Adhoc Study No. 49

AGRICULTURAL DEVELOPMENT
IN
MADHYA PRADESH

(A Districtwise Analysis 1950-51 to 1979-80)

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OUTLINE

C O N T E N T S

PART THREE - DISCUSSION

PART FOUR- ABSTRACT

Part One

B A C K G R O U N D

C H A P T E R-I

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

1.1 Agricultural Development and Economic Growth

Pressing need of food production for our growing population and the requirement of raw materials for expanding non-agricultural sector requires a consistant and quick development of our agriculture. Agricultural development is an essential condition for economic growth in our country. It is fundamental to building up of the much needed economic and social overheads in the country particularly in the rural sector. Agriculture must provide major increases in agricultural production, at the same time it must also make significant net contributions to the capital needs of other sectors of the economy.

1.2 Agricultural Development before the Plans

'The First Year Plan gave a brief account of the result of a study of trends in land use pattern and cropping for forty years preceding 1946-47. It showed that (1) the net area sown had not increased appreciably except in Uttar Pradesh. The area growing more than one crop had increased by about 20 per cent and the total cropped area thus showed some increase. This was however, nowhere compareable to population increase.

(2) Irrigated area had increased by about 10 per cent mainly from major/medium irrigation. It had been noticed that the area irrigated from minor irrigation works remained almost static over this long period. It appeared to indicate that the new construction at best kept pace with works going out of use for want of repairs. (3). Area under current fallows remained at the level of 1919 - 20 till the early forties and thereafter showed some increase, particularly in the cotton growing tracts possibly

because of a sudden decrease in cotton area which was left partly fallow[1].'

'These few facts show clearly that although the gross cropped area had increased as a result of double cropping, there was hardly any increase in the new area that had been put under cultivation during the previous forty years. The percentage of population depending on agriculture, however, did not show much change during the first fifty years of the twentieth century. The percentage of workers engaged in agriculture to total workers also showed an increase of about 6.5 per cent in this period. The result was that the dependence on agriculture, increased appreciably and led to a fall in per capita gross as well as irrigated area. Gross, net and irrigated area sown per capita declined from 114. 104 and 17 cents respectively to 95, 84 and 14 cents. All this had actually been a period of stagnation and agriculture had to serve the purpose of a shock-absorber. Even the acreage and production of food crops hardly showed any upward move. The question of any stepping up of capital formation within the agriculture sector could not arise under the circumstances[2].'

1.3 Development strategies during the Plan Periods

'India's post-independence agricultural production strategy and policy may be divided into three periods. In the first, growth was expected to flow directly from socially oriented measures designed to increase equity. In the second, emphasis was placed on assuring supply of purchased inputs. In the third,

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1. G.D. Agrawal and P.C. Bansil, "Economic Problems of Indian Agriculture", Vikas Publications, 1969, pp. 384-385.
2. Ibid p.385

new agricultural production technology was central to the strategy. Each of these quite different emphases may be better seen as a correct perception of a necessary condition for growth than as either incorrect or alternative means of achieving growth[3].

1.3.1 Blanket Development Strategy

'Launching of the First Five Year Plan in 1950-51 land marks an important phase in the agricultural development of this country. Analysing the pattern and path of agricultural output growth in different states over the period 1953-1971, Jha observed that, during the first period i.e. 1953-56 to 1958-61, most of the states performed well in terms of growth and the rates were more or less compareable. The uniform pattern observed in the first period started breaking up in the second period (1958-61 to 1963-65). The blanket development strategy (dispersing of the resources on too many schemes over too wide an area) adopted in the fifties resulted in uniform growth pattern in the earlier years, but soon enough the technological slack was exhausted in the early sixties[4].'

1.3.2. Selected Area Approach

The selected area approach aimed at making concentrated efforts for increasing agricultural production on a selective basis. Intensive Agricultural District Programme (I.A.D.P.) popularly known as 'Package Programme,' was launched in 1960-61 to concentrate development activities in selected areas having better potentialities for rapid development. It amied at

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3. John W. Mellor, 'Agriculture in Growth: Changing Research and Data Needs for Effective Policy', Panse Memorial Lecture, Indian Society of Agricultural Statistics, New Delhi, February 13, 1980. Journal of the Indian Society of Agricultural Statistics Vol.XXXII, No.1 April 1980.
4. Dayanath Jha, 'Agricultural Growth, Technology and Equity', Indian Journal of Agriculture Economics, Vol XXXIX No.3,1974.

(a) increasing food production in order to meet the shortage and to provide a base for more rapid economic development and
(b) demonstrating the most effective ways of increasing food production through concentration of resources, both human and material, and setting a pattern of extending such programmes to other areas.

In the first instance the programme was started in seven selected districts and later extended to seventeen all over the country. In the mid-term appraisal of the Third Five Year Plan the need to give more emphasis on this approach was suggested. The Agricultural Production Board accordingly agreed in January 1964, to select about, 20-25 per cent of cultivated area in the country for intensive agricultural development. Thus a similar approach, but with the extension staff on a reduced scale, was introduced in several other parts of the country through Intensive Agricultural Area Programme (IAAP). The Programme came into operation in 1964 and by the end of Fourth Five Year Plan it covered large number of districts allover the country. There by all hopes were placed mainly on the selected area approach i.e. concentration of all efforts and resources in areas already developed to a considerable extent.

