it has been falling over time in terms of percentage of both total expenditure and food expenditure, indicating a greater imbalance in the food habits of the rural population.

The demand-supply projections for the coming years are given in Figure 2.

It may be seen from Figure 2, the requirement for pulses for 1994-95 as per physiological norms set by ICMR works out to 14.32 million tonnes for which production requirement is estimated at 17.66 million tonnes. By the turn of the century production of about 20 million tonnes would be required to meet the consumption requirement of about 16.04 million tonnes. Production capacity will remain behind the projected demand, creating wide gap and causing deficiency in protein intake through pulses. Shortage of pulses will thus continue to be a cause of concern in the near future. The country has to make a much more vigorous effort to bridge this gap and save the foreign exchange required to meet the demand through imports.

Figure 2. The demand and supply projections for 2001 A.D.

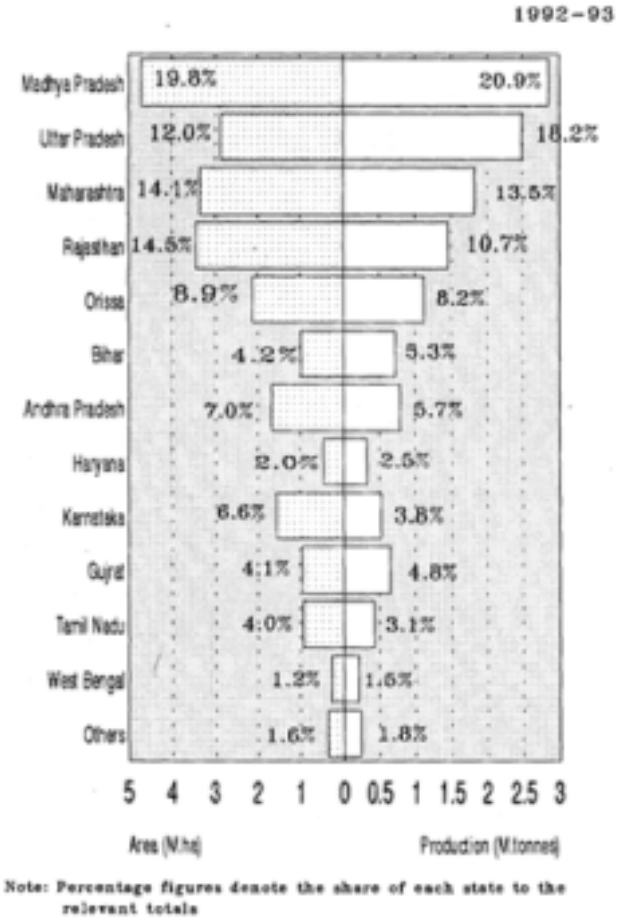


Note: Based on physiological need @43 gm/day person and 12.5 percent retail level and production level wastage, etc.
Source: Bhushan, B. and Sobti, R.(1992) Pulses: Present slatus and prospects, Yojana (36) 3.

Unlike wheat or paddy pulses constitute a group of crops, each one of them having unique characterstics of its own. The peculiar characterstics of different pulses generate problems for the development of location-specific techniques. This study covered only four pulse crops that seen to have exploitable potential. The primary purpose of the study is diagnosis of the dimensions and magnitude of the problems inhibiting production and productivity of pulses in one of the chief pulse producing state of Madhya Pradesh. Historically, Madhya Pradesh has been the major pulse producing state in the country. It ranked first both in terms of area (19.8 percent) and production (20.9 percent) of pulses in India (Figure 3).

The study was initiated from June 1988 with 1988-89 as the reference year for field survey. The multi-stage stratified random sample for the study covered 10 districts, 20 blocks, 40 villages and 360 farmers from 9 out of 14 agro-climatic zones in the state.

Figure 3. State-wise area and production of total pulses



Note: Percentage figures denote the share of each state to the relevant totals

Before presenting the findings of the field survey, separate chapters on the status of pulses in India and in the state of Madhya Pradesh is given, so as to have a clearer perspective.

3 PULSES IN INDIAN AGRICULTURE

An examination of the historical growth process revealed some of the reasons for the stagnation in pulse production. Although the area under pulses as a proportion of Total Cropped Area (TCA) started falling even in the pre-HYV era the decline has been accentuated as the HYV technology gathered momentum and advanced further (Table 3). During the period from 1967-68 to 1989-90, TCA has increased by about 17.41 million hectares, while the corresponding increase in pulse area is only 0.26 million hectares.

Table 2 Share of Pulses in Total Cropped Area (All India)

Year	Gross Cropped Area (000 ha)	Area under pulses (000 ha)	Grossirrig-ated area (000 (ha)	Irrig-ated area under pulses (ha)	Pulse area to TCA (%)	Pulse area to GIA (%)
Pre-HYV era						
1950-51	131893	20554	22563	1939	15.58	8.59
1964-65	159229	24163	30705	2212	15.20	7.20
HYV era						
1967-68	163736	23017	33207	2003	14.06	6.00
1989-90	181143	23275	59050	2211	12.85	3,74

Furthermore, micro-level studies reveal that, it is during the HYV period that pulses have been pushed to the marginal lands. Thus, pulses suffered on account of a net decrease in area (both in hectareage and quality of land) and in other associated resources.

Pulses also did not get its due share of increase in the irrigated area. In the pre-HYV period, most of the additional irrigated area got diverted to non-pulse crops, particularly, cereals such as wheat and rice. In the HYV period the irrigated area under pulses even registered a fall(Table 2) and all the additional irrigated area went to non-pulse crops. Thus with diversion of better quality lands away from pulses accompanied by more or less stagnant irrigated area, the present crisis in pulses was inevitable.

Although area, production and productivity of pulses showed positive growth during the last four decades (ie 1949-50 to 1991-92) their performance was rather poor and insignificant as compared to crops like wheat and rice (Table 3). The growth in area and production of total pulses, though positive in the pre-HYV period slowed down in the HYV period.

Table 3: All India compound growth rates of area, production and yield of pulses and other selected crops.

