Ah-hoc Study No.59

PROSPECTS OF CHANGING CROPPING PATTERN IN FAVOUR OF PULSES AND OILSEEDS IN MADHYA PRADESH

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CHAPTER-I

I N T R O D U C T I O N

1.1 Agricultural Production

Agriculture not only supports the largest section of our population but also supplies surplus for export and raw material for industrialisation. It continues to be the core of the Indian economy. However, inspite of the fact that a record level of 152.4 million tonnes of foodgrains production was obtained in 1983-84 the growth rates of agricultural production have not increased as desired.

1.2 Growing Needs

Indian agriculture must provide major increases in production as the pressure of demand on agricultural commodities is mounting rapidly due to increase in population, increase in the levels of consumption and the increasing demand of raw materials for agro-industries. The task of increasing food and non-food production to meet the growing needs of population and changing demand has become imminent.

The evolution of high yielding varieties of some major cereals brought about 'green revolution' in the country. The new strategy popularly known as 'High Yielding Varieties Programme', resulted in spectacular changes on the Indian farm front. However, the distribution of benefits has not been uniform. 'Considerable inequality in the distribution of land, and accordingly in incomes, steady loss of good agricultural land to non-agricultural uses, shifts in priorities, etc. all seemed to exhaust the potentialities of green revolution.[1] In some high value food and commercial crops

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1. Issues in Agricultural Development- A Statewise Analysis, S. Giriappa and M. Vivekanand. Agricultural Development and Rural Transformation Unit. Institute of Social and Economic Changes, Banglore, 1984 P.1

the new technology has had its favourable impact, whereas, in pulses, oilseeds, coarse cereals and many other crops new technology has yet to be substantial so as to improve the productivity level .

Though the area, production and yield of pulses has increased marginally at the national level, their performance in some states was deplorable. In Gujarat, Haryana, Punjab and Uttar Pradesh, area under pulses declined and their production also declined in these states except in Gujarat[2] The per capita net availability of pulses in the country was 18.7 kg. per year in 1971 which has declined to 14.2 kg. per year in 1985.[3] The decline in availability of pulses has resulted in lower protein availability in the average Indian diet.

In the case of oilseeds the production falls short of the consumption requirements in the country. There is a big gap between demand and supply of edible oils, necessitating large scale imports and huge outflow of foreign exchange. In the year 1981-82 import of vegetable oils valued Rs.6,244.92 millions[4], which was thirty eight times more than the value of imported oils in 1975-76. 'The per capita consumption of edible oils in India is about 5kg, per annum which is far less than the world average of about 13 kg. per annum'.[5]

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2. Issues in Agricultural Development- A Statewise Analysis, by S. Giriappa and M. Vivekanand. Institute for Social and Economic Changes, Banglore. (Mimeographed). 1984, pp. 44-45.
3. Bulletin on Food Statistics- 1985, Directorate of Economics and Statistics, Department of Agriculture, Ministry of Agriculture, Govt.of India, P.176.
4. Bulletin on Food Statistics, 1985, Directorate of Economics and Statistics, Department of Agriculture, Ministry of Agriculture, Govt. of India,
5. Ray, A.K. and Chahal, J.K. (1986) "Problems of Oilseeds Production- A Critical Analysis" Agricultural Situation in India, Vol.41 No.5 p.323

4. To suggest possible measures for achieving the desired cropping pattern in favour of pulses and oilseeds production.

1.7 Methodology

The present study is based on secondary data. The data are obtained from 'Agricultural Statistics' published by Directorate of Agriculture, Madhya Pradesh, Bhopal. The two reference years for which the data on changes in cropping patterns were studied, were 1970-71 and 1984-85. However, for the state of Madhya Pradesh the data available for the latest year was for 1983-84 and therefore 1983-84 was taken as a current year and 1970-71 as a base year.

This study is based on 12 agro-climatic regions of the state. These agro-climatic regions and their districts are given below.

(1) Chhattisgarh plains including Balaghat district

Durg, Rajnandgaon, Bilaspur, Raigarh, Raipur, Balaghat

(2) Bastar Plateau

Bastar

(3) Northern Hill region of Chhattisgarh

Surguja, Mandla, Sahdol

(4) Kymore Plateau and Satpura Hills

Jabalpur, Seoni, Panna, Rewa, Sidhi, Satna

(5) Vindhya Plateau

Sagar, Damoh, Bhopal, Sehore, Raisen, Vidisha

(6) Central Narmada Valley

Narsinghpur, Hoshangabad

(7) Gird Region

Gwalior, Shivpuri, Guna, Morena, Bhind

(8) Bundelkhand Region

Tikamgarh, Chhatarpur, Datia

(9) Satpura Plateau

Chhindwara, Betul

(10) Malwa Plateau

Indore, Dhar, Ujjain, Ratlam, Mandsaur, Dewas, Shajapur, Rajgarh

(11) Nimar Plateau

Khargone, Khandwa

(12) Jhabua Hills

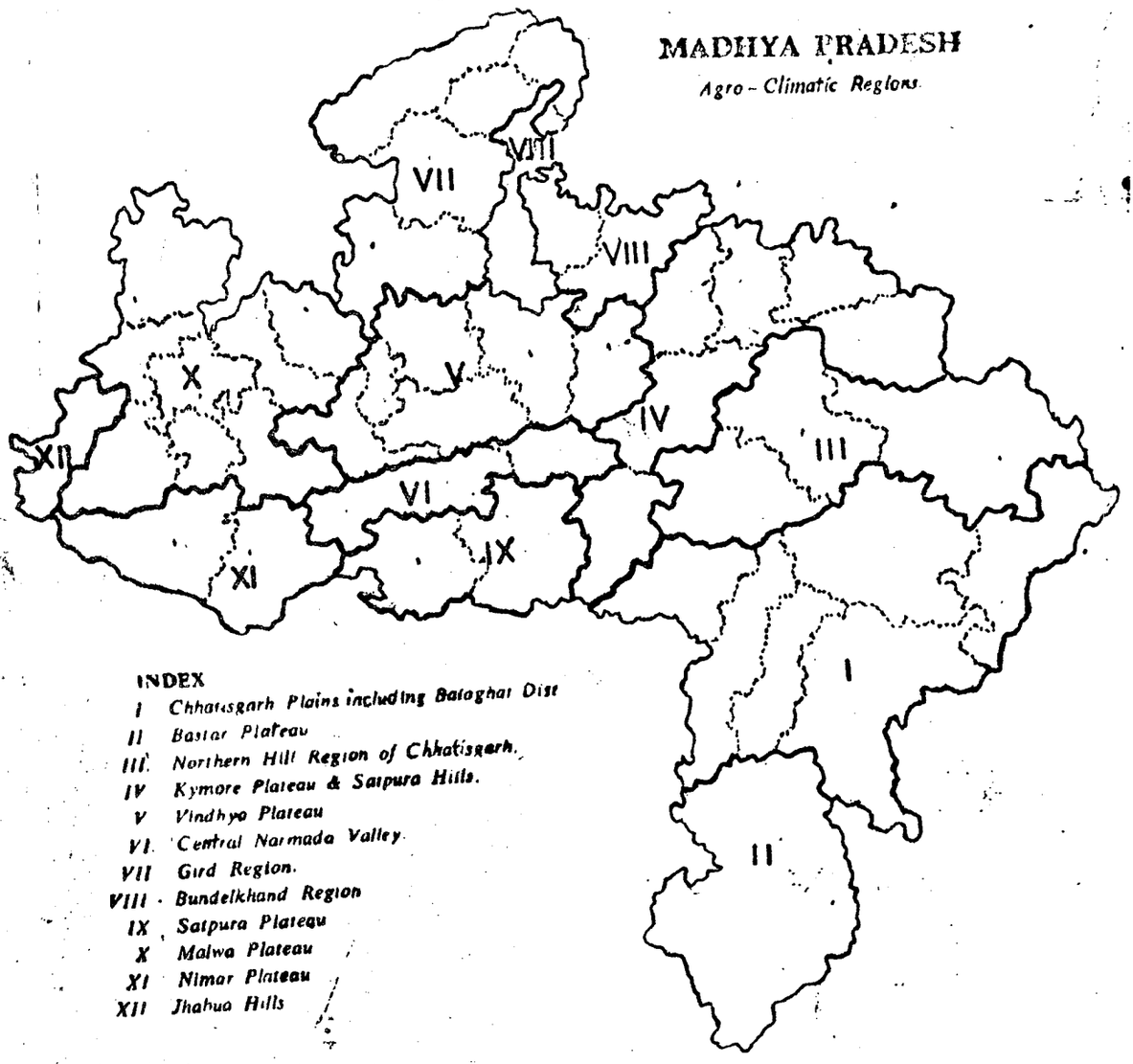
Jhabua

Of the 12 agro-climatic regions, a region each was selected with the highest increase and highest decrease in area under pulses.

Similarly for oilseeds a region each with highest increase and highest decrease in area was selected.

In the case of pulses the region with the highest increase in area was Malwa Plateau and the region with the highest decrease was Gird region. In Malwa Plateau two districts viz. Mandsaur and Ratlam were selected, whereas, in Gird Region Morena district was selected.

In the case of oilseeds the region with the highest increase in area was Central Narmada Valley and that with the highest decrease was Jhabua Hills. Further, from among the districts of Central Narmada Valley, Hoshangabad was selected and from Jhabua hills, Jhabua district which alone constituted the region was our choice. Another district with the highest decrease in oilseeds acreage was Rewa, and this being one of the most important districts of another region called Kymore Plateau and Satpura hills was chosen for the study (Table 1.1)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XII Jhabua Hills

Table 1.1 Selected regions and districts

(Figures-increase or decrease in per cent)

Particulars	Region	District
Pulses		
1. Highest increase in area	Malwa Plateau (70.74)	Mandsaur (146.4) Ratlam (127.8)
2. Highest decrease in area	Gird Region (6.83)	Morena (48.2)
Oilseeds		
1. Highest increase in area	Central Narmada Valley (133.94)	Hoshangabad(136.2)
2. Highest decrease in area	Jhabua Hills (26.37)	Jhabua (26.3)
	Kymore Plateau & Satpura Hills (11.00)	Rewa (35.09)

For knowing the reasons for shift in the area of pulses and oilseeds in positive and negative directions in the six selected districts and also to know the constraints in the production of these crops, a questionnaire was prepared- (enclosed in Appendix). The Joint Directors and Deputy Directors of Agriculture of these selected districts were asked to give the possible reasons for changes in cropping pattern and the constraints in the production of pulses and oilseeds and their suggestions for achieving the desired cropping pattern in favour of pulses and oilseeds.

We received replies in the questionnaire from 5 out of 6 districts.

The conclusions drawn in the study are mainly based on the observations, comments and suggestions made by the officials responding to our querries in questionnairs. In addition discussion with the officials in the State government and those in the J.N.Krishi Vishwa Vidyalaya proved useful.

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CHAPTER-II

AGRICULTURAL CHARACTERISTICS OF MADHYA PRADESH

2.1 Location :

Being centrally situated Madhya Pradesh is termed as the heart of India. Surrounded by Utter Pradesh in the north, Bihar and Orissa in the east, Andhra Pradesh and Maharashtra in the South, Gujarat and Rajasthan in the west, Madhya Pradesh is spread between latitudes $17^{o}48'N$ to $26^{o}52'N$ and longitudes $74^{o}2'E$ to $84^{o}24'E$. Area of the state is 44,000 sq.kilometres.[1]

The State comprises 45 districts spread in 12 revenue divisions.

2.2 Physical Features

The Vindhyas and Satpuras are the two parallel mountain ranges running west to east through the middle of the state. Narmada is the longest river running through the state for more than 1,000 kilometres from east to west.

The main physical regions of the State are the Northern Region, the Malwa plateau, the Narmada Valley, the Satpura Ridge and Chhattisgarh Plains.

The main river systems in the State are the Chambal, the Betwa, the Sone, the Narmada, the Tapti, the Mahanadi and the Indrawati.

The State is divided into six catchment areas of six important rivers viz. Jamuna, Narmada, Tapti, Godawari, Mahanadi and Ganga.

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1. Dubey, S.K.(1986) "Agricultural Development in Madhya Pradesh" (A Districtwise Analysis) 1950-51 to 1979-80, Ad-hoc Study No.49 Agro-Economic Research Centre for Madhya Pradesh, JNKVV, Jabalpur

2.3 Demographic Features

Madhya Pradesh is the biggest state in area and sixth in population among various states of the country. According to 1981 census its population was 52.13 million and the density of population was 118 per sq. kilometre. The percentage of population residing in rural areas was 79.69 and the total number of workers, (20.07 million) formed 39.49 per cent of the total population. Among the various occupational categories, cultivators and agricultural labourers together formed 87.44 per cent of the total rural working population.

2.3.1 Tribal Population

Madhya Pradesh bears the largest tribal population. It has 22.1 per cent of total tribal population of the country and 20 per cent of the total population of this State. Tribal population is spread almost all over the State but its concentration is more in 14 districts. These are Jhabua, Bastar, Mandla, Surguja, Shahdol, Dhar, Raigarh, Khargone, Seoni, Chhindwara, Sidhi, Betul, Bilaspur and Raipur. Eighty one per cent of the tribal population of the state is confined in the above mentioned districts.

2.4 Agriculture

Madhya Pradesh is primarily an agricultural state as agricultural sector (including crops and allied activities) is the mainstay of the state economy, accounting for nearly 53 per cent of the state's income. Eighty per cent of the population in the state is rural and 87.44 per cent of its rural working force is directly engaged in agriculture, as mentioned earlier.

The per capita availability of land in the state was 0.67 hectare in 1961 which declined to 0.53 hectare in 1971 and further went down to 0.43 hectare in 1981 indicating the increasing pressure on land.

2.4.1 Land Utilisation

The geographical area of the state was 442.11 lakh hectares out of which 226.28 lakh hectares or 51.18 per cent was cultivated. It included 9.34 lakh hectares categorised as current fallow and 7.41 lakh hectares as old fallow. These categories formed 2.11 and 1.68 per cent respectively, leaving the net cultivated area equal to 43.48 per cent.

Area under forests was 31.68 per cent of the total geographical area of the State and 20.37 per cent of the total forest area of the country.

About 10 per cent of the area was not available for cultivation and 3.94 per cent land was cultivable waste. Another 6.72 per cent uncultivated land was under pastures, grazing land, tree crops and groves (Table 2.1)

Table 2.1 Land use classification in Madhya Pradesh (1983-84)

S.No.	Particulars	Area (Lakh Hect.)	Percentage to total geographical Area (%)
1.	Forest	140.05	31.68
2.	Not available for cultivation	45.93	10.39
	(a) Land put to non-agricultural use	22.23	5.03
	(b) Barren and un-cultivable land	23.70	5.36
3.	Other un-cultivated land excluding fallow land	29.73	6.72
	(a) Permanent pastures and grazing land	28.06	6.34
	(b) Land under miscellaneous trees,crops and groves	1.67	0.38
4.	Culturable waste land	17.42	3.94
5.	Fallow land	16.75	3.79
	(a) Current fallow	9.34	2.11
	(b) Old fallow	7.41	1.68
6.	Net area sown	192.23	43.48
	Total Geographical Area	442.11	100.00
	Area sown more than once	34.05	—
	Total cropped area	226.28	—

2.4.2 Size of Land Holdings

There were 6,411 thousand operational holdings in the state with operated area of 21,931 thousand hectares according to the Agricultural Census 1980-81. The total area of holdings constituted 49.62 per cent of the geographical area of the state.

The average size of operational holdings in the State was 3.4 hectares in 1980-81 as compared to 3.6 hectares in 1976-77 and 4.0 hectares in 1970-71. Thus the average area of the holding declined from 4.0 hectares to 3.4 hectares within a period of 10 years. This is obviously due to fragmentation and sub division of holdings.

According to the Agricultural Census 1980-81 nearly one third i.e. 32.8 per cent of the total operational holdings in the State (2,102.5 thousand out of 6,411.0 thousand) were less than one hectare each. These marginal and sub-marginal holdings together operated only 4.2 per cent of total area.

Marginal, small and semi-medium holdings (i.e. below 4.0 hectares) formed 73.3 per cent of the total number but shared only 30.01 per cent of total area. Medium size of holdings ranging between 4 to 10 hectares constituted 19.9 per cent of the total number and the area of such holdings formed 35.9 per cent. Only 6.8 per cent of holdings were classed as large holdings (10 hectares and above) but the area held by this class formed 34.0 per cent.

This shows the unequal distribution of land within the different classes of farmers. While the small holders numbered more, the area under their control formed a smaller percentage as compared to the percentage in total number. On the other hand big landholders, although small in number commanded a comparatively large percentage of area. (Table 2.2)

Table 2.2 Distribution of operational holdings in different size groups Agricultural Census 80-81, Madhya Pradesh

Category & Size class (Hectares)	Number of operational holdings (in '000)	Percentage number of operational holdings	Area of operational holdings ('000 hect.)	Percentage	Average size of holdings (hect.)
Marginal (Below 1.0hect.)	2,102.5	32.8	930.1	4.2	0.4
Small (1-2 hect.)	1,226.4	19.1	1,791.6	8.2	1.5
Semi-medium (2.01-4 hect.)	1,371.5	21.4	3,871.5	17.7	2.8
Medium (4.01-10 hect.)	1,275.6	19.9	7,875.9	35.9	6.2
Large Above 10 hect.)	435.0	6.8	7,462.0	34.0	17.2
Total	6,411.0	100.0	21,931.1	100.0	3.4

Source : Agricultural situation in India - Directorate of Economics and Statistics, Department of Agriculture and Cooperation, Ministry of Agriculture, Vol.1983, page- 649.

2.4.3 Soils and Fertility Status

The state has been broadly divided into the following seven major soil groups.

(1) Alluvial
(2) Deep black
(3) Medium black
(4) Shallow and light black
(5) Mixed red and black
(6) Mixed red and Yellow, and
(7) Skeletal or gravelly.

The analytical results of the large number of soil samples have shown that soils of Madhya Pradesh are low to medium in available phosphorus and nitrogen, whereas medium to high in available potassium. According to fertility status this state has been divided into six categories.[1] (Table 2.3)

1. Information on Soils of Madhya Pradesh By S.S. Khanna, D.P. Motiramani and S.M. Gorantiwar, J.N.K.V.V.Jabalpur(M.P.) (Mimeographed)

Table 2.3 Fertility status of soils of Madhya Pradesh

Category	Fertility status of soil			Districts falling in each category
	N	P	K	
1. Category 1	L	M	H	Mandsaur, Jhabua, Dhar, Ujjain, Indore, Shajapur, Rajgarh, Guna, Shivpuri, Datia, Vidisha, Raisen, Sehore, Dewas, Khargone & Betul.
2. Category 2	L	M	M	Ratlam, Morena, Gwalior, Bhind, Khargone & Hoshangabad
3. Category 3	L	L	H	Narsinghpur, Jabalpur, Satna, Rewa, Sidhi & Raigarh
4. Category 4	M	L	H	Tikamgarh, Panna, Shahdol, Ambikapur (Surguja), Seoni and Balaghat
5. Category 5	L	L	M	Damoh, Durg and Raipur
6. Category 6	M	M	H	Chhindwara and Chhatarpur

Note : L= Low, M= Medium; and H= High

2.4.4 Crop Zones

The state is divided into follcwing five distinctly marked crop zones.

	Crop Zones	Districts
(1)	Rice Zone	Sidhi, Shahdol, Surguja, Mandla, Bilaspur, Raigarh, Balaghat, Durg, Rajnandgaon, Raipur, and Bastar.
(2)	Wheat Zone	Vidisha, Sagar, Damoh, Sehore, Raisen, Hoshangabad, Narsinghpur & Bhopal.
(3)	Rice-Wheat Zone	Panna, Satna, Rewa, Jabalpur and Seoni
(4)	Cotton-Jowar Zone	Mandsaur, Ratlam, Rajgarh, Ujjain, Shajapur, Jhabua, Dhar, Indore, Dewas, Khandwa, and Khargone.
(5)	Jowar-Wheat Zone	Morena, Bhind, Gwalior, Datia, Shivpuri, Guna, Tikamgarh, Chhatarpur, Betul and Chhindwara.

The five crop zones represent only broad divisions.

2.4.5 Agro-Climatic Zones

A technical committee, constituted by the ICAR, on which Government of Madhya Pradesh and JNKVV were also represented, conducted study of the agricultural situations prevailing in Madhya Pradesh with a view to identify agro-climatic regions which should be treated as units for concentrating the efforts directed to agricultural research and development. After two years of intensive labour, the committee brought out a comprehensive report which has divided Madhya Pradesh into 12 agro-climatic regions as given below.[1]

Table 2.4 Crop zones with agro-climatic zones and their coverage.

Crop zone	Agro-climatic zone	District/Area covered
(1) Rice Zone	I. Chhattisgarh plain including Balaghat district	Raipur, Durg, Bilaspur, Rajnandgaon and Balaghat together with Kanker tahsil of Bastar, and Raigarh, Sarangarh and Gharghoda tehsils of Raigarh.
	II. Bastar Plateau	Excepting the Kanker tehsil, the entire Bastar district.
	III. Northern Hills Region of Chhattisgarh	Singrauli tahsil of Sidhi the districts of Shahdol, Surguja and Mandla and the Jashpurnagar and Dharmajaigarh tahsils of Raigarh
(2) Rice-Wheat Zone	IV. Kymore Plateau and Satpura Hills	Districts of Rewa, Satna, Panna, Jabalpur and Seoni together with Gopadbanas and Deosar tahsils of Sidhi district.
(3) Wheat Zone	V. Vindhya Plateau	The districts of Damoh, Sagar, Vidisha, Bhopal, Raisen (Except Bareli tahsil) and Sehore(Except Bundi tahsil) and Chachoda and Raghogarh tahsils of Guna district

1. 'Focus on Location- specific Research- National Agricultural Research Project", Directorate of Research Services, JNKVV, Jabalpur.

Continued table.....

	VI.Central Narmada Valley	Narsinghpur and Hoshangabad districts (except Harda tahsil) Bundi tahsil of Sehore & Bareli tahsil of Raisen district.
(4) Jowar-Wheat-Zone	VII.Gird Region	Districts of Gwalior, Morena, Bhind and Shivpuri, Kolaras, Pohri tahsils of Shivpuri and Ashoknagar, Mungeli tahsil of Guna district.
	VIII.Bundelkhand Region	Districts of Datia, Tikamgarh, Chhatarpur & Karora and Pichhor tahsils of Shivpuri and Guna tahsil of Guna district.
	IX. Satpura Plateau	Districts of Betul & Chhindwara
(5) Cotton-Jowar-Zone	X- Malwa Plateau	Districts of Mandsaur, Rajgarh, Ujjain, Indore, Dewas, Shajapur, Ratlam, Badnawar and Sardarpur tahsils of Dhar and Petlawad tahsil of Jhabua district.
	XI. Nimar Plateau	Districts of Khandwa, Khargone and Harda tahsil of Hoshangabad district and Manawar tahsil of Dhar district
	XII- Jhabua Hills	Thandla, Jhabua, Jobat and Alirajpur tahsils of Jhabua and Kukshi tahsil of Dhar district

2.4.6 Cropping Pattern

About 87 per cent of the net area sown is mono cropped. In 1983-84 the area sown more than once was 24.26 lakh hectares (13.18 per cent) out of 184.00 lakh hectares of net area sown.