1.3.3. New Strategy of Agricultural Development

While the IADP and IAAP Programmes were in progress, the deceleration in output growth during the Third Five Year Plan and the unprecedented drought of two years 1965-67 made the situation worse. However, in the middle of sixties an important event in the field of agriculture was the introduction of new strains of various food grains which are highly responsive to the higher

levels of inputs and are capable of giving much higher yields than the varieties which were already in cultivation. The biological revolution brought about by the introduction of new strains of various food grains helped the country to embark upon a new strategy of agricultural development. The new strategy popularly known as 'High Yielding Varieties Programme (H.Y.V.P.) brought out Green Revolution' in the country and resulted in spectacular changes on the Indian farm front. The other important programmes introduced under the new strategy were : Multiple Cropping Programme, Ayacut Development, Water Management, Dry land Agriculture Development along with several other supporting schemes and programmes related with agriculture and rural employment. The important rural employment oriented programmes implemented in the Fourth and Fifth Five Year Plans were : Crash Scheme for Rural Employment, Pilot Intensive Rural Employment Project (PIREP), Drought prone Area Programme (DPAP), Small Farmers Development Agency (SFDA) and Marginal Farmers and Agricultural Labourers Development Agency (MFAL) etc. These programmes covered a wide range of activities including minor irrigation, land development, soil conservation, promotion of improved agricultural practices and use of modern inputs. As a result of these programmes additional area has been brought under cultivation, irrigation facilities have been expanded, consumption of chemical fertilizers has increased and improved seeds have been popularized. However, while development efforts have been gaining momentum, the realisation of their benefits has not been uniform. It has been handicaped by various physical and socio-economic factors at various stages.

1.4 Agricultural Development in Madhya Pradesh

Biggest in size, Madhya Pradesh appears to be weak in many respect in it's agricultural situation. Though pockets of progress and prosperity co-exist with backward tribal areas, the state as a whole lags much behind some of the progressive states of the country. The study of 'Agricultural Development in Madhya Pradesh (1950-51 to 1975-76)[5] revealed the following facts regarding the agricultural development in the state.

'There had been significant stepping up of develcpment efforts in agriculture since the inception of planning era. During the First Plan period agricultural output in the state increased by 46.30 per cent with the linear growth rate of 8.87 per cent per annum. This pattern started breaking up in the Second Plan period. The pace of growth in output slowed down and the increase of average agricultural output during this period remained only 31.9 per cent over the average of First Plan period. Decomposition of crop output growth during 1950-51 to 1960-61) revealed that, contribution of area increase was only 17.46 per cent while increase in productivity contributed 80.69 per cent to total output growth[6].'

During the Third Plan period there was a further deceleration in the output growth. Contribution of all the factors, incorporated in decomposition analysis : i.e. area, productivity and cropping pattern, were negative. From 1966 onwards the 'New Strategy of agricultural development brought a new life and resulted in outstanding gains in some areas[7].'

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5. S.K. Dubey, K.G. Sharma and G.D. Agrawal, "Agricultural Development in Madhya Pradesh (1950-51 to 1975-76)" Agro-Economic Research Centre for M.P. Jabalpur, 1979.
6. Ibid
7. Ibid

The impact of 'New Strategy' which brought out 'Green Revolution in the country, was limited in this state Forty one per cent of the total cropped area in the state (area covered by non-food grains and pulses) remained outside the orbit of High Yielding Varieties Programme. The impact of high yielding varieties was limited by and large to irrigated areas and there too the crop which was under it's major influence was wheat[8].'

1.5 Regional Variations

The overall state position conceals considerable regional or districtwise differences because of the vast differences in soils, topography, water supply, farming practices, techniques and attitude of farmers in different parts of the state. Madhya Pradesh is divided into several agro-climatic zones with vast differences in soils, topography altitudes, water supply and climatic conditions which result in great variations in farming patterns followed and productivity obtained in different parts.

1.6 Need of a Districtwise Study

A knowledge of regional differences in growth of agricultural output, productivity and associated factors is helpful in formulating and executing measures for development and utilization of the resources of different regions in ways that promote rapid agricultural growth and correct the regional inbalances. 'If high rates of agricultural production growth are to be attained and maintained, policy must evolve as objectives and priorities change. Policies must be chosen consonant with

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8. Ibid

new market and technological conditions, with the dynamic interactions of institutional and physical infrastructure, and with the iterative effects of past policy itself. Effective policy cannot develop unless appropriate data are collected and analysed to clarify evolving policy needs[9]. Since it is not unusual to find fast growing, medium pace and slow growing districts in the state, in order to get a proper perspective of the agricultural development process in different parts of the state, it is essential to study and analyse the data, at as disaggregated a level as possible.

1.7 Present Study

In the light of the facts stated above, the present study of Agricultural Development in Madhya Pradesh (Districtwise Analysis) was taken up with the following objectives:

1.7.1 Objectives

1. To study intra-state disparities in Madhya Pradesh
2. To make inter-district comparision with regards to:
   (a) Land use crop performance and localization
   (b) Input output structure in agriculture and its changes.
   (c) Agricultural Efficiency
   (d) Agricultural Development
3. To compile and analyse districtwise data on various aspects of agro-ecoromic situations in the state.

1.7.2. Scope

With in a state the district is the most important unit of administration, and a large measure of detailed planning and

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9. John W. Mellor, 'Agriculture in Growth: Changing Research and Data Needs for Effective Policy.

execution of development programmes is done at the district level, therefore, district was taken as an appropriate unit for the study. Though it has disadvantages in some cases, where there are significant differences in physical conditions and land use with in the district, still the districts were taken as unit of our study because district being the smallest unit in the state for which agricultural statistics was available from different sources.

1.7.3 Approach

Two different approaches were adopted in the study : (i) to study intra-state disparities and (ii) to make inter-district comparison. In the first approach the agro-climatic regions, crop zones, resource development regions and divisions, regional differences in food grains production, productivity and agricultural efficiency etc. were studied. A review of related studies has been done in this regard.

Under the second approach inter-district comparison with regards to land use, cropping pattern, input output structure, agricultural efficiency and development was done. In this connection two methods were used; (1) trenel analysis and (2) indicators approach.

Districtwise indices of area, output and productivity of principal crops were constructed with 1952-53 as the base year and their linear growth rate over the period 1950-51 to 1979-80 were worked out for all the districts except those which were bifurcated or carved out from another district at any later stage. For the newly formed districts the time series analysis or the temporal changes were studied between the

periods 1956-57 to 1979-80 or 1972-73 to 1979-80 which depended on their year of formation. Periodical changes or shift in input and output structure was compared between the trienniums 1958-59 to 1960-61 and 1977-78 to 1979-80.

Using the indicators approach, districtwise agricultural efficiency was measured through following indicators:

(i) intensity of cropping

(ii) gross value of agricultural output per hectare

(a) its level and (b) growth rate

(iii) composite yield indices.