(1949-50 to 1991-92)

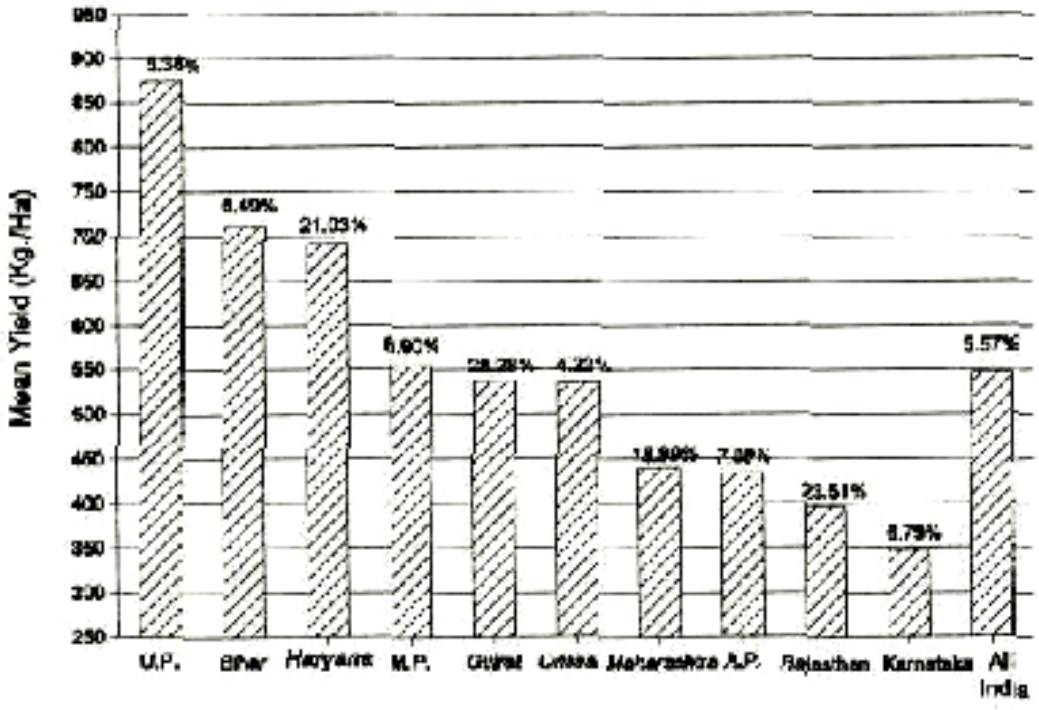
Crop	(1949-50 to 1964-65)			(1967-68 (o 1991-92)			(1949-50 to 1991-92)		
	A	P	Y	A	P	Y	A	P	Y
Pulses	1.90	1.39	-0.50	0.30	0.88	0.58	0.26	0.46	0.20
Rice	1.33	3.49	2.13	0.59	2.85	2.29	0.82	2.63	1.79
Wheat	2.68	3.99	1.27	1.71	4.97	3.19	2.42	5.74	3.23

Source: Agricultural Statistics at a Glance (1993) Directorate of Economics and Statistics, Ministry of Agriculture, New Delhi.

There is a wide variation both in the mean yield and yield variability in the ten major pulse producing states of the country (Figure 4). The mean yield per hectare ranges from a low of 347.0 kg in Karnataka to a high of 875.0 kg in Uttar Pradesh. The coefficient of

Figure 4: State-wise 10-year mean yield and coefficient of variation of total pulses

(1984-85 to 1992-93)



Note: The figures in percentage denotes Coefficient of Variation of yield.

variation in the mean yield ranges from 4.22 percent in Orissa to 28.28 percent in Gujarat. The states have been classified as "high" and "low" based on yield and variability to plan

appropriate development strategy. The states falling under different categories with the triennium average area and production ending 1992-93 are given in Table 4.

In Madhya Pradesh, Haryana and Bihar, having high yield but high variability, attempts should be to reduce variability. In the state of Uttar Pradesh having high yield and low variability, the strategy should be thus in inducing area expansion. In the low yield but high variability states of Rajasthan, Maharashtra, Karnataka, Andhra Pradesh and Gujarat (together contributing 35 percent of production Inflls and occupying 45.4 percent area) technologies that raise productivity and at the same time reduce yield variability need to be developed for large scale adoption. In the state of Orissa, having low yield and low variability, attempt should be made for increasing productivity through generation of technologies which are less sensitive to weather aberrations that cause yield variability. This type of analysis needs to be conducted separately for all pulses and also in the more disaggregated districts and block levels, for orienting the development programme in pulses to suit the local conditions.

Table 4: Classification of states based on yield and variability

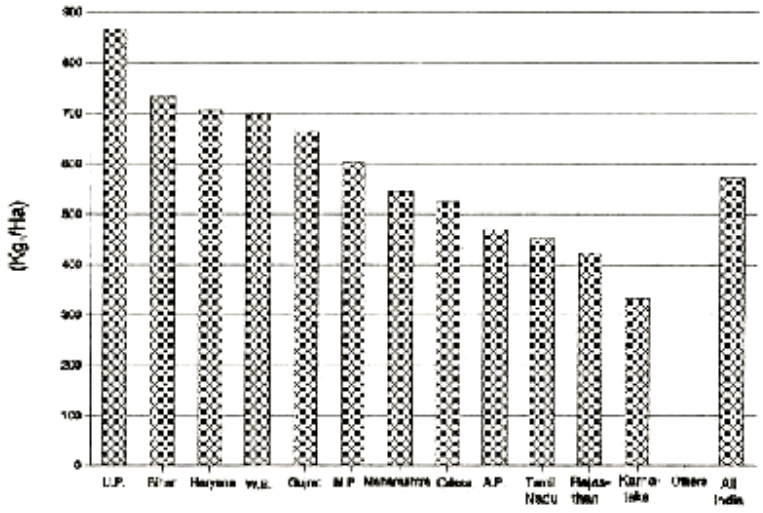
Category	**Name of states**	**Triennium Average ending1992-93**	
		Area (000 ha)	**Production (000 tonnes)**
1 High Yield- High Variability	Madhya Pradesh Haryana Bihar	6358.0 (26.9)	4124.0 (31.0)
2 High Yield- Low Variability	Uttar Pradesh	2926.4 (12.4)	2591.6 (19.5)
3 Low Yield- High Variability	Rajasthan Maharashtra Karnataka Andhra Pradesh Gujarat >	10734.2 (45.4)	4660.1 (35.0)
4 Low Yield- Low Variability	Orissa	2075.7 (8.8)	1112.6 (8.4)

4 PULSES IN MADHYA PRADESH

Historically, Madhya Pradesh has been the major pulse producing state in the country. It ranked first both in terms of area(l9.8 percent) and production(20.9 percent) of pulses in India (Figure 3).