In the cropping pattern food grains occupyied dominating position. As much as 59.21 per cent of the gross cropped area was occupied by cereals and 21.97 per cent by pulses. Other food crops like fruits, vegetables, sugarcane, condiments and spices which are commercial crops covered only 1.64 per cent of the gross cropped area (Table 2.5).

Table 2.5 Cropping Pattern of Madhya Pradesh 1983-84

Crops/Crop categories	Area (Thousand hect.)	Percentage to gross cropped area
Cereals	13,398.50	59.21
Pulses	4,972.30	21.97
Food Grains	18,370.80	81.18
Oil seeds	2,374.60	10.49
Sugarcane	43.43	0.19
Fibre crops	568.62	2.52
Fruits	52.13	0.23
Vegetables	129.53	0.57
Condiments and spices	146.84	0.65
Tobacco	1.28	0.01
(Fodder+Other crops)Misc.	940.97	4.16
Gross Cropped Area	22,628.20	100.00

Among commercial crops oilseeds were most important. They occupied as much as 10.49 per cent area followed by fibre crops (mainly cotton) which shared only 2.52 per cent area.

2.47 Irrigation

The state lags much behind the all India 25.7 per cent of net irrigated area to net area sown. In this state only 14.4 per cent of the net area sown and 12.5 per cent of gross cropped area was irrigated in 1983-84. Districtwise proportion of irrigated area varied from less than two per cent in Mandla, Shahdol and Bastar districts to more than forty per cent in Balaghat, Morena and Tikamgarh districts.

Among the various sources of irrigation, canals (43.79 per cent) and wells (41.14 per cent) were important as they shared about equal percentage of the irrigated area and accounted for a total of 84.93 per cent of the gross irrigated area. (Table 2.6)

Table 2.6 Sources of Irrigation in M.P.1983-84

Sources	Gross Irrigated area ('000 ha.)	Percentage to total
Canals	1255.8	43.79
Tanks	156.8	5.47
Wells	1179.7	41.14
Other sources	275.2	9.60
Total	2867.5	100.00

Of the total irrigated area wheat alone shared 44.36 per cent, the other important crop being paddy, which shared 30.24 per cent. Gram was third important irrigated crop although it occupied a comparatively very low (7.13 per cent) of the gross irrigated area. Other crops or groups of crops having any significant area were fruits & vegetables (3.63 per cent), condiments & spices (3.35 per cent) and rape and mustard (2.29 per cent).

From the point of view of extent of irrigation, sugarcane was the most important with practically entire area (97.39 per cent) under irrigation. Condiments & spices and fruits & vegetables were other two crop groups irrigated to the extent between 55 to 65 per cent. Among other crops which do not essentially need irrigation wheat was irrigated to the extent of 33.65 per cent, rape and mustard, 21.08 per cent and paddy, 17.53 per cent.

From this study point of view pulses, as a group, was irrigated to the extent of only 4.69 per cent. The oilseeds group of crops received a still less importance with only 3.29 per cent of the area irrigated. Individually, gram was irrigated to the extent of 9.70 per cent and pea, 7.49 per cent. Among oilseeds rape and mustard received the best of the treatment with 21.08 per cent of the crop under irrigation (Table 2.7).

Table 2.7 Irrigation by crops, 1983-84, Madhya Pradesh

Crop	Total cropped area ('000ha.)	Total Irrigated area ('000ha.)	Percentage to total irrigated area	Percentage of irrigated area to total cropped area
Paddy	4946.50	866.98	30.24	17.53
Jowar	2127.70	2.17	0.07	0.10
Bajra	173.70	0.03	0.001	0.02
Maize	831.50	5.89	0.20	0.71
Wheat	3,779.80	1,271.77	44.36	33.65
Barley	159.40	38.14	1.33	23.93
Other Cereals	1,467.00	0.32	0.01	0.02
Total Cereals	13485.60	2185.30	76.21	16.20
Gram	2106.50	204.44	7.13	9.70
Tur	508.2	0.99	0.03	0.19
Moong	231.9	4.60	0.16	1.98
Masoor	288.2	13.22	0.46	4.59
Peas	128.2	9.60	0.33	7.49
Other Pulses	1,719.50	1 25	0.05	0.07
Total Pulses	4982.50	234.10	8.16	4.69
Rape-Mustard	311.90	65.75	2.29	21.08
Linseed	584.70	3.53	0.12	0.60
Other Oilseeds	1,484.30	9.22	0.32	0.62
Total oilseeds	2380.90	78.50	2.73	3.29
Sugarcane	87.30	85.02	2.97	97.39
Cotton	544.40	51.55	1.79	9.47
Total Condiments & Spices	147.60	95.80	3.35	64.90
Total Fruits & Vegetables	181.60	104.20	3.63	57.38
Fodder	875.50	18.70	0.66	2.13
Misc.	50.20	14.33	0.50	28.54
Total	22735.60	2867.50	100.00	12.61

The low level of irrigation in both the crop groups of pulses and oilseeds is one of the important factor which restricts the yield levels and application of improved technology including HYV Seeds.

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CHAPTER-III

PULSES AND OILSEEDS DEVELOPMENT IN MADHYA PRADESH

3.1 Pulses

Pulse Crops play a very important role in the development of cropping system. Pulses are annually cultivated over an area of 22 to 24 million hectares in India covering nine pulse crops namely chickpeas (gram), lathyrus (Kesari), lentil, peas in rabi and pigeon pea (arhar), green gram (moong), black gram (urd), horse gram (kulthi) and moth in kharif. The production of total pulses varies between 10-13 million tonnes.

Gram and arhar are the major pulses grown over an area of about 70 lakh hectares and 30 lakh hectares respectively. Moong and urd are grown in a number of States during both kharif and rabi seasons. Moong is also grown in summer season. Moong and urd occupy about 11 per cent and 10 per cent of the area of total pulses in India.

The production of pulses range between 100 to 130 lakh tonnes in the country.

3.1.1 Contribution of Madhya Pradesh in Pulses Production

Development of pulse crops has been accorded a very high priority in the agricultural development of Madhya Pradesh. Madhya Pradesh has earned an important place in the country's map for the production of pulses and contributes about 22 per cent of the total pulses production of the country.

Madhya Pradesh shares the largest area under pulses among all the states. In 1983-84 out of the total area of 23,542.00 thousand hectares in the country Madhya Pradesh had 4,972.0 thousand hectares or 21.12 per cent.

As regards production, the state's contribution was second largest, the largest being that of Uttar Pradesh. Out of total production of 12,893.4 thousand tonnes, Madhya Pradesh shared 2,702.3 thousand tonnes in 1983-84 or 20.96 per cent.

The pulse growing districts are listed in appendix table A3.1.

Pulses are energy rich crops but they are cultivated largely under conditions of energy starvation. These crops are subjected to high degree of instability in production from year to year. This is on account of the fact that pulses are grown mainly under rain-fed conditions, mostly on marginal and sub-marginal lands and the irrigated area under pulses is very low.

The pulse crops have unique quality to fix atmoshpheric nitrogen with the help of bacteria present in the nodules on the roots and thus improve the soil fertility. Secondly, under moisture stress conditions prevalent in rainfed area, pulses grow more successfully than cereals.

It is true that stagnant production of pulses is primarily due to the fact that the pulses in general are grown under rainfed conditions and poor management practices, but the situation can be corrected by growing pulses under better standard of cultivation. The state of Madhya Pradesh has popularized the application of correct doses of fertilizers with effective plant protection measures and has been successful in boosting the productivity of pulses, although these efforts need to be intensified.

3.1.2 Development of Pulses in Madhya Pradesh

The area under pulses increased from 45.76 lakh hectares in 1980-81 to 51.39 lakh hectares in 1982-83. In the subsequent two years, however, the area declined to 49.82 and 48.44 lakh hectares

respectively. In the case of production there was a steady increase from 20.10 lakh tonnes in 1980-81 to 27.02 lakh tonnes in 1983-84. However, the production dropped to 23.44 lakh tonnes during 1984-85 (Table 3.1).

Table 3.1 Area and Production of Pulses (Madhya Pradesh), Sixth Plan

Year	Area under Pulses (lakh hectares)	Production of total pulses (lakh tonnes)
1980-81	45.76	20.10
1981-82	48.56	24.73
1982-83	51.39	26.07
1983-84	49.82	27.02
1984-85	48.44	23.44

The amount sanctioned by State Government on Centrally Sponsored Pulses Development Scheme in the year 1980-81 to 1984-85 was Rs.74,075, Rs.51,575, Rs.91,931, Rs.101,645 and Rs.80,371 lakhs respectively. Against this the expenditure incurred on the scheme in different years was Rs.45.344, Rs.88.620, Rs.115.960, Rs.119.870 and Rs.48.982 lakhs respectively. In two years i.e. 1980-81 and 1984-85 the expenditure was less than the amount sanctioned. But in the remaining three years i.e. 1981-82, 1982-83 and 1983-84, the expenditure was more than the sanctioned amount. In 1980-81 and 1984-85 the percentage of expenditure to amount sanctioned was 61.21 and 60.94 respectively, whereas, in 1981-82, 1982-83 and 1983-84 it was 171.83, 126.14 and 117.93 respectively. (Table 3.2)

Table 3.2 Expenditure on Centrally Sponsored Pulses Development Scheme in Sixth Plan, M.P.

(Rs.in lakhs)

Year	Amount sanctioned by State Govt.	Expenditure	% of Expenditure to amount sanctioned (Col.3 to 2)
(1)	(2)	(3)	(4)
1980-81	74.075	45,344	61.21
1981-82	51.575	88.620	171.83
1982-83	91.931	115.960	126.14
1983-84	101.645	119.870	117.93
1984-85	80.371	48.982	60.94
	399.597	418.776	104.79

Centrally sponsored scheme on pulses development including summer moong and centrally sponsored scheme for the distribution of pulses minikits sanctioned in 1972-73 were in operation during the two plan periods. The centrally sponsored scheme was basically a development oriented programme providing facilities for :-

1. Distribution of certified truthfully labelled seed
2. Plant protection chemicals
3. Plant protection equipment and operation
4. Distribution of Rhyzobium culture

With a view to achieve more production the following strategy is proposed to be followed.

i) Introduction of pulse crops in irrigated farming system

ii) Bringing of additional area under pulses by way of

a) short duration varieties of urad, moong etc. in rice fallowed by utilising the residual moisture in rabi season.

b) summer season pulses with irrigation after oilseeds, sugarcane, potato and wheat, and

c) rabi area under lentil

iii) Intercropping of arhar (tur) in soybean, bajra, cotton, sugarcane and groundnut both under irrigated and un-irrigated conditions,

iv) Encourage the cultivation of pulses to replace Khesari dal

v) Multiplication and use of improved seeds

vi) Adoption of plant protection measures

vii) Use of phosphatic fertilizers and rhizobium culture

viii) Improved post harvest technology.

ix) Adoption of appropriate public policies including pricing and marketing of pulses.

3.2 Oilseeds

Oilseeds are the principal commercial crops of India and constitute the second major agricultural crop group after food-grains in terms of tonnage and value. Cultivated oilseeds are the principal source of edible and non-edible oils. Edible oils, which form essential part of human diet, are derived from groundnut, rapeseed-mustard, sesamum, soybean, sunflower, safflower and niger. Non-edible oils are obtained from linseed and castor and serve as an important raw material for industrial products like soaps, paints, lubricants, etc.

In 1984-85, the oilseeds were cultivated over an area of 19.9 million hectares with a production level of 13.1 million tonnes in the country. Of these, groundnut and rapeseed-mustard were most important crops which together accounted for 61 per cent

of the total area and 75 per cent of total production of oilseeds in 1984-85. Though sunflower and soybean are the recent introduction in the country, they have played an important role in augmenting the sources of edible oils.

Major oilseed growing states are Gujarat, Uttar Pradesh, Madhya Pradesh, Maharashtra, Andhra Pradesh, Karnataka, Rajasthan and Tamil Nadu. Gujarat tops the list of states in respect of area and production accounting for about 13 per cent of total area and 17 per cent of total production of oilseeds. The main crop of Gujarat is groundnut. The next important state on area basis is Uttar Pradesh, where rapeseed-mustard is the most prominent crop.

3.2.1 Development of Oilseeds in Madhya Pradesh

The data on area, production and yield of total oilseeds in M.P. for the past 20 years does not indicate any trend. In the year 1964-65 the area, production and yield of oilseeds in M.P. was 19.74 lakh hectares, 6.47 lakh tonnes and 0.327 tonnes per hectare respectively. In the year 1984-85, however, the area, production and yield shot up to 27.67 lakh ha. 13.78 lakh tonnes and 0.498 tonnes/ha. The area, production and yield in the year 1985-86 was 27.40 lakh hectares, 13.74 lakh tonnes and 0.501 tonnes/hectare respectively, nearly equal to that of 1984-85.(Table 3.3)

Table 3.3 Area, production and yield of oilseeds in Madhya Pradesh in the last 20 years.

Year	Area (Lakh ha)	Production (Lakh tonnes)	Yield (Tonnes/ha)
1964-65	19.74	6.47	0.327
1969-70	17.94	5.84	0.325
1974-75	21.50	7.56	0.351
1979-80	17.53	3.93	0.224
1984-85	27.67	13.78	0.498
1985-86	27.40	13.74	0.501

Source : Technology Mission on Oilseeds for the State of Madhya Pradesh April, 1987. Department of Agriculture, M.P. Bhopal.

From acrage point of view soybean ranked first followed by linseed, groundnut, rapeseed- mustard, sesamum, niger, sunflower, castor and safflower in the VI plan period. From production point of view, the ranking of crops was different. In this case soybean ranked first followed by rapeseed- mustard, groundnut, linseed, sesamum, niger, sunflower, castor and safflower. The yield was highest in the case of summer groundnut while the area and production were too low. The yield of sesamum was lowest among nine oilseeds. (Table 3.4)

Table 3.4 Relative importance of oilseed crops in Madhya Pradesh in the year 1983-84 and during VIth plan

Oilseed crop	Year 1983-84			During VI Plan (1981-82 to 1985-86		
	Area (lakh ha)	Production (lakh tonnes)	Yield (kg/ha)	Area (lakh ha.)	Production (lakh tonnes	Yield (kg./ha)
1. Groundnut	3.12	2.32	745	3.12	1.99	638
2. Rapeseed mustard	3.12	2.32	749	2.94	2.03	690
3. Sunflower	0.30	0.16	500	0.19	0.09	474
4. Soybean	6.14	4.62	752	5.21	3.68	707
5. Sesamum	2.60	0.47	181	2.59	0.42	164
6. Niger	2.18	0.45	214	2.20	0.38	173
7. Castor	0.04	0.01	388	0.04	0.01	319
8. Linseed	5.84	1.65	281	5.19	1.31	234
9. Safflower	0.01	0.004	250	0.01	0.01	250
10. Groundnut (Summer)	0.21	0.302	1428	0.11	0.20	1833

3.2.2 Contribution of M.P. in Oilseed Production

The state contributes 10.8 per cent of the oilseed production of the country. All the nine oilseeds viz. groundnut, sesamum,

niger, sunflower, castor, linseed, rapeseed-mustard, safflower and soybean together are cultivated over an area of about 2.7 million hectares.

As regards area and production of each oilseed crop, the state represents very important positions in the country as given below.

Crop	Rank
1. Niger	First position
2. Soybean	First position
3. Linseed	Second position
4. Sesamum	Third position
5. Rapeseed mustard	Third position
6. Groundnut	Seventh position
7. Sunflower	Seventh position
8. Safflower	Sixth position

The cropwise productivity of different oilseed in the states compares well with the national and world average (Table 3.5)

Table 3.5 Productivity of different oilseeds at world, country and state levels

(Unit- (kg./ha)

S.No.	Oilseed crop	World Average Yield	National Yield	State Average Yield	State's highest average for any district
1.	Groundnut	1122	870	745	1317 (Mandsaur) (Chhindwara)
2.	Rape-mustard	1262	686	749	1190 (Morena)
3.	Soybean	1925	783	752	1294 (Gwalior)
4.	Sunflower	1008	529	500	580 (Shajapur)
5.	Sesamum	-	243	181	444 (Shivpuri)
6.	Castor	-	696	388	737 (Guna)

Source : Oilseed and Pulse Development Programme in Madhya Pradesh- National Project- December 1986, Directorate of Agriculture, Madhya Pradesh, Bhopal

The main oilseed crops of the state are, groundnut, rapeseed-mustard, soybean, and sunflower. For each crop a specified number of districts contribute substantiallyto area and production. Treating 80 per cent of area or 80 per cent of production levels as sufficient to qualify the group of districts to be called as potential districts grouping emerges as per table 3.6.

Table 3.6 Potential districts for different oilseed crops,M.P.

Oilseed crops	Potential Districts having	
	80% production	80% area
1. Groundnut	Khargone, Mandsaur, Chhindwara, Dhar, Shivpuri, Raigarh, Jhabua, Shajapur, Khandwa, Rajgarh,	Khargone, Mandsaur, Shajapur, Dhar, Chhindwara, Raigarh, Khandwa, Shivpuri, Jhabua, Rajgarh.
2. Rapeseed-mustard	Morena, Mandla, Bhind, Surguja, Bastar	Morena, Bhind, Mandla, Surguja, Bastar
3. Soybean	Hoshangabad, Indore, Ujjain, Dewas, Shajapur, Chhindwara, Betul, Dhar, Sehore, Raisen, Rajgarh	Hoshangabad, Indore, Betul, Dewas, Ujjain, Sehore, Shajapur, Dhar, Chhindwara, Raisen, Rajgarh
4. Sunflower	Shajapur, Rajgarh, Mandsaur	Shajapur, Rajgarh, Mandsaur

Table 3.7 Target and achievement of VIth Plan period for Oilseeds, M.P.

S.No.	Crop	Target VI Plan	Achievement VI Plan
		Production '000 tonnes	Production '000 tonnes
1.	Groundnut	300.00	197.20
2.	Sesamum	45.00	41.20
3.	Niger	50.00	38.00
4.	Castor	Nil	1.40
5.	Sunflower	Nil	15.00
6.	Soybean	840.00	368.60
	Total Kharif	1235.00	661.40
7.	Linseed	165.00	129.00
8.	Rapeseed-Mustard	190.00	175.00
9.	Safflower	Nil	-
	Total Rabi	355.00	304.00
10.	Groundnut(Summer)	Nil	35.00
	Grand Total	1590.00	1000.40

To achieve the target following strategy has been adopted.

(i) Expansion of non-traditional oilseed crops like soybean and sunflower in potential area.

(ii) Increase in irrigated area of crops like groundnut during rabi and summer seasons and rapeseed-mustard during rabi season.

(iii) Improvement in productivity of oilseed crops through the use of quality seeds of improved varieties, phosphatic fertilizers and gypsum in groundnut, rhizobium culture in groundnut and soybean, better farm implements and plant protection measures and adoption of improved package of practices.

(iv) Free distribution of seed-minikits on large scale to popularise newly released varieties.

(v) Extension of area under oilseed cultivation through double cropping/sequential cropping/inter-cropping and replacement of low value crops by oilseed crops.

Inter-cropping

	Main crop	Inter crop
(i)	Cotton	Groundnut/Soybean/Sesamum
(ii)	Groundnut	Sunflower
(iii)	Sorghum/Maize	Soybean
(iv)	Sugarcane	Soybean

Relay cropping

(i)	Soybean	Safflower/Sunflower
(ii)	Sorghum	Safflower
(iii)	Paddy	Linseed/Safflower

Crop replacement

(i) Low yielding rabi wheat by safflower

(ii) Minor millets by soybean/niger

(vi) Extension of safflower in Tawa Command Area.

(vii) Extension of Safflower cultivation in dry farming areas of the state.

(viii) Planting of castor on bunds in the dry farming regions.

(ix) Improvement in the management of Utera cultivation

(x) Planting of soybean on the bunds of paddy fields in Chhattisgarh region

(xi) To provide adequate and proper marketing facilities

3.2.3 Oilseed Development Programme in Madhya Pradesh

To help the state governments in their efforts to achieve the targetted production of nine cultivated oilseeds including groundnut, rapeseed-mustard, soybean, sunflower, safflower, sesamum, niger and linseed, the Govt.of India sponsored the National Oilseeds Development Project. The seventh plan envisages to increase the production of these nine oilseeds to 170 lakh tonnes as against the targetted production of 130 lakh tonnes in the terminal year (1984-85) of the sixth plan in the country.

Madhya Pradesh is an important oilseeds growing state and its participation in the programme in 1985-86 was planned to be substantial. Thus out of the target area of 122.70 lakh hectares for the country as whole, M.P. had 15.20 lakh hectares or 12.39 per cent. Again, out of the total production target of 136.00 lakh tonnes for the country, M.P. had 14.43 lakh tonnes or 10.61 per cent. As regards seed minikit distribution the target for M.P. was 1,23,500 out of the total target of 5,56,600 for the country. In case of fertilizer minikit distribution the target set for M.P. was 22,784 out of the total target of 1,09,220 for the country.

As far as the total outlay is concerned the amount for Madhya Pradesh was Rs.369.143 lakhs of the total amount of Rs.3,799.04 lakhs for all the states taken together. Similarly, the amount of budgetary ceiling for this state came to Rs. 288.670 lakhs of the total amount of Rs.3,000 lakhs for all the states.

3.2.4 Soybean Production in Madhya Pradesh

Madhya Pradesh has earned an important place in the country's map for the production of soybean. Soybean crop is now well established in the cropping pattern of M.P. especially in the western, central and south central districts of the state. Area under its cultivation has raised from a modest 0.13 lakh hectares in 1973-74 to about 9 lakh hectares in 1984-85. This is nearly 76 per cent of the total soybean area of the country. The state is, therefore, rightly called the soybean state.

3.2.5 Major Soybean Producing districts

The following are the major soybean producing districts in the state.

1. Indore
2. Dhar
3. Ujjain
4. Dewas
5. Shajapur
6. Sehore
7. Raisen
8. Betul
9. Rajgarh
10. Hoshangabad
11. Sagar
12. Jabalpur
13. Chhindwara
14. Narsinghpur
15. Bhopal
16. Vidisha

3.2.6 Area, Production and yield of soybean

The area under the crop increased from 3.07 lakh hectares in 1981-82 to 9.34 lakh ha.in 1984-85. During the same period the production increased from 2.35 lakh tonnes to 7.69 lakh tonnes (Table 3.8)

Table 3.8 Area, Production and yield of soybean in M.P.

Year	Area (Lakh hect.)	Production (Lakh tonnes)	Yield (kg./ha)
1981-82	3.07	2.35	765
1982-83	4.57	2.79	611
1983-84	6.13	4.61	752
1984-85	9.34	7.69	780

3.2.7 Pattern of Soybean Development in the State

The above progress in soybean cropping in M.P. is the outcome of appropriate planning and extension work supported by research, marketing and processing activities. Production of soybean received a boost with the implementation of the Centrally sponsored soybean scheme. Under this scheme, (sanctioned in the year 1969-70 and continued upto 1980-81), cultivators were given seed minikits, demonstrations and subsidised improved seeds. As a result of the implementation of this scheme the area which was nearly 2,000 hectares in 1969-70 increased to 934 thousand hectares in 1984-85.