The selected indicators used for assessing the level of agricultural development of each district were divided into following categories and sub-categories :

I. Agricultural Resource Base

A. Resource Availability

(i) Land

(ii) Size of Holdings

(iii) Rainfall

(iv) Soil Fertility

(v) Irrigation

(vi) Agricultural Population

(vii) Animal Power

B. Resource Utilisation

(i) Land use

(ii) Ground water and Irrigation Potential

(iii) Cropping pattern

II. Adoption of Improved Technology

A. Resource Development

(i) Land improvement

(ii) Irrigation Potential created

B. Adoption of Improved Practices

C. Mechanisation in Agriculture

(i) Use of Electric Power

(ii) Use of Farm Machinery

(iii) Use of improved implements and equipments.

III. Infra-Structure Facilities

(i) Communication

(ii) Rural Electrification

(iii) Rural Literacy

(iv) Banking and Rural Credit

(v) Agricultural Marketing

(vi) Storage and Ware-housing

(vii) Veterinary Services.

1.7.4. Limitations

The study of forty five districts of the biggest state of this country, had some practical difficulties in collection compilation and analysis of data. Some of the districts are quite big in size on account of which considerable heterogenity in topography and wide differences in agro-climatic conditions are found within the districts. Reorganisation of the state (in 1956), division and creation of new districts done at different time periods created difficulties in compiling of data. Shortage of man power and computational facilities had been the biggest limitation in this study.

The study is based on secondary data. Period covered is thirty years i.e. 1950-51 to 1979-80. In case of newly created district or the district which were bifurcated the starting period was the year of their formation or division.

While presenting data (original or derived) in the tables arrangement of district has been done in alphabetical order. In some tables where the districts have been categorised or ranked on the basis of some particular characteristic, the arrangement is based on the category or decending ranking order.

1.7.5 Presentation of Findings

The findings of this districtwise analysis of agricultural development in Madhya Pradesh is presented in this report which contains four parts and eight chapters as detailed below:

Part I Background

Chapter 1. Introduction

Chapter 2. The Setting

Part II Review

Chapter 3. Intra-State Disparities

Part III Discussion

Chapter 4. Input Structure

Chapter 5. Crop Performance and Adjustment

Chapter 6. Output Growth

Chapter 7. Agricultural Efficiency and Development

Part IV Abstract

Chapter 8. Summary and conclusions

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C H A P T E R- II
T H E S E T T I N G

2.1 Situation

Being centrally situated Madhya Pradesh is said to be the heart of India. Surrounded by Uttar Pradesh in the north, Bihar and Orissa in the east, Andhra Pradesh and Maharashtra in the South, Gujrat and Rajasthan in the west, Madhya Pradesh is spread between latitudes $17^{\circ}48'$ N to $26^{\circ}52'$N and longitudes 74° 2'E to 84° 24'E. Area of the state is 44,000 Sq.Kilometers.

2.2 Formation of the state

Madhya Pradesh came into existence on 1st November 1956 as a result of the reorganisation of the states broadly on linguistic basis. The present state constitutes Mahakoshal unit of the former Central provinces, whole of the former states of Vindhya Pradesh, Bhopal and Madhya Bharat (Excepting sunel enclave of Mandsour district which transferred to Rajasthan). Sironj sub-division of kota district in Rajasthan was merged with Vidisha district (formerly Bhilsa) of Madhya Pradesh.

The state comprises following 45 district coming from the different integrated territories (Table 2.1, Map 2.1)

At present the number of districts in the State is 45. Three former districts of Mahakoshal viz. Hoshangabad Sagar, and Chhindwara were bifurcated giving rise to three new districts viz. Damoh Narsinghpur and Seoni. In 1972 two new districts Bhopal and Rajnandgaon were carved out from Sehore and Durg districts.

Table 2.1 Constituent Units and districts of Madhya Pradesh

Name of former state	No.of District	Name of District integrated
Mahakoshal region of old Central Provinces	14	Sagar, Jabalpur, Mandla, Hoshangabad, Khandwa, Balaghat, Betul, Durg, Raipur, Bilaspur, Surguja Raigarh, Bastar and Chhindwara.
Madhya Bharat	16	Bhind, Morena, Gwalior, Shivpuri Guna, Vidisha, Rajgarh, Shajapur, Ujjain, Ratlam, Mandsaur, Dewas, Indore, Khargone, Dhar and Jhabua.
Vindhya Pradesh	8	Rewa, Satna, Sidhi, Shahdol, Datia, Panna, Chhatarpur, and Tikamgarh.
Bhopal	2	Sehore, and Raisen.
New district formed	5	Damoh, Seoni, Narsinghpur, Rajnandgaon and Bhopal.

2.3 Demographic Features

Madhya Pradesh is biggest 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, which was 20.07 millions formed 38.49 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.