Over 20 percent of the Gross Cropped Area (GCA) of Madhya Pradesh is under pulses. Though ranked first in terms of area and production, it ranked sixth after Uttar Pradesh, Bihar, Haryana, West Bengal and Gujarat in terms of average yield (Figure 5).

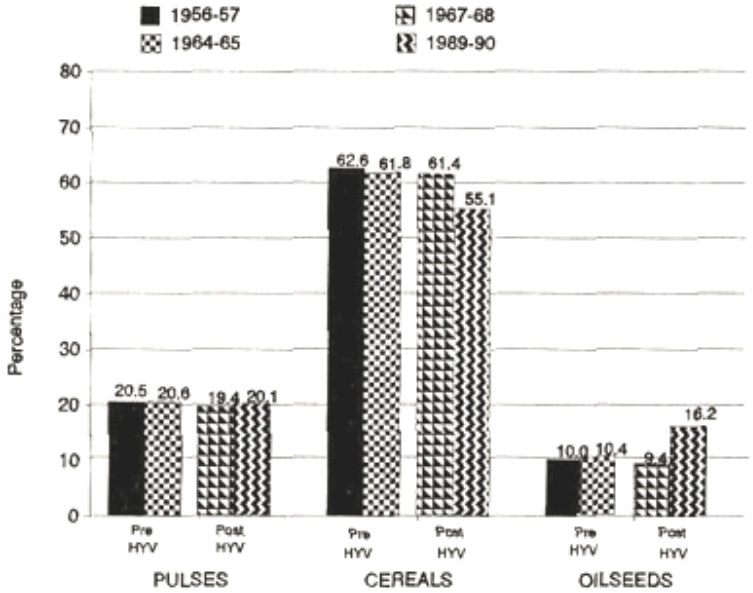
Figure 5. State-wise yield of total pulses (1992-93)



Source: Directorate of Economics and Statistics, Ministry of Agriculture, New Delhi

There is no evidence to support the general impression that the Green Revolution has adversely affected the growth of pulses in M.P. The share of pulses in GCA remained around 20 percent during the pre-HYV and post-HYV periods (Figure 6). In case of cereals, the proportion in GCA declined in the HYV period, despite rapid growth of HYV coverage. The oilseeds group was the largest beneficiary during the HYV period. It is therefore, safe to infer that as far as allocation of land resources is concerned, pulses and oilseeds were not affected adversely by the advent of the green revolution. However, oilseeds were given a preferential treatment to pulses in terms of area allocation.

Figure 6: Relative share of crops to gross cropped area (pre-HYV and post-HYV periods)



The share of pulses in the Gross Irrigated Area (GIA) in 1989-90 is only 12.8 percent in M.P.,whereas, cereals still command the major share (Figure 7). However, the decreasing share of cereals and the simultaneous increasing share of pulses in GIA, are clear indications of the rising interest of farmers in pulse crops.

Figure 7: Relative share of pulses and cereals to gross irrigated area (Madhya Pradesh)

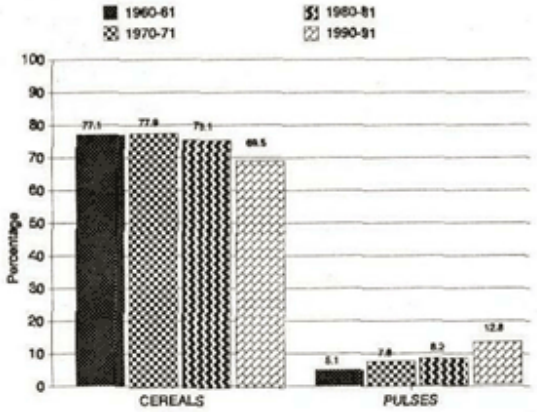
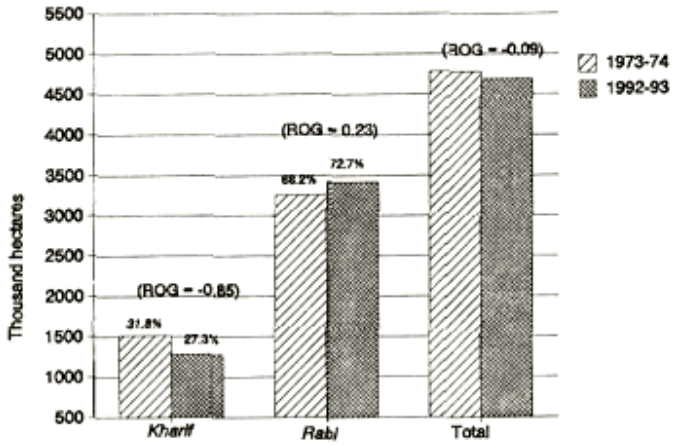


Figure 8. Area under pulses in Madhya Pradesh.



About a dozen, different pulse crops are grown in M.P. However, pigeonpea (redgram) [Cajanus cajan (Linn) Millsp.J in kharif and chickpea(bengalgram) [Cicer arietinutn Linn] in rdbi are the most important ones, followed by blackgram (urdbean) [Vigna mungo (Linn.) Hepperj in kharif and lentil [Lens culinaris Medic.] in rabi. Pigeonpea and chickpea together account for 60 percent area & 74 percent of the production of total pulses. While the area under kharif pulses was declining, the rabi pulse area was on the increase. The overall growth of area under total pulses in Madhya Pradesh was negative due primarily to a much higher fall in the kharif pulse area than a small rise in the area under rabi pulses, even though the latter accounted for 72.7 percent of the total pulse area in 1992-93 (Figure 8).

Except blackgram in kharif and chickpea and peas in rabi, all other pulse area showed a decline in 1989-90, as compared to their respective areas in 1975-76. However, blackgram area started declining after 1985. Most of the increase in kharif area went to soyabean. Other gainers were paddy and maize. Chickpea also showed a substantial increase in area. In rabi, the share of wheat, rapeseed and mustard also increased remarkably.

Except blackgram in kharif, all pulses performed better in the eighties as compared to their performance in seventies (Table 5). In terms of production and yield, pigeonpea and lentil performed very well though the area under pigeonpea showed a negative growth. On the other hand, even though the yield of chickpea had shown a nominal negative growth the area recorded a significantly high growth rate, Thus growth performance of the pulses in general showed a conflicting scenario.