The Govt.of India sanctioned a soybean development programme for the state costing Rs.15.00 crores in 1980-81, against the State Government's proposal for massive soybean development programme estimated to cost Rs.36 crores. The programme was implemented from 1981-82 and had, since then, run

successfully for four years i.e. upto 1984-85. Under this scheme all facilities given earlier were continued and additional facilities and subsidies were given for the purchase of plant protection equipments, chemicals, weedicides and farm implements. On the initiative of the State Government OILFED organised Cooperative Societies for taking up soybean production in selected districts. These Cooperative societies now supply quality seed to the growers and purchase the produce at support or market prices whichever are higher for processing.

In the year 1984-85 the soybean development programme was merged in the National Oilseed Development Project under which nine districts (viz. Indore, Dhar, Ujjain, Shajapur, Dewas, Betul, Rajgarh, Hoshangabad and Chhindwara) have been identified for intensive development of soybean.

The percentage of expenditure to the amount sanctioned by state Govt. on soybean development programme since 1980-81 to 1984-85 was 60.13, 56.96, 61.25, 76.23 and 98.57 respectively. The percentage of total expenditure to the total amount sanctioned in these five years was 78.27. (Table 3.9)

Table 3.9 Expenditure on soybean development programme since 1980-81, M.P.

(Rs. in lakh)

Year	Outlay approved by the Govt. of India	Amount sanctioned by the state Govt.	Expenditure incurred	% of expenditure to the amount sanctioned by State Govt.
1980-81	19.15	13.71	8.244	60.13
1981-82	129.15	127.61	72.684	56.96
1982-83	215.00	194.64	119.220	61.25
1983-84	360.00	354.18	270.000	76.23
1984-85	444.95	344.93	340.000	98.57
Total	1168.25	1035.07	810.148	78.27

CHAPTER- IV

CHANGES IN CROPPING PATTERNS OF THE STATE AND SUB-REGIONS

4.1 Cropping pattern of Madhya Pradesh

Madhya Pradesh had gross cropped area of 22,628.2 thousand hectares in 1983-84. Of this the maximum percentage (59.21) was under cereals and millets. The next group of crops was pulses and occupied 21.97 per cent. The oilseeds was the third significant group of crops with 10.49 per cent of the gross cropped area under it.

Among pulses gram was the most important and occupied 9.29 per cent of the gross cropped area. Urad & teora, although far less important than gram occupied second and third positions with 3.48 and 3.17 per cent respectively of the gross cropped area. Tur (arhar) was another important crop with 2.23 per cent of the gross cropped area. Moong and lentil were only other pulse crops worth mentioning with 1.02 and 1.27 per cent of the gross cropped area.

Among oilseeds the prime place of importance was occupied by soybean with 2.71 per cent of the gross cropped area. Next came linseed with 2.58 per cent. Groundnut, rapeseed & mustard and sesamum shared about an equal per-centage of the gross cropped area (1.37, 1.37 and 1.14 per cent) respectively. (Table 4.1)

It may be mentioned that this state is called the soybean state of the country and soybean which has come to stay now has replaced mainly groundnut.

Table 4.1 Cropping Pattern of M.P.

Crops	1970-71		1983-84	
	Area '000 hactares	%	Area '000 hactares	%
Rice	4352.7	21.18	4910.7	21.70
Wheat	3399.2	16.53	3771.8	16.67
Jowar	2163.6	10.53	2121.3	9.38
Maize	581.3	2.83	821.6	3.63
Bajra	222.0	1.08	172.9	0.76
Barley	156.6	0.76	159.1	0.70
Kodo-kutki	1364.2	6.64	1165.4	5.15
Sawa	133.1	0.65	132.2	0.58
Other Cereals	156.4	0.76	143.5	0.64
Total Cereals	12529.1	60.96	13398.5	59.21
Gram	1607.4	7.82	2103.0	9.29
Tur	491.0	2.39	505.2	2.23
Urad	617.5	3.00	788.0	3.48
Moong-moth	232.0	1.13	231.7	1.02
Kulthi	195.6	0.95	187.5	0.83
Teora	708.8	3.45	717.3	3.17
Peas	78.0	0.38	128.0	0.57
Masoor (Lentil)	271.1	1.32	287.5	1.27
Other Pulses	23.2	0.11	24.1	0.11
Total Pulses	4224.6	20.55	4972.3	21.97
Total Foodgrains	16753.7	81.51	18370.8	81.18
Groundnut	463.3	2.25	311.2	1.37
Sesamum	349.6	1.70	257.8	1.14
Rapeseed mustard	203.2	0.99	309.1	1.37
Linseed	628.9	3.06	584.6	2.58
Niger	238.1	1.16	211.3	0.93
Soybean	-	-	613.6	2.71
Castor	6.1	0.03	3.9	0.02
Other oilseeds	29.1	0.14	83.1	0.37
Total oilseeds	1918.3	9.33	2374.6	10.49
Sugarcane	60.53	0.29	43.436	0.19
Cotton	683.07	3.32	543.22	2.40
Sunhemp	28.68	0.14	19.37	0.09
Mesta	18.00	0.09	6.03	0.03
Tobacco	2.92	0.02	1.28	0.01
Fodder	--	--	875.36	3.87
Total Fruits	49.009	0.24	52.135	0.23
Total Vegetables	85.49	0.42	129.531	0.57
Total spices	93.683	0.46	146.835	0.65
Other crops	859.928	4.18	65.613	0.29
Total cropped Area	20553.22	100.00	22628.20	100.00

4.1.1 Change in cropping pattern

Two reference years for which the data on changes in cropping pattern were studied, were 1970-71 and 1984-85. However, for the state of Madhya Pradesh the data available for the latest year was for 1983-84 and therefore 1983-84 was taken as a current year and 1970-71 as base year.

In 1970-71, the gross cropped area was 20,553.20 thousand hectares. Thus, there was an increase of nearly 10 per cent in the gross cropped area during the last 13 years. This increase was observed in all the sub-groups of crops with a varying degree of change. Thus, a major contribution to the increase in area was made by cereals. It was 41.90 per cent. The next group of crops was that of pulses which contributed to the extent of 36.03 per cent. Oilseeds contributed 22.00 per cent. The remaining contribution of 0.07 per cent came from other cash crops taken together.

Other aspect of the change in the cropping pattern is that the maximum increase (23.79 per cent) was noted among the oilseeds. The second largest increase was noted in the group of pulses (17.70 per cent). On the other hand the percentage increase in area was smallest (6.94 per cent) among cereals.(Table 4.2)

Table 4.2 Changes in area under main sub groups of crops,M.P.

Crops	Area in '000 ha. 1970-71	Area in '000 ha. 1983-84	Change in area (+) (-)	% Change	% change over 1970-71
Total cereals	12,529.1	13,398.5	869.4	41.90	106.94
Total pulses	4,224.6	4,972.3	747.7	36.03	117.70
Total Foodgrains	16,753.7	18,370.8	1,617.1	77.93	109.65
Total Oilseeds	1,918.3	2,374.6	456.3	22.00	123.79
Total cropped area	20,553.22	22,628.20	2,074.98	100.00	110.09

A peculiar phenomenon noted was the decrease in the area under cash crops like sugarcane, cotton, sunhemp, mesta and tobacco. Only fruits, vegetables and spices recorded larger area in the current year as compared to the base year.

Thus, we conclude that there was only 10.09 per cent increase in the gross cropped area and this was mainly under oilseeds and pulses, although cereals continued to dominate (about 60 per cent) the cropping pattern of the state.

4.1.2 Change in the area under pulses

The area under pulses increased from 4,224.60 thousand hectares to 4,972.3 thousand hectares during the two reference years. Thus, the net increase was 747.7 thousand hectares. This increase was mainly due to an increase in the area under gram, urad and, to a small extent, to pea and lentil. The contribution of these crops to the total increase was 66.28, 22.80, 6.69 and 2.19 per cent respectively. However, the change in the area under each from base year to the current year showed a very different picture. Thus, the highest increase (64.10 per cent) was in the case of pea. Gram (30.83 per cent) and urad (27.61 per cent also showed a significant increase. (Table 4.3)

Thus, we see that gram, urad, pea and lentil were the main pulse crops showing significant area difference in the cropping pattern. While gram and urad contributed higher percentage to total increase, pea registered the highest percentage increase in the area.

4.1.3 Change in the area under oilseeds

In the case of oilseeds soybean was the crop which registered an increase of unprecedented kind. From just an insignificant area in 1970-71, the area under this crop increased

to as high as 613.6 thousand hectares indicating an increase of 61,360 per cent. The only another crop with increased area during the reference period was rapeseed & mustard. The area increase in this crop was 105.9 thousand hectares contributing 23.21 per cent to the total increase under oilseeds. In terms of percentage increase this came to 52.12. All other oilseeds had a decreased area in the current year than the base year. The largest decrease was in the case of groundnut (152.1 thousand hectares) followed by sesamum (91.8 thousand hectare) linseed (44.3 thousand hectares) and niger (26.8 thousand hectares) (Table 4.3)

Table 4.3 Changes in the area under Pulses and Oilseeds in state of M.P.

Pulse crops	Area '000 ha. 1970-71	Area '000 ha. 1983-84	Change in area (+) (-)	% change	% change over the base period
Gram	1607.4	2103.0	495.6	66.28	30.83
Tur	491.0	505.2	14.2	1.90	2.89
Urad	617.5	788.0	170.5	22.80	27.61
Moong-moth	232.0	231.7	- 0.3	- 0.04	- 0.13
Kulthi	195.6	187.5	- 8.1	- 1.08	- 4.14
Teora	708.8	717.3	8.5	1.14	1.2
Peas	78.0	128.0	50.0	6.69	64.10
Masoor (Lentil)	271.1	287.5	16.4	2.19	6.05
Other Pulses	23.2	24.1	0.9	0.12	3.88
Total Pulses	4224.6	4972.3	747.7	100.0	17.70
Oilseed crops					
Groundnut	463.3	311.2	-152.1	-33.33	- 32.83
Sesamum	349.6	257.8	- 91.8	-20.12	- 26.26
Rapeseed-mustard	203.2	309.1	105.9	23.21	52.12
Linseed	628.9	584.6	- 44.3	- 9.71	- 7.04
Niger	238.1	211.3	- 26.8	- 5.87	- 11.25
Soybean	-	613.6	613.6	134.47	61360
Castor	6.1	3.9	- 2.2	- 0.48	- 36.06
Other oilseeds	29.1	83.1	54.0	11.83	185.57
Total oilseeds	1,918.3	2374.6	456.3	100.0	23.79

Thus, on the basis of data for the two reference years of 1970-71 and 1983-84 it can be concluded that pulses and oilseeds have progressed well as against cereals. Among pulses gram, urad, pea and lentil are important, whereas, among oilseeds, soybean and rapeseed and mustard are important.

As far as substitution of crops it can be said that urad, pea and lentil tend to replace less important cereals whereas gram either replaces linseed or other less important rabi cereals.

In the subsequent pages the change in cropping pattern with respect to different agro-climatic regions are examined. Emphasis is naturally for pulses and oilseeds and the substitution these two crop groups might have effected.

4.2 Chhattisgarh Plains including Balaghat district

Teora was the most important pulse crop occupying 13.47 per cent area of the gross cropped area of this region. The other important pulse crops were urad and gram having 3.39 and 3.19 per cent area respectively.

Among oilseeds, the first place was occupied by linseed with 4.94 per cent of the gross cropped area.

4.2.1 Change in cropping pattern

The gross cropped area in 1970-71 was 4464.0 thousand hectares. Thus, there was an increase of 4.06 per cent in the gross cropped area during last 13 years.

A major contribution to the increase in area over 1970-71 was made by cereals. It was 107.84 per cent. Pulses was the next crop group which contributed 12.76 per cent. There was a decrease in the area of oilseeds i.e. 17.89 per cent (Table 4.4)

Table 4.4 Changes in cropping pattern, Chhattisgarh Plains including Balaghat district.

Crops	Area '000 ha. 1970-71	Area '000 ha. 1983-84	Change in area (+)(-)	% change	% change over 1970-71
Total Cereals	2,986.8	3,182.1	195.3	107.84	6.54
Total Pulses	1,033.0	1,056.1	23.1	12.76	2.24
Total Food grains	4,019.8	4,238.2	218.4	120.60	5.43
Total oilseeds	359.2	326.8	- 32.4	- 17.89	-9.02
Total Cropped Area	4,464.0	4,645.1	181.1	100.00	4.06

Thus, we conclude that there was only 4.06 per cent increase in the gross cropped area and this was only due to total foodgrains (cereals and pulses).

4.2.2 Change in the area under pulses

In the region, the area under pulses increased from 1,033.0 thousand hectares to 1,056.1 thousand hectares during the two reference years. Thus, the net increase was 23.1 thousand hectares. The main crops responsible for this increase were gram and teora. The contribution of these crops to the total increase was 227.27 and 164.93 per cent respectively.

A change in the area under each from base year to the current year showed the same picture.The highest increase(54.69 per cent) was in case of gram.Teora also showed an increase of 6.48 per cent.

Thus, we can say that the gram & teora were the main puises that showed a significant area difference in the cropping pattern. Gram & teora contributed higher percentage to the total increase as well as highest percentage increase in the area over the base year.

4.2.3 Change in the area under oilseeds

The area under oilseeds in this region decreased from 359.2 thousand hectares to 326.8 thousand hectares during the two reference years i.e. 1970-71 and 1983-84. Thus, the net decrease was 32.4 thousand hectares. This decrease was mainly due to the decrease in the area of all the oilseed crops except Soybean and Rape seed and Mustard. The contribution of these crops to the total change was 10.18 and 4.63 per cent respectively. All other oilseeds had a decreased area in the current year than the base year. (Table 4.5)

Table 4.5 Changes in area under pulses and oilseeds in sub-region 1,2, & 3 of Madhya Pradesh

Zones → / Crops ↓	Chhatisgarh Plains including Balaghat Region-1				Bastar Plateau Region-2				Northern Hill Region of Chhatisgarh Region-3			
	% to gross cropped area 1970-71	% to GCA 1983-84	% of Changed area under sub-groups	% of change over area in the base year	% to GCA 1970-71	%to GCA 1983-84	% of changed area under subgroup	% of change over area in the base year	% to GCA 1970-71	% to GCA 1983-84	% of changed area under sub-groups	% of change over area in the base year
Pulses												
Gram	2.16	3.19	227.27	54.69	0.30	0.28	7.69	9.09	2.55	2.37	2.78	0.49
Tur	1.17	0.91	- 44.59	- 19.66	0.34	0.23	-19.23	-20.00	1.09	1.38	88.89	36.99
Urad	4.39	3.39	-167.10	- 19.70	1.64	1.17	-73.08	-15.70	2.47	2.60	73.61	13.45
Moong-moth	0.56	0.40	- 29.44	- 26.98	0.42	0.37	3.85	3.23	0.21	0.03	-38.89	-82.35
Kulthi	1.11	0.95	- 23.81	- 11.11	5.20	4.33	-23.08	-1.57	2.43	1.92	-79.17	-14.73
Teora	13.16	13.47	164.93	6.48	0.22	0.25	23.08	37.50	0.22	0.13	-18.06	-37.14
Peas	0.16	0.12	- 6.06	- 19.44	0.26	0.09	-43.31	-57.89	1.05	0.74	-56.94	-24.40
LentiMasur	0.29	0.19	- 16.88	- 30.23	-	-	-	-	1.28	0.82	-87.50	-30.88
Other pulses	0.14	0.11	- 4.33	- 15.87	0.05	0.12	23.08	150.00	0.03	0.08	15.28	275.00
Total Pulses	23.14	22.73	100.00	2.24	8.43	6.84	100.00	-4.19	11.33	10.07	100.00	-3.99
Oilseeds												
Groundnut	0.59	0.54	- 4.32	- 5.28	-	-	-	-	0.21	0.31	14.18	55.88
Sesamum	0.65	0.53	- 14.19	- 15.81	0.43	0.29	-21.21	-21.87	2.12	1.55	-52.27	-20.77
Rapeseed-mustard	0.35	0.37	4.63	9.68	2.54	1.90	-66.67	-11.76	3.61	4.27	118.00	27.43
Linseed	5.82	4.94	- 93.52	- 11.67	0.60	0.54	1.09	6.82	1.28	1.59	52.27	34.31
Niger	0.60	0.56	- 2.16	- 2.62	1.89	2.25	172.73	41.01	5.60	4.91	- 35.10	- 5.27
Soybean	-	0.07	10.18	330.00	-	0.01	3.03	10.00	-	0.02	2.98	40.00
Castor	0.04	0.01	- 3.70	- 66.66	0.01	0.01	-	-	-	-	-	-
Other oilseed	-	0.02	3.08	1000.00	-	0.01	3.03	10.00	-	-	-	-
Total oilseeds	8.05	7.04	100.00	- 9.02	5.47	5.01	100.00	8.19	12.82	12.65	100.00	6.56

Thus it is concluded that in Chhattisgarh Plains the pulse crops having some potential were teora and gram and the oilseed with future were soybean and rape and mustard.

4.3 Bastar Plateau

Kulthi was the most important pulse crop which occupied 37.7 thousand hectares (4.33 per cent) of the gross cropped area. Urad was the second most important crop covering 10.2 thousand hectares (1.17 per cent).

Among oilseeds the highest area was occupied by niger with 19.6 thousand hectares (2.25 per cent). Next came rapeseed & mustard with an area of 16.5 thousand hectares (1.90 per cent). (Table 4.5)

4.3.1 Change in Cropping Pattern

In 1970-71 the gross cropped area was 737.00 thousand hectares. Thus, there was an increase of nearly 18 per cent in the gross cropped area during two reference years. A major contribution to this increase in area was made by cereals (99.77 per cent). The next group of crop was oilseeds which contributed to the extent of 2.48 per cent. These was a negative contribution of pulses group i.e. 1.95 per cent of the total change.

Another aspect of the change in the cropping pattern is that the maximum increase (21.27 per cent) was noted among the cereals. The second largest increase was noted in the oilseed group i.e. 8.19 per cent (Table 4.6) Pulses had a decreased area between two periods. Thus, we conclude that there was 18.07 per cent increase in the gross cropped area and this increase was mainly under cereals. Pulses had a negative growth.

Table 4.6 Change in the cropping pattern, Bastar Plateau.

Crops	Area '000ha. 1970-71	Area '000ha. 1983-84	Change in area (+) (-)	% change	% change over 1970-71
Total cereals	624.9	757.8	132.9	99.77	21.27
Total Pulses	62.1	59.5	- 2.6	- 1.95	- 4.19
Total Foodgrains	687.0	817.3	130.3	97.82	18.97
Total Oilseeds	40.3	43.6	3.3	2.48	8.19
Total Cropped area	737.0	870.2	133.2	100.00	18.07

4.3.2 Change in the area under pulses

The area under the pulse crops decreased. Gram, moong and moth and teora were the pulse crops that showed an increase in the area from base year to current year. Teora and Gram showed a significant increase i.e. 37.50 per cent & 9.09 per cent respectively.

Thus, we can say that teora and gram were the main pulse crops showing significant increase.

4.3.3 Change in the area under oilseeds

Among the oilseeds, the highest increase in area was in case of niger. The area increase in this crop was 5.7 thousand hectares contributing 172.73 per cent to the total increase under oilseeds. Linseed and soybean were the other oilseed crops which showed small increase in the area over base year.

A change in the area under each oilseed from base year to the current year showed that the highest increase (41.01 per cent) was in niger crop followed by soybean (10 per cent) and linseed (6.82 per cent) (Table 4.5)

Bastar is a tribal district and as high as 87 per cent area was occupied by cereals and millets. Pulses occupied 6.84 per cent and oilseed 5.01 per cent. Among pulses kulthi was important and among oilseeds niger was important. Among pulses, however, only teora and gram had an increased area between two periods.

4.4 Northern Hill Region of Chhattisgarh

This region comprises Surguja, Mandala & Shahdol districts.

Among pulses urad was the most important and occupied 2.60 per cent of the gross cropped area followed by gram (2.37) and kulthi (1.92).

Among oilseeds niger was important with 4.91 per cent of the gross cropped area. Next came rapeseed & mustard with 4.27 per cent. (Table 4.5)

4.4.1 Change in cropping pattern

There was an increase of about 8 per cent in the gross cropped area during the two reference years. This increase was observed in all the sub-groups of crops except pulses. The major contribution to the increase in area was made by cereals. It was 108.46 per cent. The next group of crops was oilseeds which contributed to the extent of 10.49 per cent. The area of pulses decreased by 5.64 per cent.

Another aspects of the change in the cropping pattern is that the maximum increase (11.80 per cent) was among the cereals. The second largest increase was noted in the group of oilseed crops (6.56 per cent). On the other hand there was a decrease in the area (3.99 per cent) of pulses. (Table 4.7) Only vegetables & spices recorded larger area in the current year over the base year.

Table 4.7 Change in the cropping pattern, Northern Hill Region of Chhattisgarh

Crops	Area '000ha. 1970-71	Area '000ha. 1983-84	Change in area (+) (-)	% Change	% change over the base period
Total Cereals	1173.4	1311.9	138.5	108.46	11.80
Total pulses	180.5	173.3	- 7.2	- 5.64	- 3.99
Total Foodgrains	1353.9	1485.2	131.3	102.82	9.70
Total Oilseeds	204.3	217.7	13.4	10.49	6.56
Total cropped area	1593.0	1720.7	127.7	100.0	8.02

4.4.2 Change in the area under pulses

The area under pulses was 180.5 thousand hectares in 1970-71 and 173.3 thousand hectares in 1983-84. Thus there was decrease of 7.2 a/ thousand hectares. Tur, Urad & gram showed an increase in the area i.e. 88.89, 73.61 and 2.78 per cent respectively. However, a change in the area under each from base year to the current year showed highest increase (36.99 per cent) in case of tur followed by urad (13.45 per cent).

Thus, we can say that tur & urad were the main pulse crops showing significant increase in area in the cropping pattern.

4.4.3 Change in the area under oilseeds

There was an increase in the area of all the oilseeds except sesamum and niger. There was a net increase of 13.39 thousand hectares in two reference years. The highest increase in the area was 118 per cent in case of rapeseed mustard followed by linseed (52.27 per cent), groundnut (14.18 per cent) and

soybean (2.98 per cent). A change in the area under each from base year to the current year showed a different picture. In this case the highest increase (55.88 per cent) was is case of groundnut followed by soybean (40 per cent), linseed (34.31 per cent) and rapeseed mustard (27.43 per cent).

Thus in this subregion tur and urad were important pulse crops and groundnut, soybean, linseed and rapeseed and mustard were important oilseeds.

4.5 Kymore Plateau & Satpura Hills

This agro-climatic region comprises six districts of Jabalpur, Seoni, Panna, Rewa, Sidhi,and Satna.