2.4 Tribal Population

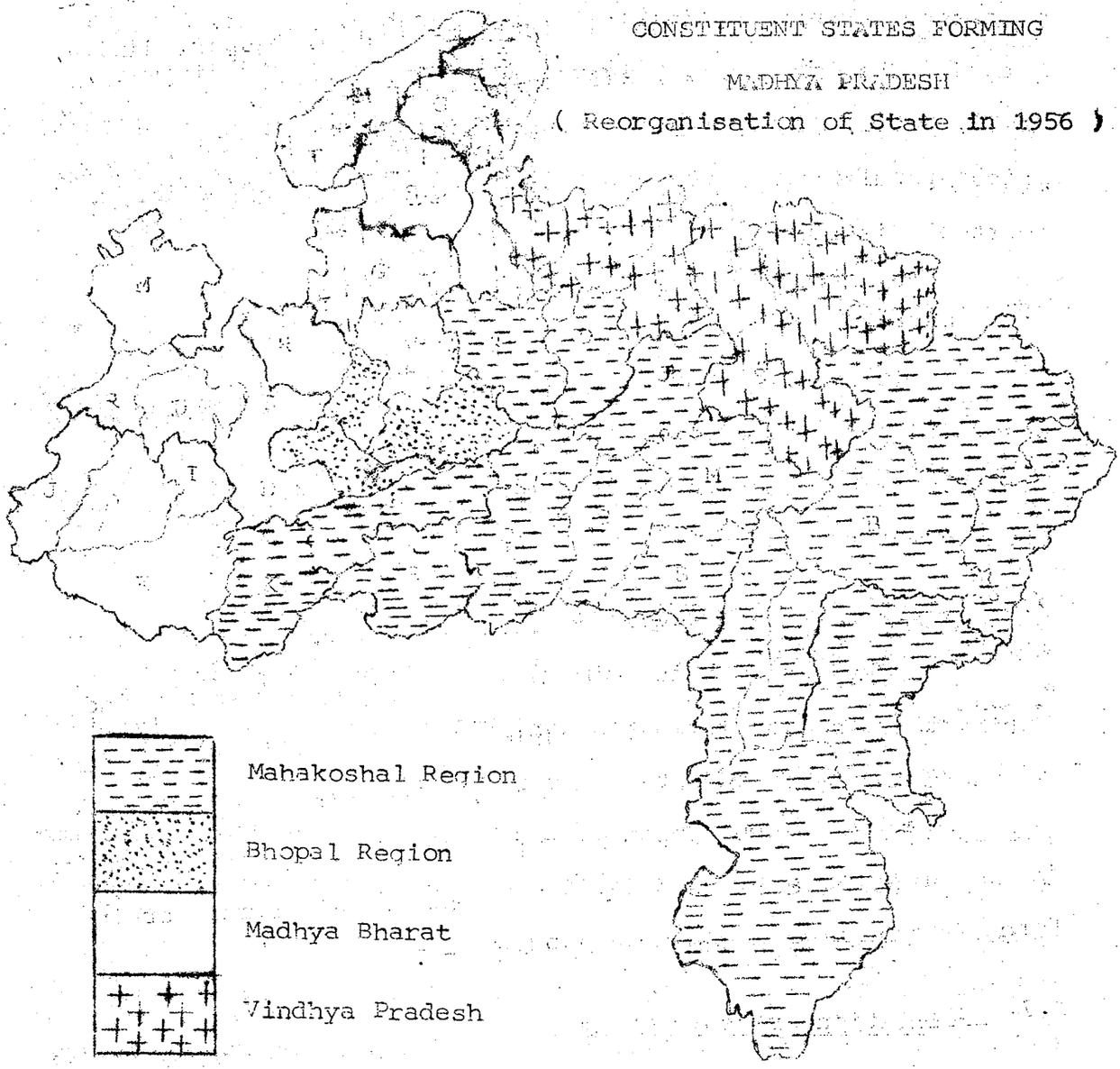
Madhya Pradesh bears the largest tribal population. It is 22.1 per cent of total tribal population in the country and 20 per cent of the total population of this State. Tribal population is

MAP 2.1

CONSTITUENT STATES FORMING

MADHYA PRADESH

(Reorganisation of State in 1956)



spread almost all over the State of Madhya Pradesh but their main concentration is in 14 district- Jhabua, Bastar, Mandla, Surguja, Shahdol, Dhar, Raigarh, Khargone, Seoni, Chhindwara, Sidhi, Betul, Bilaspur and Raipur. Eighty one per cent of total tribal population of the state is confined in the above mentioned fourteen districts.

2.5 Literacy

Literacy, in Madhya Pradesh as recorded in 1971 census was 22.14 per cent which increased to 27.82 per cent in 1981 census. Among urban population it was 53.98 per cent while the literacy of rural population was only 21.15 per cent.

2.6 Importance of Agriculture in State Economy

Madhya Pradesh is primarily an agricultural state and agricultural sector including agriculture and allied activities is the mainstay of the state economy, accounting for nearly 53 per cent of the state Income. Eighty per cent of the population in the state is rural and 87.44 per cent of it's rural working force is directly engaged in agriculture.