A comparison of state wise growth in pulse production and the coefficients of variations in the eighties revealed the association of high growth, positive or negative, with high variability. Similarly, states with moderate growth such as Madhya Pradesh, Karnataka and Andhra Pradesh showed moderate variability (Table 6).

Table 5: Growth rate of area, production and yield of four important pulses in Madhya Pradesh

Crop	Growth Rate (70-71 to 79-80)		Growth Rate (80-81 to 89-90)
Chickpea	A	2.22	1.34
	P	-0.60	1.25
	Y	-2.76	-0.08
Pigeonpea	A	-0.39	-2.15
	P	-3.84	2.97
	Y	-3,82	5.25
Blackgram (K)	A	3.27	0.15
	P	1.65	-0.56
	Y	-1.49	-0.01
Blackgram (R)	A	-11.82	-11.03
	P	-16.72	-10.09
	Y	-5.25	0.49
Lentil	A	0.85	1.12
	P	-1.97	3.66
	Y	-2.83	2.53
Total Pulses	**A**	**0.85**	**-0.54**
	P	**-2.54**	**1.60**

Hence from the stability point of view, these slates deserve further investigation for locating districts that have high growth potential.

The share of Madhya Pradesh did not increase in blackgram, lentil, kharif pulses as well as in total pulses for which all India production increased during the period from 1970-71 to 1989-90. In lentil and blackgram, though production increased, their share in all India production actually decreased, more so in blackgram. However,

Table 6: Compound growth rate and coefficient of variation of pigeonpea and chickpea for major states

(1980-81 to 1989-90).

State	Item	Pigeonpea		Chickpea	
		Compound growth rate	Cofficient of variation	Compound growth Rate	Cofficient of variation
Andhra Pradesh	A	5.34	17.3	0.70	10.8
	P	4.29	23.2	3.25	24.7
	Y	-0.70	22.8	2.74	21.5
Bihar	A	-2.86	9.9	-1.59	7.9
	P	-1.19	9.3	-0.40	8.9
	Y	1.71	7.1	1.21	7.3
Gujarat	A	6.40	18.1	-4.50	42.4
	P	3.46	29.0	-8.42	51.8
	Y	-2.76	21.8	-4.11	18.4
Karnataka	A	4.18	12.0	6.08	20.3
	P	2.12	15.3	3.15	20.7
	Y	-1.98	15.2	-2.76	12.5
Madhya Pradesh	A	-2.15	6.6	1.34	7.5
	P	2.97	19.6	1.25	12.5
	Y	5.25	22.2	-0.08	6.8
Maharashtra	A	3.15	10.6	4.50	14.4
	P	5.65	21.4	8.54	38.9
	Y	2.43	[2.1	3.98	23.7
Orissa	A	5.86	17.2	-0.01	9.0
	P	8.87	23.7	0.90	6.1
	Y	2.84	10.6	1.00	7.6
Rajasthan	A	4.30	35.5	-5.16	25.9
	P	-2.95	61.8	-5.63	32.3
	Y	1.41	47.7	-0.60	11.7
Tamil Nadu	A	5,76	29.9	-	-
	P	11.96	37.7	-	-
	Y	-0,99	25.8	-	-
Uttar Pradesh	A	-0.70	4.0	-1.29	5.8
	P	-1.19	12.2	-1.69	10.1
	Y	-0.10	9.7	-0.40	9.4
West Bengal	A	-19.02	59.6	-8.88	29.2
	P	-16.97	60.1	-8.51	28.3
	Y	2.53	35.5	0.40	16.3
All-India	A	2.33	7.0	-1.39	8.6
	P	2.84	11.0	-0.80	12.2
	Y	0.10	6.3	0.60	7.2

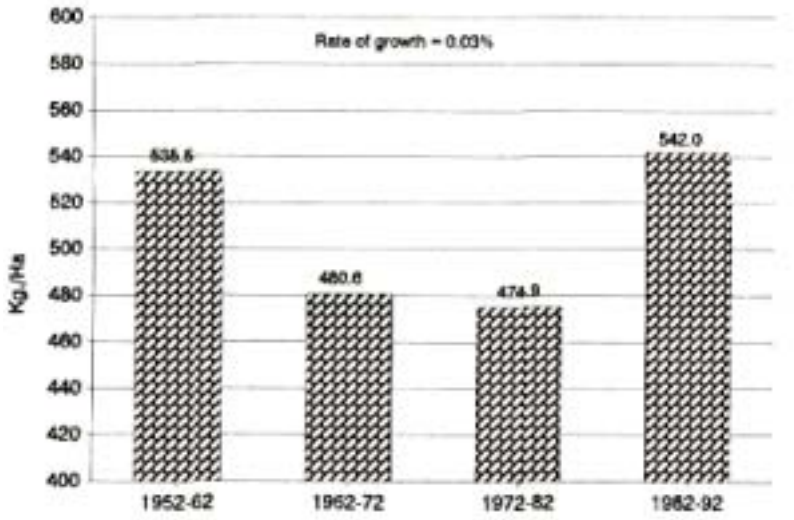
in total rabi pulses and chickpea, where all India production showed a decrease, the share of Madhya Pradesh has increased. Madhya Pradesh thus commands a comparative advantage in chickpea and blackgram. With little or more effort the share of Madhya Pradesh in blackgram can be increased.

An analysis of production stability for the different states reveals that Madhya Pradesh ensures long-run production stability without losing its comparative advantage. Comparative advantage associated with production stability provides the most desirable criterion for long term investment for the growth of a crop. The state of Madhya Pradesh is thus one of the most important region where pulse development programmes are likely to succeed in the long run. Other states that command attention in this context are Bihar and Uttar Pradesh wherein, like Madhya pradesh, the production is large and any small increase in production adds substantially to output. A more rigorous analysis may be needed at the disaggregated level to identify districts, where the pulse development programme may be harnessed to increase productivity with stability.

5 CONSTRAINTS IN PULSE CULTIVATION

The non-availability of seeds of high-yielding varieties in the desired quantities is perhaps one of the major constraints in the expansion of pulses. Although more than 200 improved varieties of pulses have been released since 1970's, its impact hardly get reflected in the yield (Figure 9). The rate of growth of yield of pulses was 0.03 percent over the past four decades.