Among pulses, gram was most important and covered 9.85 per cent of the gross cropped area. The next important pulse crops in the cropping pattern were tur, masoor (lentil), Urad and peas covered an area of 2.85, 1.92, 1.32 and 1.02 per cent respectively.

In the case of oilseeds, linseed was most important & occupied an area of 115.9 thousand hectares (4.53 per cent) of the gross cropped area. The other important oilseeds were sesamum and niger and covered 2.13 and 1.01 per cent of the gross cropped area. (Table 4.8)

4.5.1 Change in the cropping pattern

In 1970-71, the gross cropped area was 2,380 thousand hectares. Thus, there was an increase of 7.57 per cent in the gross cropped area during the two reference years. The maximum increase(14.92 per cent) was noted in the cereals. The percentage increase over the base year was negative in case of pulses and oilseeds i.e. 6.16 and 11.00 per cent respectively.(Table 4.9)

Table 4.8 Changes in area under pulses and oilseeds in sub-region 4,5, & 6 of Madhya Pradesh

Zones →	Kymore Plateau & Satpura Hills				Vindhya Plateau				Central Narmada Valley			
	Region-4				Region-5				Region-6			
↓ Crops	% to GCA 1970-71	% to GCA 1983-84	% of changed area under sub-group	% of change over area in the base year	% to GCA 1970-71	% to GCA 1983-84	% of changed area under sub-group	% of change over area in the base year	% to GCA 1970-71	% to GCA 1983-84	% of changed area under sub-group	% of charge over area in the base year
Pulses												
Gram	12.11	9.85	-117.65	-12.49	11.14	16.21	66.87	58.38	14.20	18.71	122.87	49.17
Tur	3.03	2.85	2.61	1.11	1.53	2.12	8.01	50.89	4.69	5.47	26.52	32.15
Urad	0.92	1.32	38.89	138.21	0.35	0.43	1.30	36.84	1.70	1.23	- 5.35	-17.89
Moong-moth	0.21	0.34	11.76	70.59	0.90	0.73	-1.12	-12.06	1.51	1.38	0.97	3.67
Kulthi	0.01	0.01	-	-	-	-	-	-	-	-	-	-
Teora	1.20	0.88	-19.28	-20.70	1.54	1.31	-1.21	-7.65	5.81	2.76	-47.20	-46.19
Peas	0.61	1.02	37.97	80.00	0.54	1.46	10.76	192.50	2.05	3.66	36.98	102.70
Lentil (Masur)	2.76	1.92	-53.59	-25.00	4.53	5.53	15.38	33.00	3.43	1.29	-34.79	-57.66
Other pulses	0.03	0.02	-0.65	-25.00	-	-	-	-	-	-	-	-
Total Pulses	20.88	18.21	100.00	-6.16	20.53	27.79	100.00	47.36	33.39	34.50	100.00	17.02
Oilseeds												
Groundnut	0.21	0.16	-4.23	-21.57	0.65	0.63	0.21	1.40	0.04	0.04	-	-
Sesamum	3.02	2.13	-66.54	-24.09	1.34	1.18	-1.25	-4.07	5.67	5.17	1.48	3.17
Rapeseed -mustard	0.63	0.80	21.15	36.67	0.30	0.32	0.94	13.43	-	0.01	0.11	10.00
Linseed	5.99	4.53	-103.08	-10.78	2.90	2.62	-1.04	-1.56	3.14	3.03	2.40	9.25
Niger	1.17	1.01	- 7.69	-7.17	0.40	0.13	-5.73	-63.22	0.18	0.11	-0.45	-30.77
Soybean	-	0.48	47.69	1240.00	-	4.26	106.67	10230.00	-	10.33	96.57	8460.0
Castor	0.01	-	-	-	-	-	-0.10	-100.00	0.01	-	-0.11	-100.0
Other oilseeds	0.04	0.05	1.15	3 .33	-	0.01	0.30	30.00	-	-	-	-
Total oilseed	11.07	9.16	100.0	-1 .00	5.59	9.15	100.0	77.78	9.04	18.69	100.0	133.94

Table 4.9 Change in the cropping pattern, Kymore plateau and Satpura Hills

Crops	Area '000ha. 1970-71	Area '000ha. 1983-84	Change in area (+) (-)	% change	% change over the 1970-71
Total Cereals	1586.1	1822.7	236.60	131.30	14.92
Total Pulses	496.9	466.3	- 30.60	- 16.98	- 6.16
Total Foodgrain	2083.0	2289.0	206.00	114.32	9.89
Total Oilseeds	263.5	234.5	- 29.00	- 16.09	-11.00
Total cropped area	2380.0	2560.2	180.2	100.0	7.57

4.5.2 Change in the area under pulses

The area under pulses decreased from 496.9 thousand hectares to 466.3 thousand hectares during the two reference years. The highest percentage increase over the base year was (138.21 per cent) in case of urad followed by peas (80 per cent) and moong & moth (70.59 per cent).

4.5.3 Change in the area under oilseeds

The area under oilseeds decreased from 263.5 thousand hectares to 234.5 thousand hectares. Thus, the net decrease was 26.0 thousand hectares. Soybean registered an increase of 1,240 per cent. The only other crop with increased area during the reference period was rapeseed & mustard (36.67 per cent). All other oilseeds had a decreased area in the current year than the base year. It is concluded that in this sub region urad, peas and moong and moth have good prospects. Among oilseeds soybean has a very bright future. Rape and mustard also shows good chances of growth.

4.6 Vindhya Plateau

Vindhya plateau, has six districts, namely Sagar, Damoh, Bhopal, Sehore, Raisen and Vidisha.

Among pulses, the most important was gram and occupied 389.3 thousand hectares (16.21 per cent). The next important pulse crop was lentil and occupied 5.53 per cent of the gross cropped area. The other important pulse crops were tur, pea and teora having 2.12, 1.46, 1.31 per cent of the gross cropped area.

In the case of oilseeds, the prime place of importance was occupied by soybean with 4.26 percent of the gross cropped area. The next important crop was linseed with 2.62 per cent of the gross cropped area. (Table 4.8)

4.6.1 Change in the cropping pattern

In 1970-71, the gross cropped area of this region was 2207.0 thousand hectares. Thus, there was an increase of nearly 8.85 per cent in the total cropped area. A major contribution to the increase in area was made by pulses. It was 109.88 per cent. The next group of crops was oilseeds which contributed to the extent of 49.10 per cent. On the other hand, the contribution of cereals was negative (-32.36 per cent) (Table 4.10)

Table 4.10 Change in the cropping pattern, Vindhya Plateau

Crops	Area '000ha. 1970-71	Area '000ha. 1983-84	Change in area (+) (-)	% Change	%change over 1970-71
Total Cereals	1355.6	1292.4	- 63.2	- 32.36	- 4.66
Total Pulses	453.1	667.7	214.6	109.88	47.36
Total Foodgrains	1808.7	1960.1	151.4	77.52	8.37
Total Oilseeds	123.3	219.2	95.9	49.10	77.78
Total cropped area	2207.0	2402.3	195.3	100.00	8.85

Another aspects of the change in cropping pattern was that the maximum increase (77.78 per cent) was noted among the oilseeds. The second largest increase was noted in the group of pulses (47.36 per cent). On the other hand, a peculiar phenomenon was noted in the decrease in the area of cereal group of crops. This decrease was 4.66 per cent. Thus, we can conclude that there was only 8.85 per cent increase in the gross cropped area and this increase was only due to oilseeds and pulses, although cereals continued to dominate (53.80 per cent) the cropping pattern of this region.

4.6.2 Change in the area under pulses

The area under pulses increased from 453.1 thousand hectares to 667.7 thousand hectares during the two reference years. This increase was mainly due to an increase in the area under gram, lentil, peas and tur. The contribution of these crops to the total increase was 66.87, 15.38, 10.76 and 8.01 per cent respectively. A change in the area under each from base year to the current year showed that the highest increase (192.50 per cent) was in the case of pea. Gram (58.38 per cent), tur (50.89 per cent), urad (36.84 per cent) and lentil (33.0 per cent) also showed a significant increase. Thus we can say that the gram, lentil, peas and tur were the main pulse crops showing significant area difference in the cropping pattern. While gram and lentil contributed higher percentage to total increase, pea registered the highest percentage increase between two periods.

4.6.3 Change in the area under oilseeds

In the case of oilseeds, soybean was the main crop which registered an increase of 106.67 per cent. The other oilseeds have not performed well. The area under pulses particularly

gram, tur, lentil, pea and urad can increase in future. Among oilseed, only soybean holds good chances.

4.7 Central Narmada Valley

This sub region has only two districts, namely, Narsinghpur and Hoshangabad.

Among pulses, gram was most important and occupied 18.71 per cent of the gross cropped area. Tur, peas and teora, although far less important than gram, occupied second, third and fourth positions covering 5.47, 3.66 and 2.76 per cent respectively.

Among oilseeds, the largest area was occupied by soybean with an area of 84.6 thousand hectares (10.33 per cent). The next important was sesamum followed by linseed. These occupied 5.17 and 3.03 per cent respectively of the gross cropped area.

4.7.1 Change in the cropping pattern

There was an increase of 13.24 per cent in the gross cropped area. The important contribution to the increase in area was made by oilseeds. It was 91.54 per cent. The next group of crop was pulses which contributed to the extent of 42.95 per cent. On the other hand, the area of the cereals decreased by 35.53 per cent. The maximum increase (133.94 per cent) was noted among the oilseeds. The second group of crops was pulses in which 17.02 per cent increase was noted. A peculiar phenomenon was noted in the decrease in the area of cereals. This decrease was 9.85 per cent. (Table 4.11)

Thus, we conclude that there was only 13.24 per cent increase in the gross cropped area and this was mainly due to oilseeds and pulses, although cereals continued to dominate the cropping pattern of this region.

Table 4.11 Change in the Cropping Pattern, Central Narmada Valley

Crops	Area '000ha. 1970-71	Area '000ha. 1983-84	Change in area (+) (-)	% Change	% change over 1970-71
Total Cereals	345.2	311.2	-34.0	- 35.53	- 9.85
Total Pulses	241.4	282.5	41.1	42.95	17.02
Total Foodgrains	586.6	593.7	7.1	7.42	1.21
Total Oilseeds	65.4	153.0	87.6	91.54	133.94
Total Cropped area	723.0	818.7	95.7	100.0	13.24

4.7.2 Change in the area under pulses

The net increase was 41.1 thousand hectares. This increase was mainly due to an increase in the area under gram, pea and tur. The contribution of these crops to the total increase was 122.87, 36.98 and 26.52 per cent respectively. The increase between two period indicated that the highest increase (102.70 per cent) was in pea, Gram (49.17 per cent) and tur (32.15 per cent also showed a significant increase.

Thus, we see that gram, pea and tur were the main pulse crops showing significant area difference in the cropping pattern.

4.7.3 Change in the area under oilseeds

In the oilseed group, soybean was the main crop which registered an increase of 96.57 per cent (Table 4.8). Other oilseeds had either a very small increase or a decreased area. It may be mentioned that Narsinghpur district is famous for the production of pulses meinly gram and tur. Hoshangabad district, on the other hand has an increasing area under soybean. With increasing amount of irrigation this region has immense potential for pulses and soybean.

4.8 Gird Region

This agro-climatic region has five northern districts, namely, Gwalior, Shivpuri, Guna, Morena and Bhind.

The most important pulse was gram followed by tur, moong & moth and lentil. The area under these crops was 14.33, 2.25, 2.15 and 2.09 per cent respectively.

Among oilseeds, the most important was rapeseed & mustard. The area occupied by this crop was 7.73 per cent of the gross cropped area. Next came linseed (1.76 per cent). Groundnut and sesamum shared about an equal per cent of the gross cropped area (1.02 and 1.18 respectively).

4.8.1 Change in the cropping pattern

The gross cropped area increased by 8.88 per cent during the two periods. A major contribution to the inc rease in area was of cereals. It was 49.19 per cent. The next higher contribution was of oilseeds (39.93 per cent). The contribution of pulses was negative. The maximum increase (28.61 per cent) was noted among the oilseeds. The next largest increase was noted in the group of cereals (8.00 per cent). On the other hand, there was a decrease in the area of pulses by 6.83 per cent.(Table 4.12)

Thus, we conclude that there was only 8.88 per cent increase in the gross cropped area and this was mainly due to oilseeds and cereals. Cereals continued to dominate (about 54 per cent) the cropping pattern of the region.

Table 4.12 Change in the Cropping Pattern, Gird Region

Crops	Area '000ha 1970-71	Area '000ha 1983-84	Change in area (+) (-)	% change	% change over 1970-71
Total cereals	1061.9	1146.9	85.0	49.19	8.00
Total pulses	502.2	467.9	- 34.3	-19.85	- 6.83
Total Foodgrains	1564.1	1614.8	50.7	29.34	3.24
Total oilseeds	241.2	310.2	69.0	39.93	28.61
Total cropped area	1946.0	2118.8	172.8	100.0	8.88

4.8.2 Change in the area under pulses

The net decrease was 34.3 thousand hectares. This decrease was mainly due to the decrease in the area of gram, tur, and moong & moth and to a small extent to teora and kulthi. Only three crops (lentil, urad & peas) showed an increased area in the current year than the base year. The highest increase was in case of lentil (119.31 per cent) followed by urad (79.09 per cent) and pea (65.79 per cent). However, the area under these crops was most insignificant.

4.8.3 Change in the area under oilseeds

The increase in oilseeds was mainly due to rapeseed & mustard, groundnut and soybean. The contribution of these crops to the total increase was 112.17, 20.86, 20.29 per cent respectively. (Table 4.13)

Thus in this region only lentil shows some prospects and among oilseeds rapeseed and mustard holds much hope.

Table 4.13 Changes in area under pulses and oilseeds in sub-region 7 , 8 , & 9 of Madhya Pradesh

Zones →	Gird Region Region-7				Bundel-Khand Region Region-8				Satpura Region Region-9			
↓Crops	% to gross cropped area 1970-71	% to GCA 1983-84	% of Changed area under sub-groups	% of change over area in the year base	% to GCA 1970-71	% to GCA 1983-84	% of changed area under sub-group	% of change over area in the base year	% to GCA 1970-71	% to GCA 1983-84	% of changed area under sub-group	% of change over area in the base year
Pulses												
Gram	17.74	14.33	-120.99	- 12.02	13.47	13.78	37.10	15.08	8.21	5.54	-238.09	-26.01
Tur	3.45	2.25	- 57.14	- 29.17	1.64	1.75	5.89	19.67	5.95	5.90	59.52	8.98
Urad	0.56	0.93	25.36	79.09	2.89	4.49	39.56	75.23	4.35	5.85	229.76	47.30
Moong-moth	2.69	2.15	- 19.53	- 12.81	1.20	1.55	10.07	46.07	1.02	1.52	71.43	62.50
Kulthi	0.01	-	- 0.29	-100.0	-	-	-	-	0.15	0.28	17.86	107.14
Teora	0.06	0.03	- 1.75	- 50.0	0.05	-	-0.98	-100.0	0.45	0.25	- 19.05	-38.10
Peas	0.20	0.30	7.28	65.79	0.05	0.08	0.74	75.0	0.28	0.35	11.90	38.46
Lentil (Masur)	1.04	2.09	70.26	119.31	1.42	1.63	7.37	28.30	1.01	0.58	- 41.66	-36.84
Other pulses	0.06	-	- 3.20	- 91.67	0.05	0.06	0.75	25.00	0.15	0.20	8.33	50.0
Total Pulses	25.81	22.08	100.0	- 6.83	20.76	25.37	100.0	26.36	21.57	20.47	100.0	4.16
Oilseeds												
Groundnut	0.37	1.02	20.86	200.0	-	0.29	45.28	240.00	4.58	2.68	- 22.75	-35.90
Sesamum	2.98	1.18	- 47.68	-56.82	7.10	3.42	-456.60	-45.83	0.80	0.75	- 1.03	- 8.33
Rapeseed -mustard	4.44	7.73	112.17	89.58	0.42	0.91	84.90	145.16	0.01	0.03	0.30	200.00
Linseed	2.65	1.76	- 20.87	-27.85	1.65	1.58	16.98	7.32	0.35	0.40	1.18	24.24
Niger	0.61	0.32	- 7.39	-72.86	0.08	0.04	-3.77	-33.33	6.11	4.26	- 19.94	-23.56
Soybean	-	0.66	20.29	1400.0	-	0.61	96.23	510.00	-	9.36	141.88	9620.0
Castor	-	0.01	0.29	20.0	-	-	-	-	0.01	0.01	0.15	100.0
Other oilseeds	1.37	1.96	22.32	59.0	0.23	0.96	118.87	370.59	-	0.01	0.15	10.0
Total Oilseeds	12.39	14.64	100.0	28.61	9.48	7.81	100.0	-7.38	11.96	17.50	100.0	60.48

4.9 Bundelkhand Region

Bundelkhand region comprises three districts of Tikamgarh, Chhatarpur & Datia.

Among pulses, gram was the most important crop and occupied 13.78 per cent of the gross cropped area. The next significant crop was urad which occupied 4.49 per cent area. Tur, lentil and moong & moth shared about an equal per cent of gross cropped area (1.75, 1.63 and 1.55 per cent respectively).

In oilseeds, sesamum was important with 3.42 per cent of the gross cropped area. The other oilseeds was linseed which occupied about 1.58 per cent of the gross cropped area.

4.9.1 Change in the cropping pattern

There was an increase of nearly 12.47 per cent in the gross cropped area during the last 13 years. The major increase in the area was under pulses (43.91 per cent). The next crop group was cereals which contributed 36.57 per cent. Oilseeds had a decreased area. Another aspect of the change in the cropping pattern is that the maximum increase (26.36 per cent) was noted among the pulses. The second largest increase (7.58 per cent) was noted in the group of cereals. On the other hand, the change in the area of oilseeds was negative (-7.38 per cent) (Table 4.14). Thus we conclude that there was only 12.47 per cent increase in the gross cropped area and this was mainly due to pulses and cereals.

Table 4.14 Change in the cropping pattern, Bundelkhand Region

Crops	Area '000ha 1970-71	Area '000ha 1983-84	Change in area (+) (-)	% Change	% change over 1970-71
Total Cereals	447.3	481.2	33.9	36.57	7.58
Total Pulses	154.4	195.1	40.7	43.91	26.36
Total Foodgrains	601.7	676.3	74.6	80.47	12.40
Total Oilseeds	70.5	65.3	- 5.2	- 5.61	- 7.38
Total cropped area	743.2	835.90	92.70	100.0	12.47

4.9.2 Change in the area under pulses

This increase was mainly due to an increase in the area under urad & gram and to a small extent to moong & moth, lentil and tur. The contribution of these crops to the total increase was 39.56, 37.10, 10.07, 7.37 and 5.89 per cent respectively. However, a change in the area under each from base year (1970-71) to the current year (1983-84) showed that the highest percentage increase (75.23) was in the case of urad followed by pea (75.00), moong & moth (46.07), lentil (28.30), tur (19.67) and gram(15.08).

4.9.3 Change in the area under oilseeds

The decrease in area under oilseeds was mainly due to the decrease in the area under sesamum. The contribution of this crop to the total decrease was 456.60 per cent. On the other hand, all other oilseeds had an increased area in the current year than the base year. The largest increase was in the case of soybean followed by rapeseed mustard and groundnut. (Table 4.13)

Thus in this sub-region gram, urad and moong and moth hold good promise. Among oilseeds soybean, rapeseed and mustard and groundnut can further enlarge the areas.

4.10 Satpura plateau

Satpura plateau has only two district, namely, Chhindwara and Betul.

Among pulses, the most significant were tur, urad and gram. Soybean was the most important oilseed. The area occupied it was 9.36 per cent of the gross cropped area. Next came niger with 4.26 per cent. The third, position was occupied by groundnut (2.68 per cent).

4.10.1 Change in the cropping pattern

There was an increase of 9.71 per cent in the total cropped area during the last 13 years i.e. from 1970-71 to 1983-84. A major contribution to the increase was made by oilseeds. It was 74.51 per cent. The next group of crop was that of pulses which contributed to the extent of 9.23 per cent. Cereals contributed 5.71 per cent.

The maximum increase (60.48 per cent) was noted among the oilseeds. The second largest increase was noted in case of pulses (4.16 per cent). On the other hand, the percentage increase in area was smallest (0.89 per cent) among cereals (Table 4.15). Thus we conclude that there was only 9.71 per cent increase in the gross cropped area and this increase was mainly due to oilseeds, although cereals continued to dominate (about 57.55 per cent) the cropping pattern of this region.

Table 4.15 Change in the Cropping Pattern, Satpura Plateau

Crops	Area in '000ha. 1970-71	Area in '000 ha. 1983-84	Change in area (+) (-)	% change	% change over 1970-71
Total Cereals	586.4	591.6	5.2	5.71	0.89
Total Pulses	202.1	210.5	8.4	9.23	4.16
Total Foodgrains	788.5	802.1	13.6	14.95	1.72
Total Oilseeds	112.1	179.9	67.8	74.51	60.48
Total cropped area	937.0	1028.0	91.0	100.0	9.71

4.10.2 Change in the area under pulses

The net increase in area under pulses was 8.4 thousand hectares. This increase was mainly due to an increase in the area under urad, moong & moth and tur and to a some extent to kulthi and peas. The contribution of these crops to the total increase was 229.76, 71.43, 59.52, 17.86 and 11.90 per cent respectively. The maximum increase between two periods was noted in the case of kulthi (62.50 per cent), Moong & moth (62.50 per cent), urad (47.30 per cent) and peas (38.46 per cent) also showed a significant increase. Thus, we see that urad, moong & moth, and tur were the main pulse crops. There was a decrease in the area of gram, masoor & teora.

4.10.3 Change in the area under oilseeds

In the case of oilseeds, soybean was the main crop. The area of soybean increased from just insignificant acreage in 1970-71 to 96.2 thousand hectares in 1983-84 indicating an increase of 9620 per cent. The other crops with increased area during the reference periods were rape & mustard, castor and linseed. The area increased in these crops was 200, 100 and 24.24 per cent respectively. (Table 4.13)

4.11 Malwa Plateau

This is the biggest agro-climatic region of the state and comprises eight districts namely Indore, Dhar, Ujjain, Ratlam, Mandsaur, Dewas, Shajapur and Rajgarh.

Among pulses, gram was the most significant crop and occupied 14.37 per cent of the gross cropped area. The next important pulse crop was urad (6.13 per cent) followed by tur (2.48 per cent) and moong & moth (1.53 per cent).