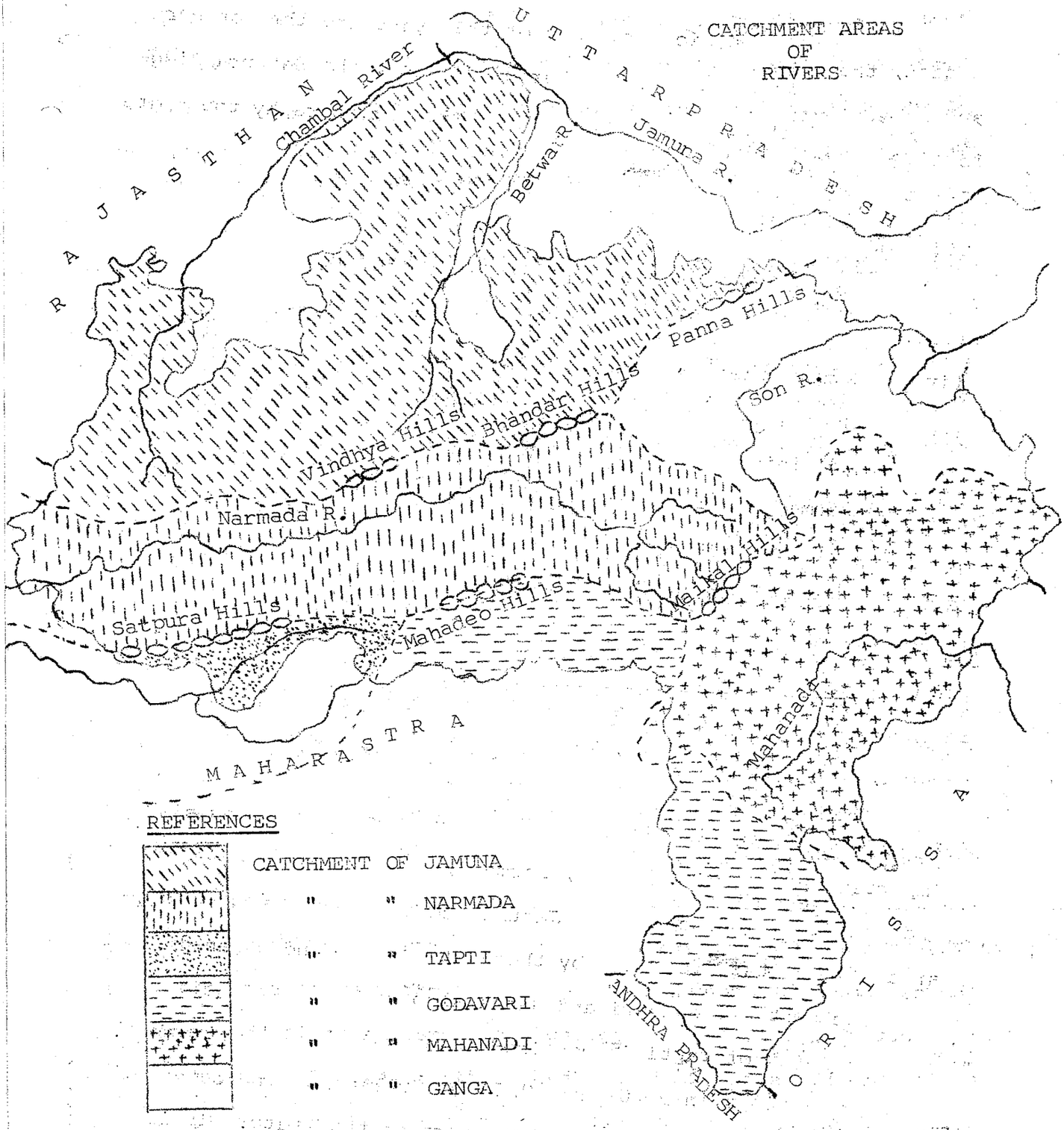
2.7 Population Pressure on Land

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.

2.8 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.

Map 2.2


CATCHMENT AREAS
OF
RIVERS
RAJASTHAN
UTTAR PRADESH
Chambal River
Betwa R.
Jamuna R.
Panna Hills
Son R.
Vindhya Hills
Bhandar Hills
Narmada R.
Satpura Hills
Mahadeo Hills
Maikal Hills
Mahanadi
MAHARASTRA
ORISSA
ANDHRA PRADESH
REFERENCES
CATCHMENT OF JAMUNA
" " NARMADA
" " TAPTI
" " GODAVARI
" " MAHANADI
" " GANGA

The main physical regions of the State are the Northern Region, the Malwa plateau, the Narmada valley, the Satpura Ridge and Chhattisgarh Plains. According to the physiography the state is divided into nine zones.

(i) Gird region

(ii) Bundelkhand and Shivpuri hills

(iii) Malwa plateau, Nimar plains and Jhanua hills.

(iv) Kymore plateau

(v) Sone area of Vindhyan and Malwa plateaues

(vi) Adjoining area of Vindhyan plateau

(vii) Narmada Valley

(viii) Satpura plateau

(ix) Chhatisgarh plains, plateau and other adjoining areas.