Figure 9: Average yield of pulses (All India) 10-Year average



The failure of these varieties to make any real dent in pulse productivity could thus be due to their inherent weakness. In pulses, improved varieties hardly have an yield advantage of 15-20 percent over the traditional varieties. Even this yield advantage did not attract the fanners to go for these varieties indicating their poor performance at the field level. At present , the very best seed available belong to the same group, which the fanners are already using. Varieties with-better yield advantage and desirable characteristics to suit the varied agro-climatic conditions need to be developed in pulses.

The fertiliser use in pulses was very low with chickpea receiving the highest priority and pigeonpea the least. Though the recommended dose in Madhya Pradesh was 15-25 kg. of nitrogen and 20-50 kg. of superphosphate per hectare in pulses, the actual application of chemical fertiliser on an average, was found to be 2.8 kg in pigeonpea, 6.4 kg in lentil, 8.13 kg in blackgram and 12.04 kg in chickpea. For the growth and development of root nodules, phosphorous is absolutely necessary and application of 40 kg P2O5 per hectare has been recommended. Use of fertilisers, especially in kharif pulses, even in the study period was low. With the withdrawal of subsidies on fertilisers resulting in a hike in the prices , the use of fertilisers is expected to decline.

It is apparent that the distortion in fertiliser subsidy / pricing policy making the phosphatic and potassic fertilisers more costly relative to the nitrogenous fertiliser also contributed to the adverse impact on the growth of pulse crops. According to Economic Survey 1993-94, the consumption of phosphatic and potassic fertilisers decreased in 1992-93. The imbalance in NPK consumption ratio would likely aggravate the already existing soil fertility problems. The impact of such an unbalance in fertiliser use would be more severe in pulses as phosphorous is considered the most important nutrient for pulses. Allowing for a rise in the procurement prices to compensate for cuts in fertiliser subsidies does not make sense in pulses as well as in many other crops for which procurement by Government agencies is inadequate or lacking. Measures to correct the distortions in fertiliser policy and to educate the farmers on the use of

balanced fertilisers as well as on the techniques to improve fertiliser use efficiency are urgently called for.

Bio-fertilisers are expected to make up for the high price of fertilisers to some extent as well as to protect the long-run soil health. Rhizobium inoculation of legume crops has long been considered as an important factor for increasing yields. Experimental evidence suggests that anything up to 100 percent of the nitrogen requirement of pulse crops can be met with by providing efficient strains of Rhizobium coupled with sound agronomic practices. Besides, the bio-fertilisers are also environment-friendly and free from the adverse effects of chemical fertilisers. Seeds should be inoculated with efficient Rhizobium cultures to activate the process of nodulation.

Though efforts to popularise these Rhizobium inoculants have been going on for a long time and several public and private sector units are manufacturing them , the adoption of these biofertilisers is found to be very negligible. Many of the farmers who happened to use .the culture reported that these inoculation with Rhizobium is not giving the desired level of response. Probably, the Rhizobium inoculation is not very effective in pulses. If this technology is as efficient as claimed, it does not have to be "pushed" even now by the government agencies as there would have been enough demand by this time . Sustained use of Rhizobium inoculants in the long run thus seems to be difficult. Blaming the poor transport and storage facilities for the ineffectiveness in the field does not make much sense as these are to be expected in its adoption. The final testing ground of any technology is in the farmers' field. Of course, strict Quality Control Standards needs to be enforced in the manufacture and sale of the inoculants.

Given that these inoculants are very effective, some vested interests might be suspected to suppress its spread. A nexus between the chemical fertiliser industry and the government is to be doubted in this context.

In pulses there are a number of diseases and insect pests which cause heavy losses resulting in poor production. Though several resistant/tolerant varieties had been developed by research institutions the spread of such varieties in the farmers fields is very limited. The main reason could be our weak seed production programme. Research on bio-pesticides and incorporation of insect-resistant genes, albeit promising in the field verification trials, is yet to be commercially viable. Chemical pest control seems to be the only option left with the pulse fanners at present.

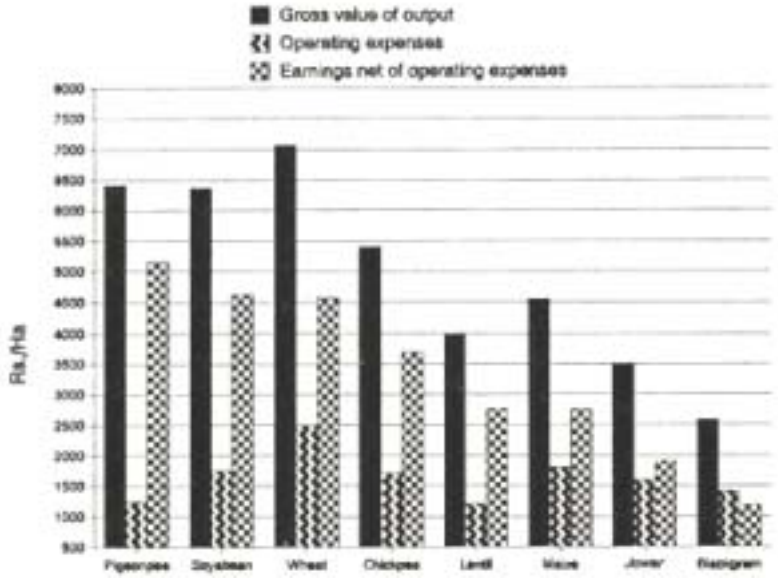
Even though several plant protection chemicals with their method and time of application have been developed the use of pesticides in pulses was very negligible. Either these pesticides may not be giving the desired effect to control the pests or the damage due to these pests may be below the economic threshold level. Cheaper and effective pesticides to combat the pests in pulses thus needs to be developed .

Furthermore, there is hardly any visible technological change in pulse farming in the country. This clearly shows that technological stagnation is primarily responsible for the backwardness of pulses not only in Madhya Pradesh but in the country as a whole.

6 COST STRUCTURE IN PULSE FARMING

Human labour was found to be the highest single cost item in pulses as well as in its competing crops. More than half (52 percent) of total human labour used in pulses was contributed by farm family. Along with a progressive decline in per hectare use of human and bullock labour, use of machine labour, in value terms, has increased considerably.