Table 4.16 Change in area under pulses and oilseeds in sub region 10, 11 & 12 of Madhya Pradesh

Zones →	Malwa Plateau Region-10				Nimar Plateau Region-11				Jhabua Hills Region-12			
↓ Crops	% to gross cropped area 1970-71	% to GCA 1983-84	% of changed area under sub-groups	% of change over area in the base year	% to GCA 1970-71	% to GCA 1983-84	% of changed area under sub-groups	% of change over area in the base year	% to GCA 1970-71	% to GCA 1983-84	% of changed area under sub-groups	% of change over area in the base year
Pulses												
Gram	8.12	14.37	72.66	113.47	1.16	1.82	63.70	67.72	6.71	9.23	23.96	54.29
Tur	3.02	2.48	- 0.24	- 0.99	3.23	3.24	18.52	7.04	1.92	1.80	0.72	5.71
Urad	4.01	6.13	26.75	84.61	8.09	8.06	39.26	5.95	8.63	15.01	54.06	95.24
Moong-moth	1.81	1.53	0.28	1.97	2.83	2.90	19.26	8.39	0.49	0.54	0.72	0.22
Kulthi	0.38	0.22	- 0.82	- 27.78	3.02	2.40	- 38.52	- 15.66	5.92	7.96	19.82	50.93
Teora	0.17	0.18	0.38	28.07	0.01	0.01	--	--	--	--	--	--
Peas	0.09	0.14	0.59	80.65	0.05	0.04	--	--	0.11	0.19	0.72	100.0
Lentil (masur)	0.15	0.14	0.07	5.77	0.17	0.20	2.96	21.05	--	--	--	--
Other pulses	0.17	.18	0.33	24.56	0.43	0.34	- 5.18	- 14.89	0.52	0.46	--	--
Total Pulses	17.92	25.37	100.0	70.74	18.99	19.01	100.0	6.47	24.30	35.19	100.0	62.57
Oilseeds												
Groundnut	7.36	3.09	- 58.86	- 49.47	8.26	5.90	- 161.77	-24.18	1.02	4.08	-108.54	- 34.76
Sesamum	0.42	0.30	- 1.06	- 15.49	0.50	0.44	- 2.94	- 7.14	0.66	0.12	- 23.17	- 79.17
Rapeseed mustard	--	0.06	1.06	2200.0	-	-	--	--	--	--	--	--
Linseed	1.39	1.56	8.04	35.84	0.11	0.14	2.94	30.77	--	--	--	--
Niger	0.02	--	- 0.19	- 66.67	-	-	--	--	--	--	--	--
Soybean	--	7.00	136.44	28,340.00	-	0.70	60.29	820.00	--	0.88	43.90	360.0
Castor	0.02	.01	- 0.09	- 28.57	-	0.01	0.74	10.0	0.84	0.51	- 12.19	- 32.26
Other oilseeds	--	0.76	14.64	10133.33	-	0.01	0.74	10.0	--	--	--	--
Total oilseeds	9.22	12.78	100.0	67.11	8.87	7.20	100.0	-13.89	8.52	5.59	100.0	- 26.37

In the case of oilseeds, soybean was most important crop (7 per cent of the gross cropped area). Next came groundnut with 3.09 per cent followed by linseed (1.56 per cent).

4.11.1 Change in the cropping pattern

There was an increase of nearly 20.57 per cent in the gross cropped area between the two reference periods. A major contribution was made by pulses. It was 61.61 per cent. The next group of crops was oilseeds which contributed to the extent of 30.08 per cent. Cereals and millets contributed 20.59 per cent. The maximum increase from base year (70.74 per cent) was noted in the pulses group. The second largest increase was noted in the group of oilseeds i.e.67.11 per cent. The Smallest percentage increase (8.66 per cent) was among the cereals and millets (Table 4.17). Thus, we conclude that the increase in the gross cropped area (20.57 per cent) was mainly due to pulses & oilseeds, although cereals continued to dominate the cropping pattern of the region.

Table 4.17 Change in the Cropping Pattern, Malwa Plateau

Crops	Area in '000ha. 1970-71	Area in '000 ha. 1983-84	Change in area (+) (-)	% change	% change over 1970-71
Total Cereals	1642.7	1784.9	142.2	20.59	8.66
Total Pulses	601.5	1027.0	425.5	61.61	70.74
Total Foodgrains	2244.2	2811.9	567.7	82.20	25.30
Total Oilseeds	309.5	517.2	207.7	30.08	67.11
Total cropped area	3357.0	4047.6	690.6	100.00	20.57

4.11.2 Change in the area under pulses

The net increase in area under pulses was 425.5 thousand hectares. This increase was mainly due to an increase in the area under gram and urad. The contribution of these crops to the total increase was 72.66 and 26.75 per cent respectively.

The highest increase from base year (113.47 per cent) was in the case of gram. Urad (84.61 per cent) and peas (80.65 per cent) also showed a significant increase.

4.11.3 Change in the area under oilseeds

The increase in oilseeds was mainly due to an increase in the area under soybean and to some extent in linseed. From an insignificant acreage in 1970-71, the area under soybean increased to as high as 283.4 thousand hectares in 1983-84 indicating an increase of 28,340 per cent. The other crops with increased area during the reference period were linseed and rape and mustard contributing 8.04 and 1.06 per cent to the total increase under oilseeds. In terms of percentage increase over the base period, this came to 35.84 and 2200 respectively (Table 4.16).

It is evident that this is a very important region in respect of both pulses and oilseeds. While gram, urad and pea were important and popular pulse crops soybean linseed and rape and mustard were adopted on increasing acreage.

4.12 Nimar Plateau

Nimar plateau has only two districts, namely, Khargone, and Khandwa.

It may be mentioned that this is the cotton region.

In the case of pulses, urad occupied maximum area (8.06 per cent) of the gross cropped area.- The other important pulses were tur, moong & moth, kulthi & gram and occupied an area of 3.28, 2.9, 2.4 and 1.82 per cent respectively.

In oilseeds group, the important place was occupied by groundnut with 5.9 per cent of the gross cropped area under it.

4.12.1 Change in the cropping pattern

There was an increase of nearly 6.35 per cent in the gross cropped area during the last 13 years. This increase was mainly due to pulses. It was 19.31 per cent. Cereals and oilseeds had a decreased area in the current year than the base year. (Table 4.18) Other crops like sugarcane, cotton, sunhemp, mesta, fruits, vegetables and spices recorded larger area in the current year as compared to the base year.

Thus, we can conclude that there was only 6.35 per cent increase in the gross cropped area and this increase was mainly due to pulses, although cereals continued to dominate (43.38 percent) the cropping pattern of the region.

Table 4.18 Change in the Cropping Pattern, Nimar Plateau

Crops	Area in '000 ha. 1970-71	Area in '000 ha. 1983-84	Change in area (+) (-)	% change	% change over 1970-71
Total Cereals	517.3	507.8	- 9.5	-13.59	- 1.84
Total Pulses	208.7	222.2	13.5	19.31	6.47
Total Foodgrains	726.0	730.0	4.0	5.72	0.55
Total Oilseeds	97.9	84.3	- 13.6	-19.46	-13.89
Total cropped area	1101.00	1170.9	69.9	100.00	6.35

4.12.2 Change in the area under pulses

The increase in area was mainly due to an increase in the area of gram, urad, moong and moth and tur. The contribution of these crops to the total increase was 63.70, 39.26, 19.26 and 18.52 per cent respectively. The maximum increase between two periods (67.72 per cent) was in gram. Lentil (21.05 per cent), moong and moth (8.39 per cent), tur (7.04 per cent) and urad (5.95 per cent) also showed a significant increase.

Thus, we can say that gram, lentil, moong and moth and tur were the main pulses showing significant area increase in the cropping pattern. Gram and urad contributed higher percentage to total increase. Gram registered the highest percentage increase in the area.

4.12.3 Change in the area under oilseeds

The decrease in area between two periods was mainly due to groundnut and Sesamum. Only linseed had an increased area in the current year than the base year. The area under soybean increased from an insignificant acreage to 8.2 th.ha. during the two reference periods indicating an increase of 820 per cent. (Table 4.16)

It can be concluded that gram, urad, moong and moth and arhar have good prospects in the region. Among oilseeds, soybean, as in other regions, shows chances of development in future.

4.13 Jhabua Hills

This region has only one district, i.e. Jhabua. The maximum area was under cereals and occupied 50.76 per cent. The second most important crop group was pulses and occupied an area of 35.19 per cent. The third group of crops was oilseeds (5.59 per cent).

Among pulses, the most important was urad and occupied 15.01 per cent of the gross cropped area. Gram and Kulthi were the next

important pulse crops and occupied 9.23 and 7.96 per cent of the gross cropped area respectively.

Among oilseeds, the most important crop was groundnut. The area occupied was (4.08) per cent.

4.13.1 Change in the cropping pattern

There was an increase of nearly 12.27 per cent in the total cropped area during the last 13 years. A major contribution to the increase in area was made by pulses. It was 123.88 per cent. The next group of crop was cereals which contributed to the extent of 14.51 per cent. The contribution of oilseeds was negative (18.30 per cent). The maximum increase (62.57 per cent) was noted among the pulses. The second largest increase was noted in the group of pulses (3.23 per cent). (Table 4.19)

Thus, we conclude that there was only 12.27 per cent increase in the gross cropped area and this was mainly under foodgrains.

Table 4.19 Change in cropping pattern, Jhabua Hills

Crops	Area in '000 ha. 1970-71	Area in '000 ha. 1983-84	Change in area (+) (-)	% change	% change over 1970-71
Total Cereals	201.5	208.0	6.5	14.51	3.23
Total pulses	88.7	144.2	55.5	123.88	62.57
Total Foodgrains	290.2	352.2	62.0	138.39	21.36
Total Oilseeds	31.1	22.9	- 8.2	- 18.30	-26.37
Total cropped area	365.0	409.8	44.8	100.00	12.27

4.13.2 Change in area under pulses

The increase in area under pulses was mainly due to urad which contributed to the extent of 54.06 per cent. Gram contributed 23.96 per cent and kulthi, 19.82 per cent. The percentage increase from base year was also higher (95.24) in urad. It was 54.29 per cent in gram and 50.93 per cent in kulthi.

4.13.3 Change in area under oilseeds

Among oilseeds only soybean has made progress. All other oilseeds had a decreased area in the second period.

Thus it can be concluded that in this tribal district urad, gram and kulthi were the important pulses whereas soybean was the only important oilseed.

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CHAPTER-V

POSSIBILITIES OF CHANGING CROPPING PATTERN IN FAVOURROF PULSES AND OILSEEDS

5.1 Madhya Pradesh

Important pulses (those occupying more than 1 per cent of the gross cropped area) of the state are gram, urad, teora, tur, lentil and moong and moth.

Of these gram had both increased area and increased percentage of cropped area between two periods. Another crop with higher area and percentage was urad. Tur, teora and lentil had increased area but decreased percentage of gross cropped area. Moong and moth had a decreased, rather stablised area and slightly decreased percentage.

Thus between the two reference periods, only gram and urad indicated a positive increase in popularity. While urad could have replaced jowar, or bajra or minor crops like kodo-kutki, gram either replaced linseed or was grown on land which had been fallow in the past and which now had irrigation facilities.

It is expected that gram would be grown on an area of 2,430 thousand hectares and urad on 898 thousand hectares.

Among oilseeds soybean is leading with 2.71 per cent of the gross cropped area. Linseed is also equally important crop (2.58 per cent). Groundnut (1.37 per cent), rapeseed and mustard (1.37 per cent) and sesamum (1.14 per cent) were other oilseeds.

Soybean had increased area and increased percentage of the gross cropped area between two periods. Actually there was an insignificant area under it in the first period. Rapeseed

and mustard was another crop with increased area and increased percentage of the gross cropped area. On the other hand linseed, groundnut and sesamum had decreased area and decreased percentage between the two periods.

Thus, it is evident that only soybean and rapeseed and mustard have possibilities of improving their performance in future. While soybean replaced cereals like jowar and bajra and in some cases groundnut, rapeseed and mustard replaced linseed and took over a rabi area which was earlier kept fallow for want to irrigation.

It is estimated that soybean area is likely to be 15 lakh hectares against our estimate of 9.43 lakh hectares. Rapeseed and mustard area to be 387 thousand hectares by 1990.(Table 5.1)

Table 5.1 Past and projected area under pulses and oilseeds,M.P.

(Area in '000 ha.)

Crop	1970	1983	1990 (Projected)
Pulses			
Gram	1,607	2,103	2,430.65
Tur	491	505	512.83
Urad	617	788	898.97
Peas	78	128	167.08
Teora	709	717	721.53
Total pulses	4,224	4,972	5,427.46
Oilseeds			
Rapeseed-Mustard	203	309	387.32
Soybean	-	613	943.00
Other oilseeds	29	83	146.17
Total oilseeds	1,918	2,374	2,662.15

In the next paragraphs the performance of pulses and oilseeds in the past and estimated area under these in different subregions are examined.

5.2 Chhattisgarh Plains including Balaghat District

Teora was the most important pulse of the region occupying 13.47 per cent of the cropped area. Other important pulses were urad (3.39 per cent) and gram (3.19 per cent). However, only teora and gram had increased area and increased percentage contribution to gross cropped area. Urad had a decreased area and also decreased contribution.

Teora is a cover crop of paddy and is sown in the standing paddy crop. However, it is mentioned that the government discourages its cultivation as its consumption is highly injurious to health. Gram is grown after kharif fallow. It is estimated that teora area would further increase to 646 thousand hectares and that of gram to 186 thousand hectares by 1990. (Table 5.2)

It is also mentioned that neither teora nor gram has replaced any other crop.

Among oilseeds linseed and soybean are important. Linseed had decreased area and decreased percentage contribution to gross cropped area between two periods. Soybean, on the other hand had a very insignificant area. Thus oilseeds are not important in the cropping pattern of this region nor are expected to perform better in future.

Table 5.2 Past and projected area under pulses and oilseeds in sub region 1, 2 and 3, M.P.

(Area in '000 ha.)

Sub region	Crops	1970	1983	1990 (projected)
1. Chhattisgarh plains including Balaghat District	Gram	96	148	186.90
	Teora	587	625	646.30
	Rapeseed mustard	15	17	18.19
	Soybean	-	3.3	5.0
2. Bastar Plateau	Gram	2.2	2.4	2.51
	Teora	1.6	2.2	2.61
	Niger	13.9	19.6	23.59
	Soybean	-	0.1	0.2
3. Northern Hill Region of Chhattisgarh.	Tur	17	24	28.90
	Urad	39	45	48.62
	Groundnut	3	5	6.58
	Rapeseed mustard	58	73	82.65
	Linseed	20	27	31.72
	Soybean	-	0.4	0.6

5.3 Bastar Plateau

Kulthi (4.33 per cent) and urad (1.17 per cent) were the only pulse crops worth mentioning. Even these two crops had a decreased area between two reference periods.

Among oilseeds niger (2.25 per cent) and rapeseed and mustard (1.90 per cent) were of some significance. Of these crops only niger had increased area and percentage contribution.

Thus in Bastar sub-region no pulse crop is important. Among oilseed only niger has some chances of growth. It is expected to be grown on an area of 23.59 thousand hectares by 1990-91. (Table 5.2) It may not replace any crop substantially.

5.4 Northern Hills Region of Chhattisgarh

Of the pulses grown in this sub region gram seems to have a stable area with a decreased percentage contribution to gross cropped area. Tur and urad had both increased area and percentage between the two reference periods. Among other pulses only kulthi had substantial area but had a decreased area and also decreased percentage between the two periods. Thus only gram, tur and urad can be considered important. Tur is expected to be grown on an area of 28.90 thousand hectares and urad on 48.52 thousand hectares. Gram will have a considerable coverage in 1990 although there would be a slight decline in area. Tur and urad are replacing the crops like jowar and minor millets like kodo and kutki and kulthi.

Among oilseeds groundnut, rapeseed and mustard and linseed had both increased area and percentage of the gross cropped area. Although niger commanded the largest area among oilseeds it had a slightly decreased area and percentage in the two periods.

In the forthcoming years rapeseed and mustard might have the highest area of about 83 thousand hectares. Linseed would also cover about32 thousand hectares. Groundnut is expected to be grown on 7 thousand hectares. (Table 5.2)

The present indications are not of replacement by these rabi crops but indicate new areas brought under cultivation.

5.5 Kymore Plateau and Satpura Hills

This is a very important sub region from both pulses and oilseeds points of view. Gram, tur, lentil and teora are important pulses. Of these gram and lentil had both decreased area and percentage contribution in the gross area. Tur seems to have a stabilised area around 70 thousand hectares. Urad and pea certainly indicate of larger coverage in the coming years. They are estimated to be grown on an area of 43 and 35 thousand hectares respectively. Urad is replacing minor millets like kodo-kutki. Among oilseeds, linseed, sesamum and niger are important. All these oilseeds had a declined area as wells as percentage area to gross cropped area. Only soybean progressed well. While there was an insignificant area under this crop in the first period it rose to 12 thousand hectares in the second period. It is expected that the crop will be cultivated on an area of about 19 thousand hectares. It is generally replacing minor millets and minor cereals. (Table 5.3)

5.6 Vindhya Plateau

Gram is the most important pulse of the sub region. It has not only increased area but also increased percentage of gross cropped area between two reference periods. Lentil, although had comparatively lower acreage between 100 to 135 thousand hectares, also had an increased area as well as percentage. Tur and pea also had increased area and percentage. Teora had a decreased areas.

The trend indicates that gram area will increase to nearly 500 thousand hectares and lentil to 155 thousand hectares. Tur and pea are expected to contribute about 60 thousand hectares each.

Sesamum and linseed, although important oilseeds of the region had a decline in acreage although they would still be important in the coming years. Soybean has done very well in this sub region and the acreage in 1990 may be around 157 thousand hectares from the present 102 thousand hectares. The data indicates that soybean is grown on areas previously alloted for jowar and other cereals and millets. (Table 5.3)

Table 5.3 Past and projected area under pulses and oilseeds in sub region 4,5 and 6, M.P.

(Area in '000 ha.)

Sub region	Crop	1970	1983	1990 (projected)
4. Kymore Plateau & Satpura Hills	Urad	22	34	42.99
	Moong-moth	5	9	12.35
	Pea	15	26	34.96
	Rapeseed-mustard	15	21	24.52
	Soybean	-	12	18.50
5. Vindhya Plateau	Gram	246	389	497.94
	Tur	34	51	63.45
	Urad	8	10.5	12.15
	Peas	12	35	62.28
	Lentil (Masoor)	100	133	155.10
	Soybean	-	102	157.00
6. Central Narmada Valley	Gram	103	153	189.32
	Tur	40	45	47.95
	Peas	15	30	43.58
	Sesamum	41	42.5	43.34
	Linseed	23	25	26.14
	Soybean	-	85	135.00

5.7 Central Narmada Valley

This region is the combination of two distinctly well known districts for pulses and soybean respectively. Narsinghpur is famous for pulses and the crops including gram, tur and pea have an increasing popularity. The area projected for these pulses come to about 190, 50 and 45 thousand hectares respectively by 1990.

Sesamum and linseed are poised to cover an area of 43 and 26 thousand hectares respectively by 1990. Soybean which has emerged as a new crop in Hoshangabad district is likely to occupy an area around 135 thousand hectares by 1990.(Table 5.3)

5.8 Gird Region

Among pulses gram, tur, moong-moth and lentil were important. However, the area and percentage increase was observed only in the case of lentil. In other pulse crops both area and percentage decreased between two periods.

The sub region is well known for rapeseed and mustard and this is the only oilseed which has spread to increasing area between two periods substantially. Actually the area has more than doubled under this crop. Sesamum and niger although important had a decreased area.

The projections for 1990 indicate that area under lentil will swell to 67 thousand hectares and that of rapeseed and mustard and groundnut to 232 thousand hectares and 41 thousand hectares respectively. (Table 5.4) Lentil has replaced other less economic pulses and the area of rapeseed and mustard has increased with the increasing area of wheat with which it is grown as a mixed crop. Groundnut has replaced the acreage under kharif cereals.

Table 5.4 Past and projected area under pulses and oilseeds in sub region 7, 8 and 9, M.P.

(Area in '000 ha.)

Sub region	Crops	1970	1983	1990 (projected)
7. Gird Region	Urad	11	20	27.60
	Peas	4	6	7.46
	Lentil(Masoor)	20	44	67.26
	Groundnut	7	22	40.76
	Rapeseed-mustard	86	164	232.15
	Soybean	-	14	21.50
8. Bundelkhand Region	Gram	100	115	123.98
	Tur	12	15	16.91
	Urad	21	37	50.18
	Moong-moth	9	13	15.85
	Masoor(Lentil)	11	14	15.94
	Groundnut	-	2.5	3.5
	Rapeseed-mustard	3	8	13.57
	Soybean	-	5	7.70
	Other Oilseeds	2	8	16.87
9. Satpura Plateau	Tur	56	61	63.87
	Urad	41	60	73.64
	Moong-moth	10	16	20.61
	Kulthi	1	3	5.42
	Soybean	-	96	148.00

5.9 Bundelkhand Region

This is mainly rabi crops growing area and therefore gram and lentil have increased area and percentage of gross area. Among kharif pulses tur, moong-moth and urad have progressed well.

By 1990 we expect that the area under gram would enlarge to 124 thousand hectares and that under lentil to 16 thousand hectares. The area expected to be sown under urad, tur and moong-moth is of the order of 50, 17 and 16 thousand hectares respectively.

The area under sesamum has slumped from 53 thousand hectares to 29 thousand hectares. The area under rapeseed and mustard, although much lower than sesamum, has doubled during and two reference years. Linseed area has only slightly increased. (Table 5.4)

At the current rate of expansion of area, rapeseed and mustard is likely to be grown on an area of 14 thousand hectares. Soybean, as in other sub-regions is becoming popular in this sub-region also and is expected to be grown on an area of 8 thousand hectares.

5.10 Satpura Plateau

This is predominantly a kharif area and area under tur, urad, moong-moth and kulthi has increased. Gram had a decreased area. If the present rate of growth in area continues the area under urad and tur is expected to be 74 and 64 thousand hectares respectively in the year 1990. Moong and moth would cover an area of about 21 thousand hectares.

Soybean is the only oilseed crop which has enlarged area during two reference periods. It is expected to further increase to 148 thousand hectares. Soybean area has increased whereas the area under cereals and groundnut has decreased evidently showing the manner of replacement. (Table 5.4)

5.11 Malwa Plateau

Malwa Plateau has a good potential for dairy farming and, therefore, fodder production is given due importance. The area under jowar and maize has increased. Of the kharif cereals the area under rice and bajra has decreased.

Among kharif pulses urad has increased area and among rabi, gram has increased area.

Among kharif oilseeds groundnut has decreased area but soybean has progressed tremendously. Linseed has also progressed well.

Among cash crops, sugarcane and cotton have decreased area whereas fodder has manifold increase in area. The possibilities of increasing area under gram to 875 thousand hectares by decreasing the area under wheat and increasing urad area to 345 thousand hectares by decreasing area under rice, bajra, cotton etc. do exist. (Table 5.5)

While soybean would substitute bajra, groundnut and cotton, linseed can take the acreage of barley and to some extent, wheat.

5.12. Nimar Plateau

Gram, lentil, moong and moth and tur are important pulses of the region. Gram is being increasingly grown on

area which was previously left fallow. This is particularly true with the areas brought under irrigation. The gram area is likely to be around 27 thousand hectares by 1990.

Soybean is gaining ground by either replacing groundnut or bajra. The area under this crop may increase to 13 thousand hectares. (Table 5.5)

Table 5.5 Past and projected area under pulses and oilseeds in sub region 10, 11 and 12, M.P.