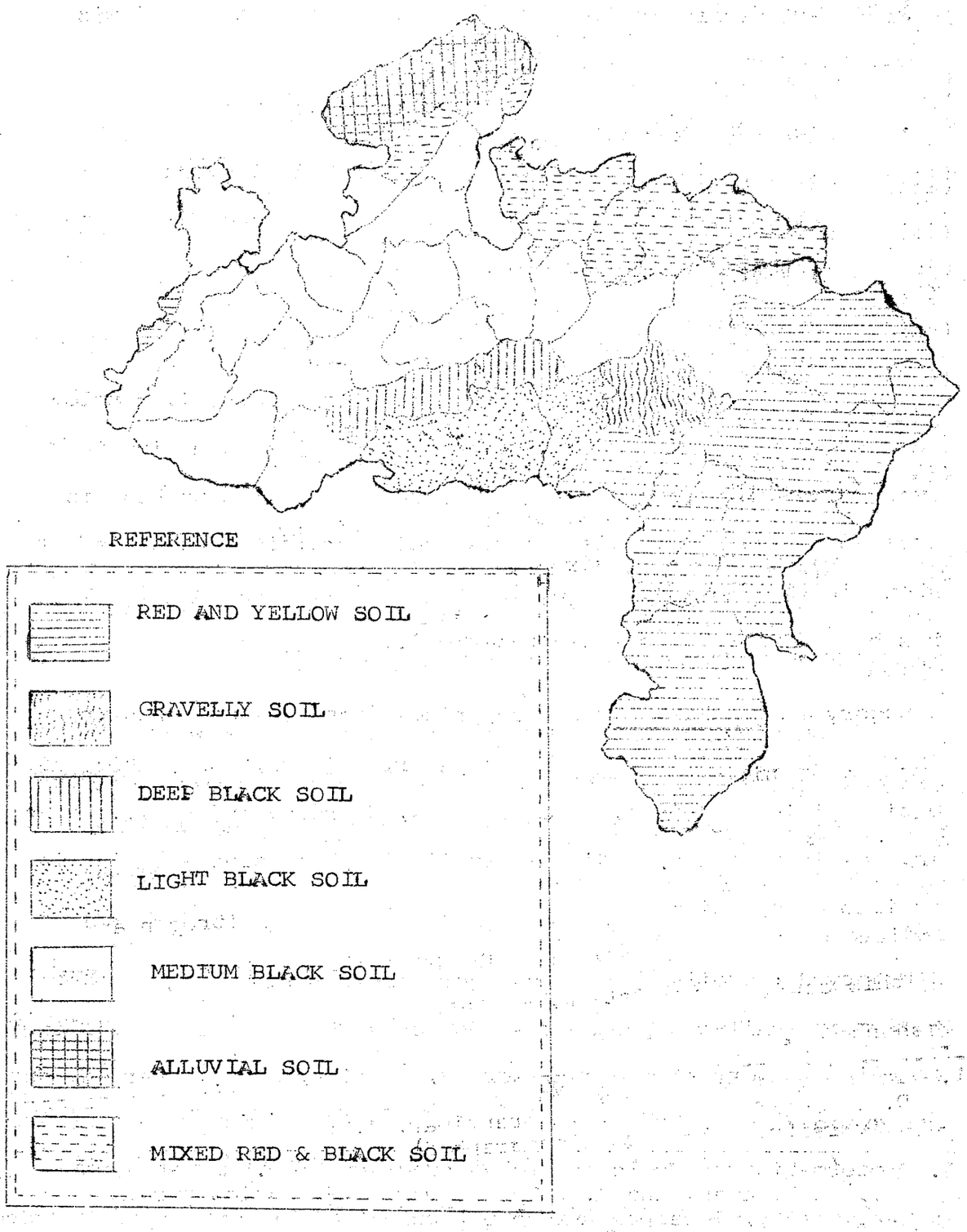
2.9 River Systems and Catchment Areas

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

The State is divided into six catchment areas of six important rivers viz. Jamuna, Narmada, Tapti, Godawari, Mahanadi and Ganga. The Catchment of Jamuna accounts for the biggest area of the state followed by those of Narmada and Mahanadi. The catchment of Godavari and Ganga also cover an appreciable area but that of Tapti is confined to a small area in the south of Satpura hills in Betul and Khandwa districts. The catchment of Narmada forms more or less central part of the State. It is separated from the catchment of Jamuna in the north by the ranges of Vindhya and Bhander hills, from the catchment of Tapti and Godavari in the south by the Satpura and Mahadeo hill ranges, from the catchment of Mahanadi in the east by Maikal hills and from the

Map. 2.3

SOIL TYPES
OF
MADHYA PRADESH



Reference : Agricultural Statistics of Madhya Pradesh, Directorate of Agriculture M.P. Bhopal

catchment of Ganges in the north east by the eastern flanks of the Vindhya hills. (Map 2.2)

2.10 Soil Types

The State has been broadly divided into the following seven major soil groups (Map 2.3).

(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.

2.11 Fertility Status

The analytical results of large number of soil samples have shown that soils of Madhya Pradesh are low to medium in available phosphorous and nitrogen, whereas medium to high in available potassium. Districtwise soil fertility status is shown in the Map 2.4. According to fertility status this State has been divided into six categories[1].

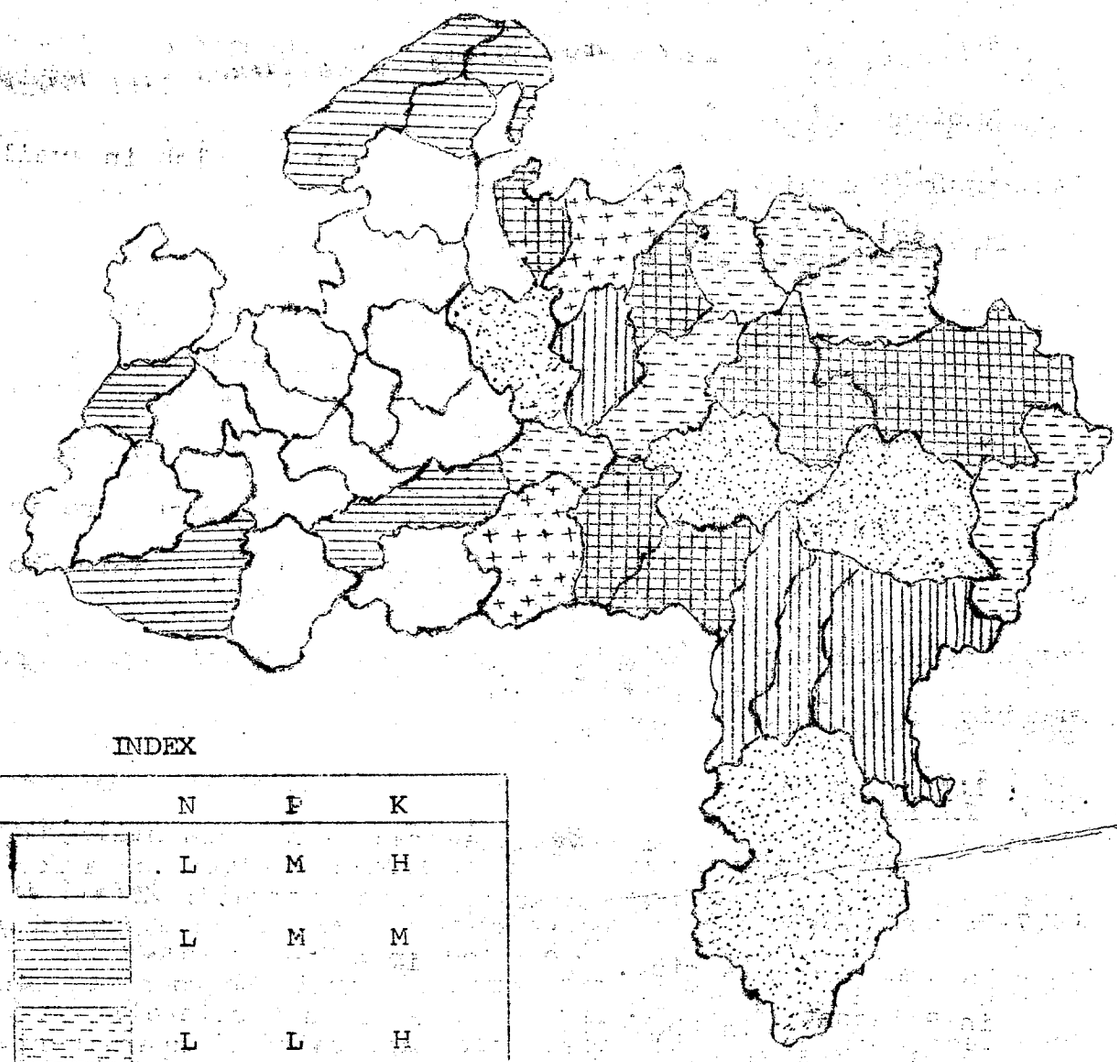
Category 1 : This category comprises districts of Mandsaur, Jhabua, Dhar, Ujjain, Indore, Shajapur, Rajgarh, Guna, Shivpuri, Datia, Vidisha, Raisen, Sehore, Dewas, Khargone and Betul. Soils are low in nitrogen, medium in available phosphorus and high in available potassium.