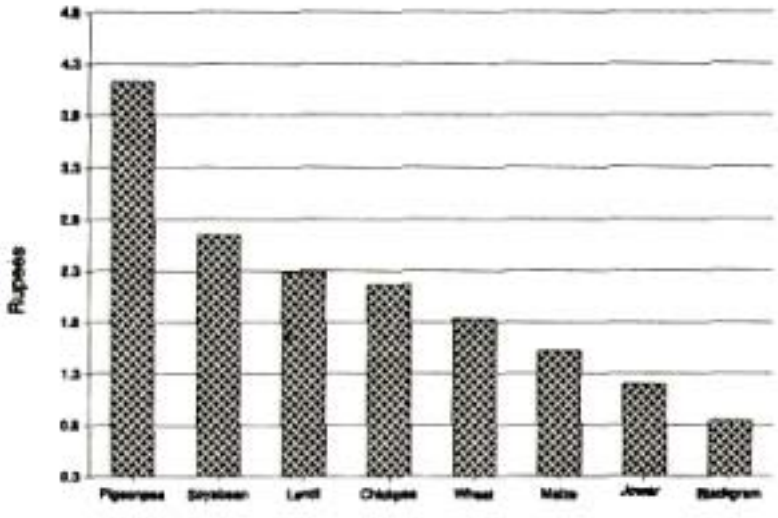
Figure 10: Gross value of output, operating expenses and earnings net of operating expenses of pulses and competing crops.



Note: (1) The operating expenses here comprises the following items: Human labour (casual, permanent and family) valued at the on-going wage rate, bullock labour charges, machine labour charges. Cost of seed, fertilisers, manures, pesticides, irrigaiion charges and interest on working capital.

Returns per rupee of operating expenses is one of the measures for comparing relative profitability of crops. Figure 10 gives the gross value of output, operating expenses and net earnings from pulses and its competing crops. Pigeonpea stands first both in terms of surplus over operating expenses and returns per rupee of operating expenses (Figure 11).

Figure 11. Returns per rupee of operating expenses of pulses and competing crops



But being a long duration crop spilling over to another season it does not permit a second crop in the rabi season. The area under pigeonpea thus declined during the last two decades (Table 6). Though more profitable than other crops, area expansion under pigeonpea is restricted by high variability in yield as well as non-availability of seeds of short duration varieties that permit a second crop in pigeonpea fields.

Soyabean is the next best rewarding kharifcrop and this explains its rapid growth in Madhya Pradesh. Blackgram (urad) is the least rewarding pulse crop in Madhya Pradesh and it is getting replaced by soyabean even in the traditionally urad producing areas. Even though the return per rupee of operating expenses is rather low, jowar and maize continue to be grown without much replacement primarily because they are the staple food in the areas where they are grown. Besides, they provide fodder for the animals . With new hybrids/composite varieties the yields of jowar and maize have gone up. Soyabean is thus the major crop competing with pulses in the kharif season.

Lentil is the most rewarding crop in the rabi season in terms of returns per rupee of operating expenses. The surplus over operating expenses for lentil is, however, less as compared to that for wheat and chickpea. The cultivation of lentil is restricted to specific areas, though it is now expanding. The increase in the growth rate of area under lentil during the eighties supports the above fact (Table 6). Chickpea is the next rewarding crop in terms of returns per rupee of operating expenses and thus its area is also expanding (Table 6). However, year to year variations in yield are high in both chickpea and lentil. Moreover, wheat is the staple cereal and it gives higher surplus over operating expenses of Rs. 880 as compared to chickpea and Rs. 1814 as compared to lentil (Figure 11). Wheat thus continues to be preferred as long as farmers can mobilise 50-100 percent more finance as operating expenses for wheat cultivation when compared to growing chickpea and lentil.

Thus soyabean is the major competing crop for pulses in kharif and wheat continues to be patronised by the farmers in rabi, though at the margin, chickpea is gaining at the expense of wheat, particularly in the unirrigated and less fertile lands.

7 PRICE BEHAVIOUR AND FARMER RESPONSE

The relative price support to pulses has been constantly on the rise after 1982-83 (Table 7).

Table 7: Growth rate of price ratios relating to minimum support price of pulses relative to competing crops.

(**1982-83 to 1989-90)**

Crops	Growth rate of price ratio (perceniage)
Pigeonpea/Jowar	4.88
Pigeonpea/Soyabean (yellow)	3.40
Blackgram/Jowar	4.29
Blackgram/Soyabean (yellow)	2.82
Chickpea/Wheat	2.41
Chickpea/Rapeseed & Mustard	1.29

The rising support price ratios for pulses reflect the policy intention to promote pulse cultivation. But in the absence of vigorous procurement operations (as pulses are not included in the Public Distribution System) there were reports of fall in market prices below support levels, particularly in the initial years. Pulse production did not rise in relation to rise in the support prices. While at the all India level, total pulse production reveals an annual compound growth rate of 0.47 percent per year. During the period from 1982-83 to 1989-90, it was only 0.15 percent per annum in Madhya Pradesh. In other words, either the price signals did not reach the farmers or the farmers did not respond to these signals probably due to absence of procurement system or some other reasons.

Though the growth in the wholesale prices of pulses in Madhya Pradesh during the seventies and the eighties was the highest when compared to its competing crops (cereals and oilseeds), the price variability in pulses was also the highest (Table 8).

Table 8: Wholesale price index of crops

(Base period 1959-60 to 1961-62= 100)

Category	1970-71	1989-90	Compound growth rate(%)	Coefficient of variation
Pulses	233.2	1846.4	9.53	52.96
Oilseeds	244.1	1063.0	8.22	45.29
Cereals	221.8	877.2	6.50	37.30

The high annual fluctuations in price of pulses indicating a higher risk might have turned the farmers away from pulses and in favour of other competing crops like oilseeds and cereals which did not exhibit price fluctuations as high as that observed in pulses.

The growth of Farm Harvest Price (FHP) after 1982-83 also showed a favourable price regime in pulses in Madhya Pradesh, compared to cereals like jowar, maize and wheat, where it is negative. The more favourable price regime for pulses especially after 1982-83, failed to evoke a commensurate response. It may be inferred that production response to price in pulses is rather weak and non-price factors such as high-yielding technology /modem varieties, better infra-structures

including adequate procurement system are more important for accelerating pulse production in general and in Madhya Pradesh in particular.