(Area in '000 ha.)

Sub-region	Crops	1970	1983	1990 (projected)
10. Malwa Plateau	Gram	273	582	875.11
	Urad	134	248	345.26
	Teora	6	7.5	8.46
	Peas	3	6	8.72
	Rapeseed-mustard	0.1	2.0	2.91
	Linseed	47	63	73.77
	Soybean	-	283	435.40
11. Nimar Plateau	Gram	13	21	27.19
	Tur	35	38	39.71
	Urad	89	94	96.80
	Moong-moth	31	34	35.73
	Soybean	-	8	12.31
12. Jhabua Hills	Gram	25	38	47.60
	Urad	31	61	87.80
	Kulthi	22	33	41.06
	Peas	0.4	0.8	1.16
	Soybean	-	4.0	6.15

5.13 Jhabua Hills

In kharif the area under cotton, bajra and groundnut is decreasing. Urad and soybean taking their places. Gram area is also increasing. Although it is not replacing any important crop it is finding a place in rotation in the area which was otherwise left fallow.

While urad is likely to be grown on an area 89 thousand hectares, soybean area may increase to 6 thousand hectares. Gram may occupy about 48 thousand hectares by 1990-91. (Table 5.5)

5.14 Some Random Observations

To know the possibilites and constraints of pulses and oilseeds cultivation opinions of Deputy Directors of Agriculture of six districts were obtain i in a questionnaire cum schedule. In addition, discussion was held with the officials of the Directorate of Agriculture, Bhopal.

The six districts were Mandsaur, Ratlam, Morena, Hoshangabad, Jhabua and Rewa. (Table 5.6)

Table 5.6 Details of selected sub regions and districts

(Figures in brackets Percentage increase)

S.No.	Particulars	Selected sub region	Selected district
	Pulses		
1.	Highest percentage increase	Malwa Plateau (70.74)	Mandsaur, (146.4) Ratlam, (127.8)
2.	Lowest percentage increase	Gird Region (-6.83)	Morena (-48.2)
	Oilseeds		
1.	Highest percentage increase	Central Narmada Valley (133.94)	Hoshangabad (136.2)
2.	Lowest percentage increase	Jhabua Hills (-26.37)	Jhabua (-26.3)
		-	Rewa (-35.1)

See table 5.7, 5.8 and 5.9 also.

In the following pages the extent of cultivation of pulses and oilseeds, the possibilities of increasing the area and the constraints in each of the selected districts are described.

Table 5.7 [illegible]ion of Regions and districts

Regions	Pulses			Oilseeds		
	Percentage increase (+) or decrease (-) in pulse area over the base period	Districts showing highest percentage increase(+) or decrease(-) in the region		Percentage increase (+) or decrease (-) in oilseeds area over the base period	Districts showing highest percentage increase(+) or decrease(-) in the region.	
I. Chhatisgarh Plains including Balaghat	+ 2.24	Bilaspur Durg	+ 9.28 - 35.7	- 9.02	Durg	-58.2
II. Bastar Plateau	- 4.19	Bastar	- 4.18	+ 8.19	Bastar	+ 8.18
III. Northern Hill Region of Chhatisgarh	- 3.99	Sarguja Mandla	+ 9.3 -19.5	+ 6.56	Surguja Shahdol	+20.6 - 2.68
IV. Kymore Plateau and Satpura Hills	- 6.16	Sidhi Satna	+ 9.88 -19.9	-11.00	Seoni Rewa	+11.34 -35.09
V. Vindhya Plateau	+47.36	Damoh	+105.3	+77.78	Sehore Vidisha	+221.6 - 4.42
VI. Central Narmada Valley	+17.02	Narsinghpur	+25.19	+133.94 (Highest increase)	Hoshangabad	+136.2
VII. Gird Region	- 6.83 (Highest decrease)	Guna Morena	+37.9 -48.2	+28.61	Gwalior Guna	+57.14 - 6.6
VIII. Bundelkhand Region	+26.36	Tikamgarh	+41.3	- 7.38	Datia Chhatarpur	+ 2.34 -12.8
IX. Satpura Plateau	+ 4.16	Chhindwara Betul	+36.6 -22.2	+60.48	Betul	+110.0
X. Nimar Plateau	+ 6.47	Khandwa Khargone	+23.31 - 2.82	-13.89	Khargone	-14.7
XI. Malwa Plateau	+70.74 (Highest increase)	Mandsaur Ratlam	+146.4 +127.8	+67.11	Indore Mandsaur	+488.2 -30.8
XII Jhabua Hills	+62.57	Jhabua	+62.5	-26.37 (Highest decrease)	Jhabua	-26.3
Madhya Pradesh	+17.70		+23.79			

Table 5.8 Pattern of pulses cultivation in selected districts, Madhya Pradesh

Crops	Highest increase in area				Highest decrease in area	
	Mandsaur		Ratlam		Morena	
	1970-71	1983-84	1970-71	1983-84	1970-71	1983-84
Gram	31.6 (30.07)	137.5 (52.97)	31.2 (53.24)	66.7 (49.96)	83.7 (65.39)	40.1 (60.48)
Tur	10.3 (9.80)	7.0 (2.69)	4.0 (2.82)	4.3 (3.22)	26.6 (20.78)	16.8 (25.34)
Urad	53.6 (50.99)	108.5 (41.79)	19.1 (32.59)	56.0 (41.95)	0.9 (0.7)	0.9 (1.35)
Moong- Moth	8.6 (8.18)	3.4 (1.31)	3.8 (6.48)	3.2 (2.39)	16.0 (12.5)	7.2 (10.86)
Peas	0.1 (0.09)	0.1 (0.04)	0.1 (0.17)	1.2 (0.89)	0.2 (0.15)	0.1 (0.15)
Lentil	0.3 (0.28)	0.4 (0.15)	0.1 (0.17)	0.5 (0.37)	0.6 (0.47)	1.2 (1.81)
Other pulses	0.6 (0.57)	2.7 (1.04)	0.3 (0.51)	1.6 (1.19)	--	--
Total pulses	105.1 (100.0)	259.6 (100.0)	58.6 (100.0)	133.5 (100.0)	128.0 (100.0)	66.3 (100.0)

Note : Figures in paranthesis shows percentage to total

Table 5.9 Pattern of oilseed cultivation in selected district of Madhya Pradesh

Crops	Highest increase in area		Highest decrease in area			
	Hoshangabad		Jhabua		Rewa	
	1970-71	1983-84	1970-71	1983-84	1970-71	1983-84
Groundnut	0.2 (0.37)	0.2 (0.16)	25.6 (82.31)	16.7 (72.92)	-- (-)	-- (-)
Sesamum	31.7 (59.25)	31.0 (24.52)	2.4 (7.72)	0.5 (2.18)	4.0 (8.91)	1.4 (4.76)
Repeseed mustard	-- (-)	0.1 (0.08)	-- (-)	-- (-)	1.4 (3.12)	1.7 (5.78)
Linseed	21.5 (40.19)	23,5 (18.59)	-- (-)	-- (-)	39.5 (87.97)	25.1 (85.37)
Soybean	-- (-)	71.6 (56.65)	-- (-)	3.6 (15.72)	-- (-)	0.4 (1.36)
Castor	0.1 (0.19)	-- (-)	3.1 (9.97)	2.1 (9.18)	-- (-)	0.1 (0.35)
Others	-- (-)	-- (-)	-- (-)	-- (-)	-- (-)	0.7 (2.38)
Total	53.5 (100.0)	126.4 (100.0)	31.1 (100.0)	22.9 (100.0)	44.9 (100.0)	29.4 (100.0)

Note : Figures in paranthesis shows the percentage to total

5.14.1 Mandsaur District

In this district gram was the most important crop occupying 137.5 thousand hectares i.e. 52.97 per cent area of the total pulse area of the district in 1983-84. The next important pulse crop was urad having 108.5 thousand hectares i.e. 41.79 per cent of the total pulse area. Gram and urad registered a significant increase in area over the base year. On the other hand, tur did not maintain the increasing trend. (Table 5.8)

The reasons of increase in area under gram were: increased area under irrigation, guidance and input support in the form of seed, fertilizers, pesticides, plant protection equipments and subsidy under Intensive Pulse Development Programme. There are further possibilities of increasing gram area if farmers can be convinced of the importance of package of practices and need for substituting less economical crops.

The cultivation of gram will result in the substitution of less important cereals. The constraints in the increase in area are -

a. Less organised seed distribution system
b. Insufficient availability of fertilisers
c. Inadequate use of fertilisers and culture
d. Low cost benefit ratio for pulses as compared to other crops.

5.14.2 Ratlam District

In Ratlam district, except moong-moth all other pulse crops showed increase in area over the base period. The highest increase was observed in the case urad followed by gram. (Table 5.8)

The increase in pulse are was due to the introduction of short duration varieties of urad and moong. It made double cropping possible.

The area under gram increased because of the availability of soil moisture due to winter rains during the previous 2-3 years.

The increase in Kharif pulses area would result in reduction in jowar area.

The main constraint is the low cost benefit ratio. Untimely rains is the an other problem.

5.14.3 Morena District

In Morena district, all the pulse crops showed decreasing trend in area except urad and lentil. (Table 5.8)

The maximum decline in the area under pulses was observed in this district. The reasons were :

a) Susceptibility of pulses to insects and diseases like w lt.

b) The pulses and oilseeds, as in other areas, are grown on margina lands. With the extention of irrigated area due to Chambal Command and tubewells, pulse crops were substituted by paddy and other profitable cereals and cash crops.

c) Due to increasing demand of fodder for milch Cattle the area under pulses declined.

d. Low and erratic yield potential of pulses.

The area under pulses can be increased with the support of research and extension. These should include the use of wilt resistant varieties and use of insecticides.

Further, suitable crop rotation should be evolved to have double or multiple cropping. Mixed cropping in irrigated areas is recommended.

The likely pulse crops are : short duration arhar, summer moong, pea, late pea after toria, etc.

5.14.4 Hoshangabad District

In Hoshangabad district the increase in area of oilseeds was mainly due to significant increase in the area of soybean. In the case of other oilseeds the area was more or less same in both the periods (Table 5.9). It meant soybean did not replace other oilseeds. Either some new area came under soybean or it replaced the other kharif crops of less importance.

The popularity of soybean was due to

a) Increase in area under irrigation under Tawa Command.
b) Suitability of soybean in the lands earlier kept fallow in kharif.
c) Extension and adoption of improved technology.

There is further possibility of increasing area under linseed, sunflower and safflower.

The constraints of soybean cultivation are

a) Infestation by girdle beetle
b) Bud blight

For rabi oilseeds the competitive crop in irrigated areas is wheat.

5.14.5 Jhabua District

In Jhabua district groundnut and castor are the main oilseed crops. But all the oilseeds showed negative trend in area between two periods. Soybean is the emerging crop of this district(Table 5.9)

The reasons of decline in area under oilseeds are :

a) The district is predominantly tribal. Agriculturally the district is backward because of light soils and drought condition. The farmers are poor and can not afford to invest in costly seeds of oilseeds and other inputs.

b) Because of the moisture stress conditions during, Pod formation stage the returns from oilseeds are low.

c) In the case of sesamum there is a moisture stress at the time of flowering and pod formation.

d) In the case of soybean there is girdle beetle infestation.

e) There are no short duration varieties in oilseeds except soybean.

f) Kharif oilseeds are susceptible to red hairy caterpillar

g) Due to lack of irrigation facilities there is no scope for rabi oilseeds like mustard, linseed and safflower.

Oilseeds cultivation can be popularised if following measures are adopted.

a) Intercropping practices in heavy to medium soils and mixed cropping practices in light soils

b) Distribution of seed minikits of short duration high yielding varieties alongwith fertilisers and pesticides.

If new oilseed crops are introduced there would not be significant change in the cropping pattern as oilseeds are grown as mixed crops in this area.

It is proposed that in partially irrigated areas mustard should be intercropped with wheat and linseed with gram.

In rainfed conditions gram can be mixed with castor and sunflower. In the moisture stress conditions crops of low input technology like sunflower and sesamum should replace groundnut and soybean.

5.14.6 Rewa District

Linseed is the major oilseed crop of Rewa district followed by sesamum and rapeseed-mustard. Except rapeseed-mustard, other two oilseeds showed negative growth in area. Soybean and castor are some other important oilseeds of this district gaining area. (Table 5.9)

The reasons for the decline in area under oilseeds are :

a) Non availability of good quality improved seed of sesamum and linseed.

b) Uncertainty of winter rains affects the sowing and germination of oilseeds as these are grown under rainfed conditions.

c) Introduction of irrigation facilities in an area results in shift from oilseeds to cereals.

d) Fluctuating, uncertain and low prices of oilseeds make them uneconomic. This compels the farmers to shift to other crops.

The acreage under oilseeds can be enlarged by taking the following measures:

a) Timely supply of improved seed varieties of oilseeds suitable for early and late sowing & tolerant to drought conditions.

b) Area under upland paddy may be replaced by sesamum and linseed.

c) Area of semi-irrigated wheat may be replaced by linseed.

d) Through proper inter-cropping

e) Linseed area may be increased by introducing late sown varieties.

f) Announcement of support price well in advance before start of sowing season.

With the increase in the area under oilseeds area under cereals particularly upland paddy, dry and semi irrigated wheat and minor millets would decrease.

The cropping patterns would undergo changes as follows

Existing Cropping Pattern	Changed pattern
Fallow - Linseed	Soybean - Linseed (Late sowing)
Kodo+ Jowar - fallow	Soybean - Wheat + Linseed
Kodo+ Arhar - fallow	Soybean + Arhar
Paddy - Wheat	Paddy- Wheat + Mustard

If new oilseeds are introduced the changes in cropping pattern would be as shown below.

Existing cropping pattern		Changed cropping pattern
Teora	-	Safflower
Wheat + Teora	-	Wheat + Safflower
Kodo - Jowar	-	Sunflower - Jowar
Upland Paddy	-	Sunflower + Soybean

Til, sunflower, and soybean would substitute kodo and upland paddy. Similarly mustard and safflower would substitute teora.

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CHAPTER-VI

SUMMARY AND CONCLUSIONS

6.1 Introduction

The High Yielding Varieties Programme resulted in uneven distribution of benefits. Some high value food and commercial crops benefitted whereas, in pulses and oilseeds the impact of new technology was not substantial.

The area, production and yield of pulses increased only marginally at the national level. The per capita availability of pulses was 18.7kg.per year in 1971 and declined to 14.2kg.in 1985.

In the case of oilseeds there was a big gap between demand and supply.

The compound growth rates of area, production and yield of oilseeds are less than the foodgrains. In some states these are negative. This situation has been a cause of great concern to the policy makers.

Development programmes for oilseeds & pulses were given high priority in the seventh plan. A new Centrally Sponsored Programme was launched during the seventh plan to achieve the production target of 15 to 16 million tonnes of pulses. In order to give a push to the oilseeds production a National Oilseed Development Project (NODP) was launched. Efforts were made to achieve a target of 18 million tonnes of oilseed production by the terminal year of the Seventh Five Year Plan.

6.1.1 Objectives

The specific objectives of the study were -

1) To study the past and existing cropping pattern of the state (Madhya Pradesh) and its 12 agro-climatic regions.

2) To determine the changes in acreage of oilseeds and pulses in different agro-climatic regions and the state as a whole.

3) To find out the constraints in pulses and oilseeds production.

4) To suggest possible measures for achieving the desired cropping pattern in favour of pulses and oilseeds.

6.1.2 Methodology

The study is based on the data obtained from 'Agricultural Statistics' published by Directorate of Agriculture, Madhya Pradesh, Bhopal. For this study two reference years i.e. 1970-71 as base year and 1983-84 as current year, were taken. The study is based on 12 agro-climatic regions of Madhya Pradesh. Of the 12 agro-climatic regions, a region each was selected with the highest increase (Malwa Plateau) and highest decrease (Gird region) in area under pulses. Similarly for oilseeds a region each with highest increase (Central Narmada Valley) and highest decrease (Jhabua hills) in area was selected.

For pulses, in Malwa plateau two districts viz. Mandsaur and Ratlam were selected, whereas, in Gird region Morena district was selected.

In the case of oilseeds, Hoshangabad district was selected from Central Narmada Valley and Jhabua district was selected from Jhabua hills. Rewa,one of the most important districts showing highest decrease in oilseeds was also selected.

For finding out the reasons for shift in acreage of pulses and oilseeds in the six selected districts and to know the

constraints, a questionnaire/schedule was prepared. The Joint Directors and Deputy Directors of Agriculture of these selected district's were asked to give the possible reasons for changes in cropping pattern and the constraints and suggestions for achieving the desired cropping pattern in favour of pulses and oilseeds. In addition discussions were held with the officials in the State government and those in the JNKVV.

6.2 Agricultural characteristics of Madhya Pradesh

Madhya Pradesh is the biggest State in area and sixth in population among various states of the country.

6.2.1 Agriculture

Madhya Pradesh is an agricultural state as agriculture accounts for nearly 53 per cent of the state's income. The percentage of rural population in the state is 81.

6.2.2 Land Utilisation and size of holdings

The geographical area of the state was 442.11 lakh hectares. The area under forest was 31.68 per cent. The net sown area was 43.48 per cent of the geographical area.

The average size of operational holdings in the state was 3.4 hectares in 1980-81.

6.2.3 Soils and Fertility status

Seven major groups of soils are found in the state namely alluvial, deep black, medium black, shallow and light black, mixed red and black, mixed red and yellow and skeletal or gravelly. These are low to medium in available phosphorus and nitrogen, whereas medium to high in available potassium.

6.2.4 Agro-Climatic Zones

Madhya Pradesh has 12 agro-climatic regions namely,

(1) Chhattisgarh plains including Balaghat district.

(2) Bastar Plateau

(3) Northern hills region of Chhattisgarh

(4) Kymore Plateau and Satpura hills

(5) Vindhya Plateau

(6) Central Narmada Valley

(7) Gird region

(8) Bundelkhand region

(9) Satpura plateau

(10) Malwa plateau

(11) Nimar plateau

(12) Jhabua hills

6.2.5 Cropping Pattern

Foodgrains occupied dominating position in the cropping pattern. Cereals and pulses occupied 59.21 and 21.97 per cent of the gross cropped area. Oilseeds occupied 10.49 per cent area followed by fibre crops which shared only 2.52 per cent area.

6.2.6 Irrigation

Only 14.4 per cent of the net area sown and 12.6 per cent of the gross cropped area was irrigated in 1983-84. Districtwise proportion of irrigated area varied from less than two per cent to more than forty per cent.

Canals (43.79 per cent) and wells (41.14 per cent) were important sources of irrigation. Of the total irrigated area wheat alone shared 44.36 per cent and paddy 30.24 per cent. Gram was the third important irrigated crop. From the point of view

of extent of irrigation, sugarcane was the most important with 97.39 per cent area under irrigation. The low level of irrigation in case of pulses and oilseed group is one of the important factor which restricts the yield levels and application of improved technology including HYV seeds.

6.3 Pulses and oilseeds Development in Madhya Pradesh

6.3.1 Pulses Development

Madhya Pradesh shared the largest percentage (21.2) of area under pulses among all the states. The state contributed second largest percentage (22) of the total pulses production of the country.

The area under pulses in the state increased from 45.76 lakh hectares in 1980-81 to about 50 lakh hectares in 1983-84. In the case of production there was a steady increase from 20.10 lakh tonnes in 1980-81 to 27.02 lakh tonnes in 1983-84.

6.3.2 Centrally Sponsored Pulses Development Scheme

The amount sanctioned by state Government on centrally sponsored pulses development scheme in the year 1980-81 to 1984-85 was Rs.399.597 lakhs. Against this the expenditure was Rs.418.776 lakhs. The percentage of expenditure to amount sanctioned was 104.79.

6.3.3 Oilseeds Development

The area, production and yield of oilseeds in M.P. for the past 20 years did not indicate any trend. From acreage and production points of view soybean ranks first in the state.

The state contributed 10.8 per cent of the oilseed production of the country. The area under oilseeds was 2.7 million hectares.

6.3.4 Oilseed Development Programme in Madhya Pradesh

The Government of India sponsored the National Oilseeds Development Project to help the State Governments in their efforts to achieve the targetted production of nine oilseeds. The seventh plan envisaged to increase the production of these nine oilseeds to 170 lakh tonnes as against the targetted production of 130 lakh tonnes in the terminal year of the sixth plan.

6.3.5 Soybean production in Madhya Pradesh

Soybean is now well established in the cropping pattern of M.P. The area under soybean rose from 0.13 lakh hectares in 1973-74 to about 9 lakh hectares in 1984-85. This is about 76 per cent of the total soybean area of the country. Therefore, the state is called the soybean state.

Govt.of India sanctioned a soybean development programme for the state costing Rs.15.00 crores in 1980-81. In the year 1984-85 the soybean development programme was merged in the National Oilseed Development Project.

6.4 Changes in Cropping Patterns of the State & sub-regions

6.4.1 Cropping Pattern and Changes in Cropping Pattern of Madhya Pradesh

Gram was the most important pulse. It occupied 9.29 per cent of the gross cropped area followed by urad (3.48), teora(3.17), tur (2.23), lentil (1.27) and moong (1.02) per cent.

Soybean was most important among oilseeds with 2.71 per cent of the gross cropped area followed by linseed (2.58 per cent), groundnut (1.37 per cent), rapeseed- mustard (1.37 per cent) and sesamum (1.14 per cent).

There was an increase of about 10 per cent in the gross cropped area between two periods i.e. 1970-71 and 1983-84. The major increase in area (41.90 per cent) was in cereals followed by pulses (36.03 per cent) and oilseeds (22.00 per cent). However, the change in the area under each from base year to the current year showed a very different picture. The highest increase (23.79 per cent) was in the case of oilseeds followed by pulses (17.70 per cent) and cereals (6.94 per cent).

The increase in area in pulses was mainly due to gram, urad, pea and lentil. The highest increase was noted in the case of pea (64.10 per cent) followed by gram (30.83 per cent) and urad (27.61 per cent).

In the case of oilseeds only soybean and rapeseed mustard registered an increase in the area between two periods. All other oilseeds showed decreased area. The highest increase was noted in the case of soybean (61,360 per cent)

6.4.2 Cropping Pattern and Changes in Cropping pattern in Sub Regions

6.4.2.1 Chhattisgarh Plains including Balaghat

Out of the gross cropped area 68.50 per cent was under cereals & millets, 22.73 per cent was under pulses and 7.04 per cent under oilseeds.

In the case of pulses, teora was most important. It occupied 13.47 per cent of the gross cropped area. Urad and gram were other important pulses.

Linseed was the most important oilseed. Niger, groundnut and sesamum were some other oilseeds.

The contribution of cereals in increased gross cropped area was highest (107.84 per cent). The contribution of pulses was 12.76 per cent. The area of oilseeds decreased by 17.89 per cent.

The increase in area under pulses was mainly due to gram and teora.

6.4.2.2 Bastar Plateau

In 1983-84 the highest area (87.08 per cent) was under cereals & millets. Pulses and oilseeds occupied 6.84 and 5.01 per cent of the gross cropped area.