Category 2 : Soils of this category are low in nitrogen and medium in available phosphorus and potassium. Districts falling in this category are Ratlam, Morena, Gwalior, Bhind, Khargone and Hoshangabad.

1. Information on Soils of Madhya Pradesh' By S.S. Khanna, D.P. Motiramani and S.M. Gorantiwar, J.N. Agricultural University, Jabalpur (Mineographed)

Map. 2.4

FERTILITY STATUS OF SOILS
OF
MADHYA PRADESH



INDEX

	N	P	K
	L	M	H
	L	M	M
	L	L	H
	M	L	M
	M	L	H
	L	L	M
	M	M	H

L = Low
M = Medium
H = High

Reference:- "Information on Soils of Madhya Pradesh
By S.S.Khanna, D.P.Motiramani, S.M.Gorantiwar
Published by- Directorate of Extension J.N.K.V.V. Jabalpur
(Memeographed)

Category 3 : Districts of Narsinghpur, Jabalpur, Satna, Rewa, Sidhi and Raigarh come in this category. Fertility status of soils show that soils are poor in nitrogen and available phosphorus whereas high in available potassium.

Category 4: This category comprises Tikamgarh, Panna, Shahdol Ambikapur (Surguja) Seoni and Balaghat where soils are medium in nitrogen low in available phosphorus and high in available potassium.

Category 5 : Damoh, Durg and Raipur districts fall under this category. Soils are low in nitrogen and available phosphorus, whereas medium in available potassium.

Category 6 : Chhindwara and Chhatarpur districts are in this category, which are medium in nitrogen and available phosphorus and high in available potash.

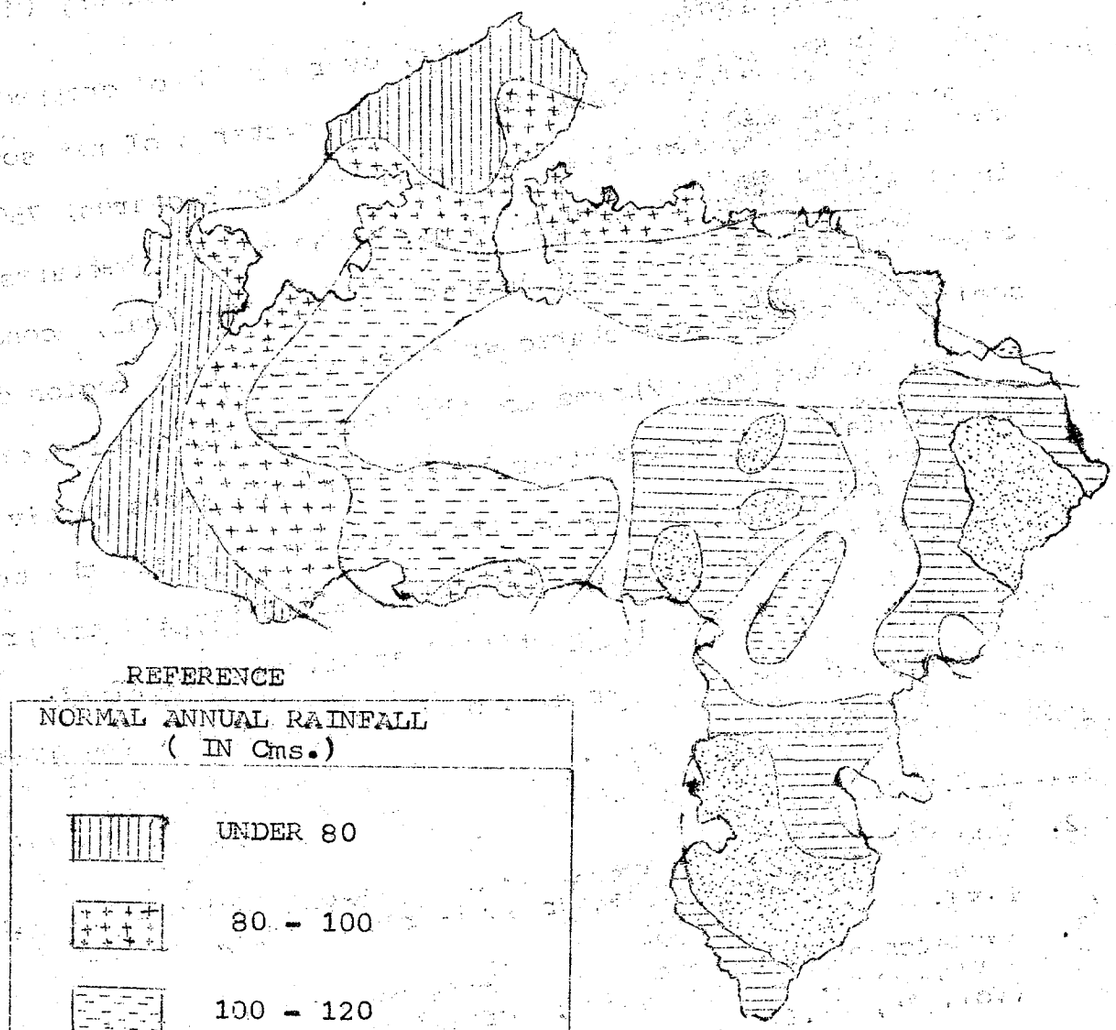
2.12 Rainfall

Based on three years average annual rainfall data for 1977-78 to 1979-80 the overall annual normal rainfall in Madhya Pradesh was 1135 mm. It varied from 750 mm. in Khargone to 1463mm. in Balaghat district. The most important rainfall characteristic of the state is that nine-tenth of it is received during the monsoon season i.e. June to September.

There were 17 districts which received rainfall less than 1000 mm. The districts receiving lowest rainfall were Khargone, Datia, Jhabua, Morena, Bhind, Shivpuri and Gwalior situated in the west and north western part of the State. The districts receiving rainfall above 1300 mm. were Balaghat, Raigarh, Bastar, Surguja and Mandla. (Map 2.5)

Map. 2.5

DISTRIBUTION OF ANNUAL NORMAL RAINFALL
IN
MADHYA PRADESH



REFERENCE

NORMAL ANNUAL RAINFALL
(IN Cms.)