Violent fluctuations in the prices of pulses within a year was also observed, with prices reaching the trough during the harvesting season and hovering around it in the marketing season. About 65 percent of the total pulse arrivals in mandies were received in the first three months after the harvest. The peak prices range from a low of around 29 percent above trough in case of chickpea and blackgram to over 100 percent in case of pigeonpea. These variations indicate the presence of forces other than stocking costs. Market intervention measures in the form of buffer-stock operations to smoothen the seasonal fluctuations are lacking in pulses where it is left open to the machination of traders. If the farmers' interest in growing pulses is to be aroused and sustained the government should actively intervene in pulse marketing. Procurement of pulses from the farmers during the peak marketing season at the support/procurement prices and channelising the produce through the Public Distribution System will be the right step to protect the interests of both the consumers as well as the producers.

Though increasing opportunities to maximise surplus over operating expenses existed in substituting pigeonpea for jowar and jawar for blackgram and pigeonpea for soyabean in the recent years, pigeonpea, jowar and blackgram had actually lost area. Though pigeonpea was the most profitable crop, its longer duration affecting the possibility of a second crop in the field acted as an obstacle to its expansion. The gain in soyabean was far in excess of the loss in area of the three crops put together. Thus soyabean, the second most profitable kharif crop in terms of profit, not only replaced the above crops, but also expanded to areas gained through reduction in kharif fallows.

Similarly, substitution of chickpea for wheat would increase the returns per rupee of operating expenses. However, the area under both chickpea and wheat had gone up implying the absence of any such substitution. The area under wheat did not decline probably because of importance of the crop in the diet of the farmers and people of the state. Moreover, wheat was more profitable than chickpea, although the operating expenses was high in the cultivation of wheat. The relatively favourable price regime induced the farmers to put in more area under chickpea which must have been brought into it either by way of increased double cropping or by withdrawing area from some other rabi crops.

Pulses did exhibit price responsiyeness, albeit weak, but factors other than price were even more important in pulse production and productivity. Appropriate technology, particularly under the changing compulsions for double cropping was a necessary adjunct for prices to play their expected role more effectively. The Directorate of Pulses Development, Lucknow has suggested the following strategy for increasing the production and productivity of pulses. They are: (l) introduction of summer pulses (urad bean, mung bean and cowpea) in irrigated area after the harvest of rabi crops, (2) introduction of short duration pigeonpea varieties into irrigated cropping system in northern and central India in sequence with wheat, (3) substitution of upland crops like rice, jowar, maize and bajra and diverting these areas under short duration pulses in the eastern and the southern states, (4) introduction of rabi rajmash in Uttar Pradesh and Bihar, (5) introduction of rabi pulses in rice fallows in the southern states with residual moisture, (6) inter-cropping of pigeonpea, mungbean, umdbean withyowar, bajra, maize, cotton, groundnut, soyabean etc, (7) introduction of rabi pigeonpea in Bihar, West Bengal, Orissa, Eastern Uttar Pradesh, Gujarat and Andhra Pradesh.

Assuming no agro-biological barrier, the success in the implementation of the above strategies depends not only on the increased production the new cropping systems may bring about, but also on the net income they generate which is normally governed by yield and prices realised by the farmers. Furthermore, these prices and yields must be more stable relative to other competing crops. Development of farm plans under various resource situations involving enterprise-mix with maximisation of income as an objective subject to minimum income variance for the different districts and educating the farmers on this aspect would be of great help to the farmers in making appropriate decisions.

8 MARKETING AND PROCESSING

The role of efficient marketing was found to be crucial in accelerating production and productivity in pulses. The traders were also observed to exploit the absence of an organised dissemination of market information much to the disadvantage of pulse producers. In a highly volatile market system as in pulses, market information agencies could prove highly valuable for efficient marketing of the produce.

Agricultural markets in Madhya Pradesh could not be termed efficient as the price differentials over different locations exceeded the transportation costs. Lack of effective market news system and existence of different grades and qualities contributed to these spatial imperfections. Appropriate reporting with quality differences and graded produce could go a long way to reduce the high price differentials, spatial as well as temporal.

Farmers generally sell their pulse crops in the village itself, in the weekly markets (hats) or in regulated markets (mandis). Only large quantities are sold in the mandi. About 75 percent of the produce is marketed and the rest is retained by the producers for their own consumption, etc.

The post harvest operations consist of cleaning, grading, drying, milling and storage. The pulse milling is almost an exclusive industry in the Indian Sub-continent, but it has not received the necessary scientific and technological support like other primary food processing industries such as rice and wheat milling. The pulse milling is an age old practice which has reached the present stage as an outcome of trial and error. There are about 10,000 Dal mills in the country out of which one thousand are in Madhya Pradesh alone. Taking 50 quintals a day as the handling capacity per mill the total value turn over in Madhya Pradesh alone comes to Rs. 100 crore. Yet the industry in Madhya Pradesh continues to be as traditional as ever. No technical improvements in the process have been observed for decades. The major problems of present day mills are low recovery, separation of whole pulse from dehusked whole pulse, high cost of milling, especially due to oil treatment, frequent breakdowns and high cost of maintenance. As the machine design has not yet been standardized there is also difficulty in getting spare parts.

Modem methods of milling have been developed at CFTRI, at Pantnagar and at CIFE. As compared to traditional technology the milling outturn in modern methods is higher by 3-5 percent which is quite high. However, manufacturers are not coming forward to fabricate these new designs on commercial scale. It is high time that Government organisations like Agro-industries corporations in different states initiate actions to commercially manufacture these improved pulse milling machineries.

9 DEVELOPMENTAL EFFORTS

Presently we have a Technology Mission on Oilseeds and Pulses to look after the development of oilseeds and pulses at the apex level. Yet, at the grass-root level there is no organization for pulses like the OILFED (Oilseed Federations). National Pulses Development Programme (NPDP) is being implemented through the usual government channels. Experience of OILFED shows that progress is rapid if farmers organisations are involved. The need for an OILFED type of organisation for pulses cannot be over-emphasised. Since oilseed producing areas are also producing pulses it may be desirable to extend the operation of OILFED to production and processing of pulses also.

A national apex body of pulse processors needs to be organised to develop and promote innovative approaches in processing, packaging and storing of pulses. Similarly, the collection, compilation and dissemination of scientific and trade information through the above organisation can be of great help to the pulse processors.