Among pulses, kulthi was the most important (4.33 per cent) followed by urad (1.17 per cent).

In the case of oilseeds, niger occupied 2.25 per cent followed by rapeseed and mustard (1.90 per cent). A major contribution to the increase in the gross cropped area was due to cereals (99.77 per cent) and oilseeds (2.48 per cent). Pulses contribution was negative.

Gram, moong-moth and teora were the crops that showed an increase in the area between the periods. The decrease in the area was mainly due to urad, pea, kulthi and tur.

Niger showed highest increase. Linseed and soybean were other oilseed crops that showed increase in the area.

6.4.2.3 Northern Hill Region of Chhattisgarh

Among pulses urad occupied 2.60 per cent of the gross cropped area. Other pulses were gram, kulthi, tur, lentil, peas, teora and moong-moth.

Niger was the most important oilseed and occupied 4.91 per cent of the gross cropped area followed by rapeseed-mustard (4.27 per cent), linseed (1.59 per cent) and sesamum (1.55 per cent).

In the case of pulses except tur, urad and gram, all other pulses showed decreased area. In the case of oilseeds, except sesamum and niger, all other oilseeds showed increased area. Rapeseed-mustard showed highest increase in area (118 per cent) followed by linseed, groundnut and soybean.

6.4.2.4 Kymore Plateau and Satpura Hills

Important pulses were gram, tur, lentil, urad and pea. Among oilseeds linseed occupied 4.53 per cent of the gross cropped area. Sesamum and niger were other important oilseeds.

The area of pulses and oilseeds decreased during the two reference years.

Except soybean and rapeseed-mustard, all other oilseeds had a decreased area in the current year over the base year.

6.4.2.5 Vindhya Plateau

Gram had the highest area among pulses. The other important pulses were lentil, tur, pea and teora having 5.53, 2.12, 1.46 and 1.31 per cent of the gross cropped area respectively.

Soybean was the prime oilseed with 4.26 per cent of the gross cropped area. Other important oilseeds were linseed, sesamum and groundnut.

Major contribution in the change in area was due to pulses followed by oilseeds.

The main crops responsible for the increase in area under pulses were gram, lentil, peas and tur.

Among oilseeds, soybean registered highest increase.

6.4.2.6 Central Narmada Valley

Gram was the major pulse crop and occupied 18.71 per cent of the gross cropped area followed by tur, pea and teora.

Soybean occupied largest area (10.33 per cent) among oilseeds. The other important oilseeds were sesamum, linseed, niger, groundnut and rapeseed & mustard.

The main contribution to the increase in gross cropped area was due to oilseeds and pulses.

There was a net increase in the area of pulses. Gram, pea and tur were responsible for this increase. The increase between two periods indicated that the highest increase(102.70 per cent) was in pea followed by gram (49.17 per cent) and tur (32.15 per cent).

Soybean registered an increase of 96.57 per cent. All other oilseeds had either a very small increase or a decreased area.

6.4.2.7 Gird region

The important pulse crops were gram, tur, moong-moth and lentil. Among oilseeds, rapeseed-mustard occupied 7.73 per cent, linseed, 1.76 per cent, groundnut 1.02 per cent and sesamum 1.18 per cent of the gross cropped area.

The major contribution to the increase in the gross cropped area was due to cereals (49.19 per cent) and oilseeds (39.93 per cent). The pulses contribution was negative.

Only lentil, urad and peas showed an increase in area. The increase in the area of oilseeds was mainly due to rapeseed-mustard, groundnut and soybean. Sesamum, linseed and niger showed a decreased area.

6.4.2.8 Bundelkhand Region

Gram was the main pulse crop of this region and occupied 13.78 per cent of the gross cropped area followed by urad (4.49per cent), tur (1.75 per cent), lentil (1.63 per cent) and moong-moth (1.55 per cent).

Sesamum was the main oilseed and shared about 3.42 per cent of the gross cropped area.

An increase of 12.47 per cent in the gross cropped area was observed during the two reference years. The major contributor was pulses (43.91 per cent) followed by cereals. The change in the area of oilseeds was negative.

Urad and gram were mainly responsible for increase in pulse area.

The decrease in area under oilseeds was due to decrease in the area of sesamum. All other oilseeds of this region showed increased area.

6.4.2.9 Satpura Plateau

Tur, urad and gram were the most significant pulse crops. Moong-moth, lentil, peas, kulthi and teora were the other crops grown in this region.

Among oilseeds soybean occupied 9.36 per cent, niger, 4.26 per cent and groundnut 2.68 per cent.

The maximum contribution to this increase in gross cropped area was made by oilseeds (74.51 per cent) followed by pulses (9.23 per cent) and cereals (5.71 per cent).

The main pulse crops responsible for the increase were urad, moong-moth, tur, kulthi & pea. Soybean showed highest increase (9620 per cent) during the two reference years.

6.4.2.10 Malwa Plateau

In the case of pulses, 14.37 per cent area was occupied by gram followed by urad (6.13 per cent), tur (2.48 per cent) and moong-moth (1.53 per cent).

Soybean was the most significant oilseed followed by groundnut, linseed, sesamum and rapeseed & mustard.

The main contributor to the increase in gross cropped area was pulses followed by oilseeds.

Soybean and linseed were the major oilseeds.

6.4.2.11 Nimar Plateau

This region is known as cotton region. The major pulse crops were urad, tur, moong-moth, kulthi and gram. The important oilseeds were groundnut, soybean, sesamum and linseed. The increase in gross cropped area was mainly due to pulses. Cereals and oilseeds showed decreased area during two reference years. The maximum increase between two periods was observed in gram. Groundnut and sesamum showed decrease in area. Only linseed showed increased area.

6.4.2.12 Jhabua Hills

The most important pulse crop was urad and occupied 15.01 per cent of the gross cropped area followed by gram and kulthi. Tur, moong-moth and peas were other important pulse crops.

Groundnut occupied 4.08 per cent of the gross cropped area. The other important oilseeds were soybean, castor and sesamum.

The share of pulses was highest in the increased cropped area. Next group of crops was cereals. Oilseeds contributed negatively.

The increase in area under pulses was mainly due to urad.

In the case of oilseeds, except soybean all other oilseeds showed decreased area in the second period.

6.5 Possibilities of changing cropping pattern in favour of Pulses and Oilseeds

6.5.1 Madhya Pradesh

Gram, urad, teora, tur, lentil and moong-moth were the important pulse crops of the state. Between the two reference periods gram and urad showed positive increase. Urad could have replaced jowar, or bajra or minor crops like kodo-kutki, and gram replaced either linseed or was grown on land which was fallow in the past and which now had irrigation facilities. It is expected that gram would be grown on an area of 2,430 thousand hectares and urad on 898 thousand hectares.

Soybean is the leading oilseed of the state followed by linseed, groundnut, rapeseed-mustard and sesamum. Between two periods only soybean and rapeseed-mustard showed an increased area. Linseed, groundnut and sesamum had decreased area.

Soybean replaced cereals like jowar and bajra and in some cases ground nut. Rapeseed-mustard replaced linseed and took over a rabi area which was earlier kept fallow for want to irrigation.

6.5.2 Possibilities of changes in cropping pattern in different agro-climatic regions are described below.

6.5.2.1 Chhattisgarh Plains including Balaghat district

It is estimated that teora area would further increase to 646 thousand hectares and that of gram to 186 thousand hectares by 1990. This region has no future for oilseed crops.

6.5.2.2 Bastar Plateau

Niger and rapeseed-mustard were the oilseeds of some significance. Only niger had increased area between two periods. It has some chances of growth. There is no scope for pulse crops.

6.5.2.3 Northern Hills Region of Chhattisgarh

Tur and urad are replacing jowar, kodo-kutki and kulthi. Among oilseeds, although niger commanded the largest area it had a slightly decreased area between two reference years. Other oilseeds like groundnut, rapeseed-mustard, and linseed had increased area in two periods. In the coming years, rapeseed-mustard, linseed and groundnut might cover about 83.32 and 7 thousand hectares respectively.

6.5.2.4 Kymore Plateau and Satpura Hills Region

Gram, tur, lentil and teora are important pulses although gram and lentil had decreased area between two reference years. In the coming years urad & pea are estimated to be grown on an area of 43 and 35 thousand hectares respectively. Urad is replacing minor millets like kodo-kutki. Linseed, sesamum, niger and soybean are the important oilseeds. Soybean is generally replacing minor millets and minor cereals.

6.5.2.5 Vindhya Plateau

Gram, lentil, tur and pea are the main pulses of this region and had an increased area as well as percentage. The trend indicates that gram, lentil, tur and pea area will increase to about 500,155, 60 and 60 thousand hectares respectively.

Soybean has done very well. Soybean area will increase to about 157 thousand hectares in 1990 from the present 102 thousand hectares. Soybean replaced jowar and other cereals and millets.

6.5.2.6 Central Narmada Valley

In this region the area projected for gram, tur and pea comes to about 190, 50 and 45 thousand hectares respectively by 1990.

Sesamum, linseed and soybean are expected to cover an area of 43, 26 and 135 thousand hectares by 1990.

6.5.2.7 Gird Region

The area of rapeseed-mustard is expected to be 232 thousand hectares by 1990. This crop is generally grown as mixed crop with wheat. The area of rapeseed-mustard has increased with the increasing area of wheat. Lentil and groundnut have replaced less economic pulses and kharif cereals respectively.

6.5.2.8 Bundelkhand Region

The area expected to be sown under gram, lentil, urad, tur and moong-moth would be 124, 16, 50, 17 and 16 thousand hectares respectively.

The Rapeseed-mustard is likely to be grown on an area of 14 thousand hectares and soybean on an area of 8 thousand hectares.

6.5.2.9 Satpura Plateau

The area under urad, tur and moong-moth is expected to be 74,64 and 21 thousand hectares respectively.

6.5.2.10 Malwa Plateau

Fodder production is given due importance due to good potential for dairy farming. The area under jowar and maize has increased whereas rice & bajra showed decreased area.

Among pulses urad and gram have increased area and in the case of oilseeds soybean and linseed have progressed well.

Gram and urad would substitute wheat and rice, bajra and cotton etc. while soybean would substitute bajra, groundnut & cotton.

6.5.2.11 Nimar Plateau

Gram area would be around 27 thousand hectares by 1990.

Soybean is replacing groundnut or bajra. This crop may be grown on 13 thousand hectares.

6.5.2.12 Jhabua Hills

In kharif season urad and soybean were taking the place of cotton, bajra and groundnut. Gram is expected to occupy about 48 thousand hectares by 1990.

6.5.3 Observations in selected districts

6.5.3.1 Mandsaur district

Reasons for increase in area under gram

More area under irrigation, guidance and input support in the form of seed, fertilizers, pesticides, plant protection equipments and subsidy under Intensive Pulse Development Programme.

By convincing the farmers about the importance of package of practices and need for substituting less economical crops, the gram area can be further increased.

Constraints

Less organised seed distribution system, non-availability of sufficient fertilizers, inadequate use of fertilizers and culture and low cost benefit ratio are the major constraints in pulse cultivation.

6.5.3.2 Ratlam District

Reason for increase in area under pulses

Due to the introduction of short duration varieties of urad & moong the area of pulses increased. Due to short duration

variety double cropping is possible.

Availability of soil moisture due to winter rains is responsible for increase in the gram area.

The increase in kharif pulses area was due to reduction in jowar area.

Constraints

Low cost benefit ratio and untimely rains are the main problems.

6.5.3.3. Morena district

Reasons for maximum decline in the area under pulses

Susceptibility of pulses to insects & diseases, substitution of pulses by paddy and other profitable cereals and cash crops due to increased irrigated area, increasing demand of fodder for milch cattle are the main reasons for decrease in pulse area.

Pulses area can be increased by the use of wilt resistant varieties, use of insecticides, use of suitable crop rotation & double or multiple cropping. The likely pulse crops are short duration arhar, summer moong, pea, late pea after toria etc.

6.5.3.4 Hoshangabad district

The increase in oilseed area in this district was due to significant increase in the area of soybean.

Reasons for increase in oilseeds are (mainly soybean)

Increased irrigated area under Tawa Command, suitability of kharif fallow land for soybean and adoption of improved technology were the main reasons for increase in the area under oilseeds.

Constraints

Infestation in soybean by girdle beetle and attack of bud blight are the main constraints of soybean cultivation. Wheat is competitive crop for rabi oilseeds.

6.5.3.5 Jhabua district

Reasons for decrease in the area of oilseeds

This is a tribal and backward district of light soils and drought conditions. Farmers are very poor and can not invest in costly seeds and other inputs, moisture stress conditions at the time of flowering and pod formation, attack of girdle beetle in the case of soybean, and non-availability of short duration varieties in oilseeds except soybean, lack of irrigation facilities for rabi oilseeds are the major reasons for decline in the oilseeds area.

Oilseeds cultivation can be popularised by intercropping practices in heavy to medium soils and mixed cropping practices in light soils, distribution of seed minikits of short duration high yielding varieties.

6.5.3.6 Rewa district

Reasons for decrease in area under oilseeds

Non availability of good quality improved seed, uncertainty of winter rains, shift from oilseeds to cereals due to introduction of irrigation facilities, uncertainty in prices of oilseeds compel the farmers to shift to other crops.

Measures to enlarge the acreage under oilseeds

Timely supply of improved seeds, replacement of upland paddy by sesamum, proper intercropping and announcement of support price well in advance before sowing are the measures by which the area under oilseeds can be increased.

With the increase in the area under oilseeds area under cereals particularly upland paddy, dry and semi irrigated wheat and minor millets would decrease.

Til, sunflower and soybean would substitute kodo and upland paddy, Mustard and safflower would substitute teora.

6.5.4 Suggestion for changing the cropping pattern in favour of pulses and oilseeds

Pulses

1. Introduction of pulse crops to be encouraged in irrigated farming system.
2. Bringing of additional area under pulses by way of short duration varieties of urad, moong and tur (arhar) in rice-fallow by utilising the residual moisture in rabi season.
3. Inter-cropping of arhar (tur) in soybean, bajra, cotton, sugarcane and groundnut both under irrigated and un-irrigated conditions.
4. Encourage the cultivation of pulses to replace the Khesari dal (lathyrus) mainly in Chhattisgarh region and Rewa division.
5. Improved (HYV) seeds of pulses and fertilizer should be available to the farmers at proper time and at subsidised rate.
6. Plant protection measures, phosphatic fertilizers and rhizobium culture should be popularised.
7. Emphasis be given to improved post harvest technology.
8. Encourage farmers to substitute less economic crops by pulse crops.
9. Disease resistant and drought resistant varieties of pulse crops be introduce in order to avoid the risk factors.
10. Adoption of appropriate public policies including pricing and marketing of pulse crops.
11. Suitable crop rotation should be evolved to have double or multiple cropping. Mixed cropping in irrigated areas is recommended.

12. Pulses area can be increased with the support of research and extension. These should include the use of wilt resistant varieties and use of insecticides.

Oilseeds

1. Expansion of non-traditional oilseeds like soybean and sunflower in potential area.

2. To increase the irrigated area under crops like groundnut during rabi and summer season, and rapeseed mustard during rabi season.

3. Improvement in productivity of oilseed crops through the use of quality seeds of H.Y.V., phosphatic fertilizers and gypsum in groundnut, rhizobium culture in groundnut and soybean, adoption of better farm implements and plant protection measures and adoption of improved package of practices.

4. Free distribution of seed-minikits on large scale to popularise newly released varieties of oilseeds.

5. Extension of area under oilseed cultivation through double cropping/sequential cropping/inter-cropping and replacement of low value crops by oilseed crops.

Crop replacement

(a) Low yielding rabi wheat by safflower.

(b) Minor millets by soybean/niger.

6. Extension of safflower cultivation in Tawa command area and in dry farming areas of the State.

7. Planting of Castor on bunds in the dry farming regions.

8. Planting of soybean on the bunds of paddy fields in Chhattisgarh region.

9. Provide adequate and better marketing facilities to offer better harvest price of oilseeds.

10. Kharif fallow land should be used for soybean cultivation.

11. Efforts should be made to use the pesticides to control the attack of girdle beetle in soybean.

12. Inter-cropping practices should be adopted in heavy to medium soils and mixed cropping practices in light soils.

13. Distribution of seed minikits of short duration high yielding varieties alongwith fertilizers and pesticides.

14. In partially irrigated areas mustard should be inter-cropped with wheat and linseed with gram.

15. In rainfed conditions gram can be mixed with castor and sunflower.

16. Timely supply of improved seed varieties of oilseed suitable for early and late sowing and tolerant to drought conditions.

17. Announcement of support price well in advance before start of sowing season.

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Appendix A 3.1 Major Pulses Producing districts of Madhya Pradesh*

A. Kharif Pulses

Arhar	Urd (Urid)	Moong
1. Narsinghpur	1. Raigarh	1. Guna
2. Raisen	2. Mandsaur	2. Chhindwara
3. Bhind	3. Chhindwara	3. Rajgarh
4. Chhindwara	4. Ujjain	4. Raipur
5. Dewas	5. Dhar	5. Dhar
6. Hoshangabad	6. Jhabua	6. Khargone
7. Rajgarh	7. Khargone	7. Shivpuri
8. Morena	8. Ratlam	
9. Rajnandgaon	9. Betul	
10. Sidhi	10. Khandwa	
11. Satna	11. Tikamgarh	
12. Khargone	12. Surguja	
13. Khandwa	13. Chhatarpur	
14. Betul		
15. Sehore		

B. Rabi Pulses

Gram	Lentil(Masoor)	Pea
1. Dewas	1. Narsinghpur	1. Narsinghpur
2. Mandsaur	2. Raisen	2. Raisen
3. Bilaspur	3. Bhind	3. Jabalpur
4. Vidisha	4. Sagar	4. Mandla
5. Narsinghpur	5. Jabalpur	5. Damoh
6. Raisen	6. Damoh	
7. Guna	7. Vidisha	
8. Bhind		
9. Sagar		
10. Jabalpur		
11. Ujjain		
12. Chhindwara		
13. Hoshangabad		
14. Rajgarh		
15. Rewa		
16. Morena		
17. Damoh		
18. Rajnandgaon		

*Oilseed and Pulse Development Programme in Madhya Pradesh, Directorate of Agriculture, Madhya Pradesh, Bhopal, December, 1986

Appendix Table A 4.1 Cropping Patterns in Region 1- Chhattisgarh Plains including Balaghat district,

(1970-71 and 1983-84)

Crops.	1970-71		1983-84	
	Area '000 hectares	%	Area '000 hectares	%
Rice	2508.9	56.20	2721.4	58.58
Wheat	86.6	1.94	106.7	2.30
Jowar	4.8	0.11	5.0	0.11
Maize	27.7	0.62	30.1	0.65
Bajra	--	--	0.1	--
Barley	0.7	0.02	1.4	0.03
Kodo-Kutki	350.2	7.84	308.4	6.64
Sawa	2.5	0.06	2.7	0.06
Other cereals	5.4	0.12	6.3	0.13
Total cereals	2986.8	66.91	3182.1	68.50
Gram	96.00	2.16	148.5	3.19
Tur	52.4	1.17	42.1	0.91
Urad	195.9	4.39	157.3	3.39
Moong-moth	25.2	0.56	18.4	0.40
Kulthi	49.5	1.11	44.0	0.95
Teora	587.6	13.16	625.7	13.47
Peas	7.2	0.16	5.8	0.12
(Lentil)Masoor	12.9	0.29	9.0	0.19
Other pulses	6.3	0.14	5.3	0.11
Total pulses	1033.0	23.14	1056.1	22.73
Total Foodgrains	4019.8	90.05	4238.2	91.24
Groundnut	26.5	0.59	25.1	0.54
Sesamum	29.1	0.65	24.5	0.53
Rapeseed-mustard	15.5	0.35	17.0	0.37
Linseed	259.5	5.82	229.2	4.94
Niger	26.7	0.60	26.0	0.56
Soybean	--	--	3.3	0.07
Castor	1.8	0.04	0.6	0.01
Other oilseeds	0.1	--	1.1	0.02
Total oilseeds	359.2	8.05	326.8	7.04
Sugarcane	7.55	0.17	2.95	0.06
Cotton	0.46	0.01	0.04	--
Sunhemp	2.51	0.06	1.56	0.03
Mesta	2.68	0.06	1.07	0.02
Tobacco	0.13	--	0.09	--
Fodder	--	--	0.79	0.02
Total Fruits	14.40	0.32	12.34	0.27
Total Vegetables	33.25	0.74	41.97	0.90
Total Spices	22.18	0.50	14.46	0.32
Other Crops	1.84	0.04	4.83	0.10
Total Others crops	86.00		80.10	
Total Cropped Area	4464.00	100.0	4645.1	100.0

Appendix Table A 4.2 Cropping Patterns in Region 2- Bastar Plateau 1970-71 and 1983-84

Crops	1970-71		Area 1983-84	
	Area '000 hectares	%	Area '000 hectares	%
Rice	437.7	59.39	545.2	62.65
Wheat	2.4	0.33	2.7	0.31
Jowar	6.5	0.88	9.6	1.10
Maize	25.4	3.45	28.5	3.28
Bajra	--	--	--	--
Barley	--	--	0.1	0.01
Kodo-kutki	130.7	17.73	145.8	16.76
Sawa	11.4	1.55	14.2	1.63
Other cereals	10.8	1.46	11.7	1.34
Total Cereals	624.9	84.79	757.8	87.09
Gram	2.2	0.30	2.4	0.28
Tur	2.5	0.34	2.0	0.23
Urad	12.1	1.64	10.2	1.17
Moong-moth	3.1	0.42	3.2	0.37
Kulthi	38.3	5.20	37.7	4.33
Teora	1.6	0.22	2.2	0.25
Peas	1.9	0.26	0.8	0.09
Masoor	--	--	--	--
Other pulses	0.4	0.05	1.0	0.12
Total pulses	62.1	8.43	59.5	6.84
Total Foodgrains	687.0	93.22	817.3	93.92
Groundnut	--	--	--	--
Sesamum	3.2	0.43	2.5	0.29
Rapeseed-mustard	18.7	2.54	16.5	1.90
Linseed	4.4	0.60	4.7	0.54
Niger	13.9	1.89	19.6	2.25
Soybean	--	--	0.1	0.01
Castor	0.1	0.01	0.1	0.01
Other oilseeds	--	--	0.1	0.01
Total oilseeds	40.3	5.47	43.6	5.01
Sugarcane	1.14	0.15	0.05	0.01
Cotton	--	--	--	--
Sunhemp	0.24	0.03	0.29	0.03
Mesta	0.51	0.07	0.45	0.05
Tobacco	0.34	0.05	0.09	0.01
Fodder	--	--	0.06	0.01
Total Fruits	2.17	0.29	2.08	0.24
Total Vegetable	4.00	0.54	4.92	0.57
Total Spices	1.04	0.14	0.80	0.09
Other crops	0.26	0.04	0.56	0.06
Total Cropped Area	737.00	100.0	870.20	100.0

Appendix Table A 4.3 Cropping Patterns in Region 3- Northern Hill Region of Chhattisgarh 1970-71 & 1983-84