The NPDP sponsored by Technology Mission on Oilseeds and Pulses was implemented in the country during the mid eighties. In Madhya Pradesh, it was introduced in 1985-86 and the implementation was started in 1986-87. The programme is comprehensive in content and is widely dispersed. It comprises of production, multiplication and supply of quality seeds, supply of rhizobium culture, plant protection chemicals, improved agricultural implements, demonstrations and training. NPDP is making steady progress, but the coverage in terms of pulse producers is insignificant. Further, the programme has been spread too thinly over the state with the result that the impact, if at all will be visible only after a long time.

The Extension machinery which is even otherwise overloaded, ill-equipped and staffed with under-qualified personnel considering the tasks before it finds it extremely difficult to do a very thorough job in pulses. One of the possible ways to improve this situation is to organize pulse farmers and focusing the available resources as well as educational efforts through these organizations of pulse farmers. This will definitely improve the situation by way of equitable distribution of official assistance, improved interactions between the farmers and the extension workers and moreover it enhances the people's participation.

Increase in pulse production has to come either through expansion of area or through an increase in productivity, or both. Expansion of area is possible by substitution, by reduction in kharif fallows and by increase in double cropping. Substitution is always a gradual process and its prospects for pulses in the short run is rather limited. Though kharif fallows are still high in Madhya Pradesh, soyabean is expected to keep pulses out of race in the share of kharif fallows brought under the plough. What is urgently needed is a pulse technology / variety which is as good as that of soyabean. In case of pigeonpea the early maturing varieties which also permit double cropping needs to be popularised. As far as rabi pulses are concerned, chickpea and lentil may still continue to benefit with increase in double cropped area. However, rapeseed and mustard are also competing for this area. The scope for major expansion of area under pulses in the short run is thus limited.

Bringing more area under pulses in the long run depends upon a favourable price regime (with less variability) and through technological breakthroughs that make higher yields realised on the farmers' fields. At present wide gaps exist between the yields of improved varieties on the research farms and those obtained on the farmers' field. The new production technologies might not have reached the farmers in a meaningful way or they might be inappropriate to the agro-ecological and socio-economic conditions of the farmers. These aspects need further in-depth investigation. Research studies on Diffusion and Adoption of technologies recently generated in pulses have to be conducted to understand the weaknesses in the process of technology generation and its dissemination.

10 CONCLUSIONS AND POLICY IMPLICATIONS

There is a wide gap between the demand for and the supply of pulses in India. This gap is likely to increase unless more vigorous efforts to increase production and productivity of pulses are made. Pulses, albeit neglected earlier by the Research and Extension systems, started getting increased attention during the fast decade or so. The price situation also improved considerably during this period. However, these favourable changes failed to get reflected in the production and productivity of pulses. The input support as well as the institutional support in pulses continues to remain weak. Furthermore, pulse farming is still in its initial phase of technological change. Specifically, there has not been enough technological break-through in pulses to make pulse farming as remunerative as other competing crops. Besides, no tangible improvements in pulse processing technology have taken place and pulse processing continues to be inefficient and costly. Lack of effective market information and existence of different grades often act against the interests of the pulse producers. Large fluctuations in the prices of pulses further dampen the farmers' interest in growing pulses.

The National Pulses. Development Programme (NPDP) presently in operation suffers from poor coverage as well as weak institutional support. A major increase in pulse production is possible only through an increase in productivity. The situation thus calls for strengthening of pulse research with specific objective of high yields under adverse agro-ecological conditions at lower real costs of production. Marketing, processing supports and price incentives should be ensured to make pulse cropping as remunerative as its principal competitors.

Important policy directions derived from the present analysis are as follows.

1. Yield variability analysis on different pulses as well as different pulse growing regions needs to be conducted to design appropriate development strategies.
2. More adaptive trials on the released varieties, newer practices and cropping systems evolved in pulses need to be conducted in the farmers' field to re-evaluate their relative advantage, profitability and effectiveness.
3. Varieties with better yield advantage and desirable characteristics to suit the varied agro-climatic conditions need to be developed in pulses.
4. Cheaper and effective pest control measures in pulses needs to be developed and propagated.
5. The reasons behind the lower adoption of Rhizobium inoculants in pulses needs to be thoroughly explored.
6. Pulse processing mills in the country need to be modernized. Government organisations like Agro-Industries Corporations should take lead in this task.
7. The distortions in fertiliser price policy require immediate correction. Moreover, educational programmes on balanced fertiliser use and measures to improve fertiliser use efficiency have to be undertaken.

8. Steps to reduce the temporal and spatial variation, in price of pulses will definitely help in sustaining as well as enhancing the farmers' interest in pulses. Formation of pulse producers' co-operatives and integrating production with processing (as presently followed in Oilseeds) may go a long way to improve the marketing of pulses.
9. Meanwhile, Government should actively intervene in the marketing of pulses. Procurement of pulses during the harvesting season of pulses at the support / procurement prices and channelising the produce through the Public Distribution System will protect the interest of both the producers and the consumers.
10. Enterprise combinations for optimal use of scarce farm resources subject to minimum income variability have to be developed in different pulse growing tracts and the optimal enterprise mix should be communicated to the farmers.
11. Groups of pulse farmers should be formed and the extension system should channelise its efforts through these groups. his will not only improve the linkage between farmers and extension system but will also enhance the technology adoption. (The Group Management Programme in Rice Farming in the state of Kerala offers rich experience in this regard)
12. Social Science research needs to be strengthened for a clearer understanding of the socio-psychological and economic perspectives of the potential adopters.

SELECTED BIBLIOGRAPHY

AICPIP, 1987. Improved Varieties of Pulse Crops in India, All India Co-ordinated Pulse Improvement Project, Directorate of Pulse Research, Kanpur.

Bhushan, B. and Sobti, R. 1992. Pulses-Present Status and Prospects, Yojana (36) 3.

Government of India, Directorate of Economics and Statistics, Ministry of Agriculture, 1991. Agricultural statistics at a Glance, New Delhi.

Government of India, Directorate of Economics and Statistics, Ministry of Agriculture, 1991. Cost of Cultivation of Principal Crops in India, New Delhi.

Government of India, 1991. Economic Survey 1990-91, New Delhi.

Government of Madhya Pradesh, Directorate of Agriculture, 1991. M.P.Agricultural Statistics, Madhya Pradesh.

Tyagi, D.S., 1990. Managing India's Food Economy-Problems and Alternatives, Sage Publications, New Delhi.