Crops	1970-71		1983-84	
	Area '000 hectares	%	Area '000 hectares	%
Rice	597.8	37.52	679.9	39.46
Wheat	99.7	6.26	167.2	9.72
Jowar	15.1	0.95	12.3	0.71
Maize	83.6	5.25	102.1	5.93
Bajra	0.1	0.00	--	--
Barley	11.9	0.75	17.0	0.99
Kodo-Kutki	290.2	18.22	256.6	14.91
Sawa	15.6	0.98	17.9	1.04
Other Cereals	59.4	3.73	59.9	3.48
Total Cereals	1173.4	73.66	1311.9	76.24
Gram	40.6	2.55	40.8	2.37
Tur	17.3	1.09	23.7	1.38
Urad	39.4	2.47	44.7	2.60
Moon-moth	3.4	0.21	0.6	0.03
Kulthi	38.7	2.43	33.0	1.92
Teora	3.5	0.22	2.2	0.13
Peas	16.8	1.05	12.7	0.74
Masoor	20.4	1.28	14.1	0.82
Other pulses	0.4	0.03	1.5	0.08
Total pulses	180.5	11.33	173.3	10.07
Total Foodgrans	1353.9	84.99	1485.2	86.31
Groundnut	3.4	0.21	5.3	0.31
Sesamum	33.7	2.12	26.7	1.55
Rapeseed-mustard	57.6	3.61	73.4	4.27
Linseed	20.4	1.28	27.4	1.59
Niger	89.2	5.60	84.5	4.91
Soybean	--	--	0.4	0.02
Castor	--	--	--	--
Other oilseeds	--	--	--	--
Total oilseeds	204.3	12.82	217.7	12.65
Sugarcane	1.82	0.11	1.51	0.09
Cotton	--	--	0.18	0.01
Sunhemp	3.52	0.22	1.53	0.09
Mesta	0.25	0.02	0.24	0.01
Tobacco	0.45	0.03	0.16	0.01
Fodder	--	--	0.1	0.01
Total Fruits	1.72	0.11	1.58	0.09
Total Vegetables	7.87	0.49	9.09	0.53
Total Spices	1.56	0.10	1.76	0.10
Other crops	17.61	1.10	1.65	0.10
Total Cropped Area	1593.0	100.0	1720.7	100.0

Appendix Table A 4.4 Cropping Patterns in Region 4- Kymore Plateau and Satpura Hills 1970-71 & 1983-84

Crops	1970-71		1983-84	
	Area '000 hectares	%	Area '000 hectares	%
Rice	487.6	20.49	589.0	23.01
Wheat	528.0	22.18	730.6	28.54
Jowar	89.2	3.75	89.3	3.49
Maize	40.9	1.72	47.3	1.85
Bajra	4.9	0.21	1.2	0.05
Barley	73.2	3.07	75.2	2.94
Kodo-Kutki	313.7	13.18	240.0	9.37
Sawa	40.7	1.71	42.8	1.67
Other crreals	7.9	0.33	7.3	0.28
Total Cereals	1586.1	66.64	1822.7	71.20
Gram	288.2	12.11	252.2	9.85
Tur	72.1	3.03	72.9	2.85
Urad	21.9	0.92	33.8	1.32
Moong-moth	5.1	0.21	8.7	0.34
Kulthi	0.2	0.01	0.2	0.01
Teora	28.5	1.20	22.6	0.88
Peas	14.5	0.61	26.1	1.02
Masoor	65.6	2.76	49.2	1.92
Other pulses	0.8	0.03	0.60	0.02
Total pulses	496.9	20.88	466.3	18.21
Total Foodgrains	2083.0	87.52	2289.0	89.41
Groundnut	5.1	0.21	4.0	0.16
Sesamum	71.8	3.02	54.5	2.13
Rapeseed-mustard	15.0	0.63	20.5	0.80
Linseed	142.7	5.99	115.9	4.53
Niger	27.9	1.17	25.9	1.01
Soybean	--	--	12.4	0.48
Castor	0.1	0.01	0.01	--
Other oilseeds	0.9	0.04	1.2	0.05
Total oilseeds	263.5	11.07	234.5	9.16
Sugarcane	2.0	0.08	0.80	0.03
Cotton	--	--	--	--
Sunhemp	3.6	0.15	2.30	0.09
Mesta	2.1	0.09	1.10	0.04
Tobacco	0.4	0.02	0.30	0.01
Fodder	--	--	5.30	0.21
Total Fruits	10.6	0.44	11.00	0.43
Total Vegetable	6.4	0.27	11.60	0.45
Total Spices	2.3	0.10	3.20	0.12
Other crops	6.1	0.26	1.10	0.04
Total Cropped Area	2380.0	100.0	2560.2	100.0

Appendix Table A 4.5 Cropping Patterns in Region 5- Vindhya Plateau 1970-71 and 1983-84

Crops	1970-71		1983-84	
	Area '000 hectares	%	Area '000 hectares	%
Rice	76.3	3.46	80.2	3.34
Wheat	1034.6	46.88	994.8	41.41
Jowar	188.9	8.56	175.5	7.31
Maize	23.1	1.05	25.7	1.07
Bajra	0.2	0.01	--	--
Barley	1.1	0.05	1.7	0.07
Kodo-Kutki	26.6	1.20	10.6	0.44
Sawa	1.4	0.06	1.2	0.05
Other cereals	3.4	0.15	2.7	0.11
Total Cereals	1355.6	61.42	1292.4	53.80
Gram	245.8	11.14	389.3	16.21
Tur	33.8	1.53	51.0	2.12
Urad	7.6	0.35	10.4	0.43
Moong-moth	19.9	0.90	17.5	0.73
Kulthi	--	--	--	--
Teora	34.0	1.54	31.4	1.31
Peas	12.0	0.54	35.1	1.46
Masoor(Lentil)	100.0	4.53	133.0	5.53
Other pulses	--	--	--	--
Total pulses	453.1	20.53	667.7	27.79
Total Foodgrains	1808.7	81.95	1960.1	81.59
Groundnut	14.3	0.65	14.5	0.63
Sesamum	29.5	1.34	28.3	1.18
Rapeseed-mustard	6.7	0.30	7.6	0.32
Linseed	64.0	2.90	63.0	2.62
Niger	8.7	0.40	3.2	0.13
Soybean	--	--	102.3	4.26
Castor	0.1	--	--	--
Other oilseeds	--	--	0.3	0.01
Total oilseeds	123.3	5.59	219.2	9.15
Sugarcane	6.4	0.29	3.6	0.15
Cotton	12.5	0.57	9.5	0.39
Sunhemp	1.4	0.06	1.1	0.04
Mesta	0.3	0.01	0.1	--
Tobacco	--	--	--	--
Fodder	--	--	188.7	7.85
Total Fruits	2.2	0.10	1.6	0.07
Total Vegetables	5.2	0.24	8.3	0.34
Total Spices	4.2	0.19	4.9	0.20
Other crops	242.8	11.00	5.2	0.22
Total Cropped Area	2207.0	100.0	2402.3	100.0

Appendix Table A 4.6 Cropping Patterns in Region 6- Central Narmada Valley 1970-71 and 1983-84

Crops	1970-71		1983-84	
	Area '000 hectares	%	Area '000 hectares	%
Rice	24.3	3.36	29.6	3.61
Wheat	208.2	28.80	196.8	24.04
Jowar	72.6	10.04	57.7	7.05
Maize	2.2	0.30	2.5	0.30
Bajra	1.3	0.18	0.3	0.04
Barley	0.3	0.04	0.3	0.04
Kodo-Kutki	30.2	4.18	19.9	2.43
Sawa	5.4	0.75	3.8	0.46
Other Cereals	0.7	0.09	0.3	0.04
Total Cereals	345.2	47.74	311.2	38.01
Gram	102.7	14.20	153.2	18.71
Tur	33.9	4.69	44.8	5.47
Urad	12.3	1.70	10.1	1.23
Moong-moth	10.9	1.51	11.3	1.38
Kulthi	--	--	--	--
Teora	42.0	5.81	22.6	2.76
Peas	14.8	2.05	30.0	3.66
Masoor(Lentil)	24.8	3.43	10.5	1.29
Other pulses	--	--	--	--
Total Pulses	241.4	33.39	282.5	34.50
Total Foodgrains	586.6	81.13	593.7	72.51
Groundnut	0.3	0.04	0.3	0.04
Sesamum	41.0	5.67	42.3	5.17
Rapeseed-mustard	--	--	0.1	0.01
Linseed	22.7	3.14	24.8	3.03
Niger	1.3	0.18	0.9	0.11
Soybean	--	--	84.6	10.33
Castar	0.1	0.01	--	--
Other oilseeds	--	--	--	--
Total oilseeds	65.4	9.04	153.0	18.69
Sugarcane	1.9	0.26	2.2	0.27
Cotton	33.1	4.58	36.0	4.40
Sunhemp	0.8	0.11	0.6	0.07
Mesta	--	--	--	--
Tobacco	--	--	--	--
Fodder	--	--	23.4	2.86
Total Fruits	2.3	0.32	1.8	0.22
Total Vegetables	2.6	0.36	4.4	0.54
Total Spices	2.0	0.28	2.4	0.29
Other crops	28.3	3.91	1.2	0.15
Total Cropped Area	723.0	100.0	818.7	100.0

Appendix Table A 4.7 Cropping Patterns in Region 7-(Gird Region)
1970-71 and 1983-84

Crops	1970-71		1983-84	
	Area '000 hectares	%	Area '000 hectares	%
Rice	36.2	1.86	50.3	2.37
Wheat	492.5	25.31	601.9	28.42
Jowar	316.3	16.25	283.3	13.37
Maize	50.9	2.62	61.7	2.91
Bajra	119.6	6.15	110.6	5.22
Barley	29.4	1.51	29.3	1.39
Kodo-kutki	8.5	0.44	4.0	0.19
Sawa	0.4	0.02	0.3	0.01
Other Cereals	8.1	0.41	5.5	0.26
Total Cereals	1061.9	54.57	1146.9	54.13
Gram	345.2	17.74	303.7	14.33
Tur	67.2	3.45	47.6	2.25
Urad	11.0	0.56	19.7	0.93
Moong-moth	52.3	2.69	45.6	2.15
Kulthi	0.1	0.01	--	--
Teora	1.2	0.06	0.6	0.03
Peas	3.8	0.20	6.3	0.30
Masoor(Lintil)	20.2	1.04	44.3	2.09
Other pulses	1.2	0.06	0.1	--
Total Pulses	502.2	25.81	467.9	22.08
Total Foodgrains	1564.1	80.38	1614.8	76.21
Groundnut	7.2	0.37	21.6	1.02
Sesamum	57.9	2.98	25.0	1.18
Rapeseed-mustard	86.4	4.44	163.8	7.73
Linseed	51.7	2.65	37.3	1.76
Niger	11.9	0.61	6.8	0.32
Soybean	--	--	14.0	0.66
Castar	--	--	0.2	0.01
Other oilseeds	26.1	1.34	41.5	1.96
Total Oilseeds	241.2	12.39	310.2	14.64
Sugarcane	10.62	0.55	8.48	0.40
Cotton	0.08	--	--	--
Sunhemp	1.02	0.05	0.84	0.04
Mesta	11.31	0.58	2.48	0.12
Tobacco	0.13	0.01	0.03	--
Fodder	--	--	139.31	6.57
Total Fruits	1.52	0.08	1.28	0.06
Total Vegetable	4.92	0.25	7.17	0.34
Total Spices	10.73	0.55	24.68	1.17
Other crops	100.37	5.16	9.53	0.45
Total Cropped Area	1946.00	100.0	2118.8	100.0

Appendix Table A 4.8 Cropping Patterns in Region 8-Bundelkhand (Bundelkhand Region) 1970-71 and 1983-84

Crops	1970-71		1983-84	
	Area '000 hectares	%	Area '000 hectares	%
Rice	43.4	5.84	52.3	6.26
Wheat	197.1	26.52	246.4	29.5
Jowar	79.6	0.71	84.1	10.01
Maize	2.9	0.40	4.4	0.53
Bajra	2.1	0.28	1.3	0.15
Barley	37.3	5.02	31.4	3.75
Kodo-kutki	48.4	6.51	23.1	2.76
Sawa	15.3	2.06	13.1	1.57
Other cereals	21.2	2.85	25.1	3.01
Total Cereals	447.3	60.16	481.2	57.54
Gram	100.1	13.47	115.2	13.78
Tur	12.2	1.64	14.6	1.75
Urad	21.4	2.88	37.5	4.49
Moong-moth	8.9	1.20	13.0	1.55
Kulthi	--	--	--	--
Teora	0.40	0.05	--	--
Peas	0.40	0.05	0.7	0.08
Masoor(Lentil)	10.60	1.42	13.6	1.63
Other pulses	0.40	0.05	0.50	0.06
Total Pulses	154.4	20.76	195.1	25.34
Total Foodgrains	601.70	80.92	676.3	80.88
Groundnut	--	--	2.4	0.29
Sesamum	52.8	7.1	28.6	3.42
Rapeseed-mustard	3.1	0.41	7.6	0.91
Linseed	12.3	1.65	13.2	1.58
Niger	0.6	0.08	0.4	0.04
Soybean	--	--	5.1	0.61
Castor	--	--	--	--
Other oilseeds	1.7	0.23	8.0	0.96
Total oilseeds	70.5	9.48	65.3	7.81
Sugarcane	2.26	0.31	2.009	0.24
Catton	--	--	--	--
Sunhemp	1.26	0.17	1.05	0.13
Mesta	0.39	0.06	0.05	0.01
Tobacco	0.08	0.01	0.07	0.01
Fodder	--	--	81.59	9.78
Total Fruits	0.607	0.08	0.432	0.06
Total Vegetables	2.19	0.30	5.259	0.63
Total Spices	1.837	0.26	2.482	0.30
Other crops	62.39	8.39	1.358	0.15
Total Cropped Area	743.22	100.0	835.9	100.0

Appendix Table A 4.9 Cropping Patterns in Region 9- (Satpura Plateau), 1970-71 and 1983-84

Crops	1970-71		1983-84	
	Area '000 hectares	%	Area '000 hectares	%
Rice	44.6	4.75	58.2	5.66
Wheat	128.2	13.68	145.7	14.17
Jowar	211.3	22.55	174.0	16.93
Maize	32.0	3.41	51.6	5.02
Bajra	0.3	0.03	0.2	0.02
Barley	--	--	--	--
Kodo-kutki	147.3	15.72	142.1	13.82
Sawa	11.3	1.20	10.9	1.06
Other cereals	11.4	1.24	8.9	0.87
Total Cereals	586.4	62.58	591.6	57.55
Gram	76.9	8.21	56.9	5.54
Tur	55.7	5.95	60.7	5.90
Urad	40.8	4.35	60.1	5.85
Moong-moth	9.6	1.02	15.6	1.52
Kulthi	1.4	0.15	2.9	0.28
Teora	4.2	0.45	2.6	0.25
Peas	2.6	0.28	3.6	0.35
Masoor(Lentil)	9.5	1.01	6.0	0.58
Other pulses	1.4	0.15	2.1	0.20
Total pulses	202.1	21.57	210.5	20.47
Total Foodgrains	788.5	84.15	802.1	78.02
Groundnut	42.9	4.58	27.5	2.68
Sesamum	8.4	0.80	7.7	0.75
Rapeseed mustared	0.1	0.01	0.3	0.03
Linseed	3.3	0.35	4.1	0.40
Niger	57.3	6.11	43.8	4.26
Soybean	--	--	96.2	9.36
Castor	0.1	0.01	0.2	0.01
Other oilseeds	--	--	0.1	0.01
Total oilseeds	112.1	11.96	179.9	17.50
Sugarcane	5.36	0.57	6.28	0.61
Catton	11.5	1.23	10.96	1.07
Sunhemp	2.93	0.31	2.01	0.20
Mesta	0.03	--	--	--
Tobacco	0.01	--	0.01	--
Fodder	--	--	2.01	0.19
Total Fruits	2.41	0.26	3.97	0.39
Total Vegetables	5.14	0.55	8.13	0.79
Total Spices	4.49	0.48	5.84	0.57
Other crops	4.63	0.49	6.79	0.66
Total Cropped Area	937.00	100.0	1028.0	100.0

Appendix Table A 4.10 Cropping Patterns in Region 10-Malwa Plateau 1970-71 and 1983-84

Crops	1970-71		1983-84	
	Area '000 hectares	%	Area '000 hectares	%
Rice	30.6	0.91	29.3	0.72
Wheat	555.7	16.55	496.5	12.27
Jowar	828.6	24.08	886.4	21.90
Maize	187.3	5.58	345.5	8.54
Bajra	29.5	0.88	19.3	0.48
Barley	2.3	0.07	1.9	0.05
Kodo-kutki	3.2	0.09	2.8	0.07
Sawa	1.3	0.04	1.9	0.05
Other cereals	4.2	0.13	0.8	0.02
Total Cereals	1642.7	48.93	1784.9	44.10
Gram	272.5	8.12	581.7	14.37
Tur	101.4	3.02	100.4	2.48
Urad	134.5	4.01	248.3	6.13
Moong-moth	60.8	1.81	62.0	1.53
Kulthi	12.6	0.38	9.1	0.22
Teora	5.7	0.17	7.3	0.18
Peas	3.1	0.09	5.6	0.14
Masoor(Lentil)	5.2	0.15	5.5	0.14
Other pulses	5.7	0.17	7.1	0.18
Total Pulses	601.5	17.92	1027.0	25.37
Total Foodgrains	2244.2	66.85	2811.8	69.47
Groundnut	247.0	7.36	124.8	3.09
Sesamum	14.2	0.42	12.0	0.30
Rapeseed-mustared	0.1	--	2.3	0.06
Linseed	46.6	1.39	63.3	1.56
Niger	0.6	0.02	0.2	--
Soybean	--	--	283.4	7.00
Castor	0.7	0.02	0.5	0.01
Other oilseeds	0.3	--	30.7	0.76
Total Oilseeds	309.5	9.22	517.2	12.78
Sugercane	19.54	0.58	12.96	0.32
Catton	347.79	10.36	169.7	4.20
Sunhemp	7.27	0.22	4.75	0.12
Mesta	0.26	0.01	0.32	0.01
Tobacco	0.52	0.02	0.38	0.01
Fodder	--	--	401.72	9.92
Total Fruits	4.90	0.15	4.66	0.11
Total Vegetables	10.57	0.31	21.37	0.53
Total Spices	37.12	1.10	71.94	1.78
Other crops	375.33	11.18	30.70	0.76
Total Cropped Area	3357.00	100.0	4047.6	100.0

Appendix Table A 4.11 Cropping Patterns in Region 11- Nimar Plateau 1970-71 and 1983-84

Crops	1970-71 Area '000 hectares	1970-71 %	1983-84 Area '000 hectares	1983-84 %
Rice	42.2	3.83	47.0	4.01
Wheat	59.5	5.41	66.2	5.65
Jowar	314.5	28.56	302.5	25.84
Maize	31.7	2.88	43.4	3.71
Bajra	50.0	4.54	29.3	2.50
Barley	--	--	--	--
Kodo-kutki	7.2	0.66	8.1	0.70
Sawa	4.9	0.44	2.9	0.25
Other cereals	7.3	0.67	8.4	0.72
Total cereals	517.3	46.99	507.8	43.38
Gram	12.7	1.16	21.3	1.82
Tur	35.5	3.23	38.0	3.24
Urad	89.1	8.09	94.4	8.06
Moong-moth	31.0	2.83	33.6	2.90
Kulthi	33.2	3.02	28.0	2.40
Teora	0.1	0.01	0.1	0.01
Peas	0.5	0.05	0.5	0.04
Masoor(Lentil)	1.9	0.17	2.3	0.20
Other pulses	4.7	0.43	4.0	0.34
Total pulses	208.7	18.99	222.2	19.01
Total Foodgrains	726.0	65.98	730.0	62.39
Groundnut	91.0	8.26	69.0	5.9
Sesamum	5.6	0.50	5.2	0.44
Rapeseed-mustared	--	--	--	--
Linseed	1.3	0.11	1.7	0.14
Niger	--	--	--	--
Soybean	--	--	8.2	0.7
Castor	--	--	0.1	0.01
Other oilseeds	--	--	0.1	0.01
Total oilseeds	97.9	8.87	84.3	7.2
Sugarcane	1.79	0.16	2.457	0.2
Catton	250.65	22.76	300.97	25.7
Sunhemp	2.09	0.19	2.40	0.2
Mesta	0.16	0.01	0.22	0.01
Tobacco	0.85	0.08	0.14	0.01
Fodder	--	--	16.93	1.44
Total Fruits	6.152	0.56	11.323	0.97
Total Vegetables	2.86	0.26	6.322	0.54
Total Spices	5.336	0.48	13.273	1.13
Other crops	7.212	0.65	2.585	0.22
Total Cropped Area	1101.00	100.0	1170.9	100.0

Appendix Table A 4.12 Cropping Patterns in Region 12- Jhabua Hills 1970-71 and 1983-84

Crops	1970-71		1983-84	
	Area '000 hectares	%	Area '000 hectares	%
Rice	23.1	6.33	29.3	7.15
Wheat	6.7	1.84	16.3	3.98
Jowar	36.2	9.92	41.6	10.15
Maize	73.6	20.16	78.8	19.23
Bajra	14.0	3.84	10.6	2.59
Barley	0.4	0.11	0.3	0.07
Kodo-kutki	8.0	2.19	4.0	0.98
Sawa	22.9	6.27	20.5	5.00
Other cereals	16.6	4.55	6.6	1.61
Total cerals	201.5	55.21	208.0	50.76
Gram	24.5	6.71	37.8	9.23
Tur	7.0	1.92	7.4	1.80
Urad	31.5	8.63	61.5	15.01
Moong-moth	1.8	0.49	2.2	0.54
Kulthi	21.6	5.92	32.6	7.96
Teora	--	--	--	--
Peas	0.4	0.11	0.8	0.19
Masoor(Lentil)	--	--	--	--
Other pulses	1.9	0.52	1.9	0.46
Total pulses	88.7	24.30	144.2	35.19
Total Foodgrains	290.2	79.51	352.2	85.95
Groundnut	25.6	7.02	16.7	4.08
Sesamum	2.4	0.66	0.5	0.12
Rapeseed-mustared	--	--	--	--
Linseed	--	--	--	--
Niger	--	--	--	--
Soybean	--	--	3.6	0.88
Castor	3.1	0.84	2.1	0.51
Other oilseeds	--	--	--	--
Total oilseeds	31.1	8.52	22.9	5.59
Sugarcane	0.15	0.04	0.14	0.03
Catton	26.99	7.40	15.87	3.88
Sunhemp	2.04	0.56	0.94	0.23
Mesta	0.01	--	--	--
Tobacco	0.01	--	0.01	--
Fodder	--	--	15.45	3.78
Total Fruits	0.03	0.01	0.07	0.02
Total Vegetables	0.49	0.13	1.00	0.25
Total Spices	0.89	0.24	1.10	0.27
Other crops	13.09	3.59	0.12	--
Total Cropped Area	365.00	100.0	409.8	100.0