- UNDER 80
- 80 - 100
- 100 - 120
- 120 - 140
- 140 - 160
- OVER -160

SOURCE:- METEOROLOGICAL DEPT
OF INDIA

Reference:- Published in Agricultural Statistics of Madhya Pradesh
Directorate of Agriculture M.P. Bhopal.

Neither total annual rainfall nor its distribution in various months of the year has any stability : both suffer from a high degree of variability. The coefficient of variation of rainfall for the State is 19.50 per cent. It ranges from 13.70 per cemt in Bastar district to 45.90 per cent in Bhind district.

2.13 SAT Area in M.P.

Barring a few districts of south east i.e. Chhatisgarh tract the entire State comes under semi-arid Tropical (SAT) Region which spreads over about 210 districts of the country (Map 2.6)[2]

In 210 districts of India, over two third cropped area has no irrigation. Out of 143 million hectares of net sown area, annual mean rainfall is over 1125 mm. in 41 million hectares, 750-1125 mm. in 51 million hectares, 350-750 mm. in 32 million hectares and below 350 mm. in 19 million hectares[3]. The physical, economic, social and technogical characteristics within this region differ widely. At the one extreme are the tracts which receive reasonably high rainfall and at the other extreme are the areas receiving very low rainfall. In between these two extremes are the tracts which are also very poor in irrigation facilities and are predominantly rainfed, generally identified as dry farming areas. In Madhya Pradesh about 88 per cent of the total cultivated area depends entirely on monsoon.

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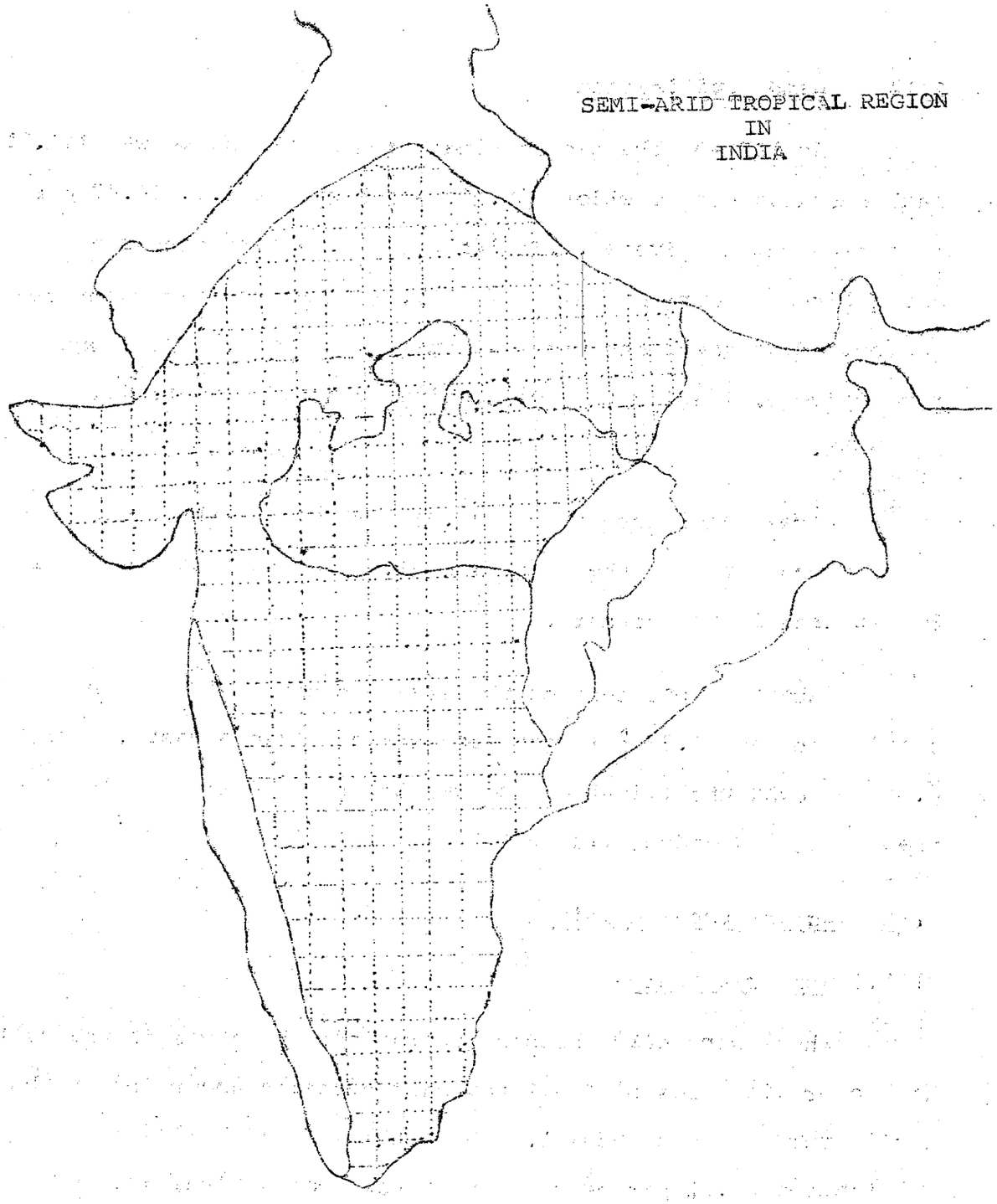
2. Economic Programme- Annual Report 1976-77, Inter-National Crop Research Institute for Semi-Arid Tropics, Hyderabad p.84.

3. Research and Development of Fertilizer use in Dry Land Agriculture, By HLS Tandon, Fertilizer News, June 1981 (Vol. 26, No.6) p.25.

Map. 2.6



SOURCE - 'Economics Program 'Annual Report 1976-77
ICRISAT Hyderabad, India.

2.14 Land Utilisation

In 1979-80 the geographical area of the state was 442.01 lakh hectares out of which 206.27 lakh hectares i.e. 46.67 per cent area was cultivated. It included 10.39 lakh hectares categorised as current fallow and 11.88 lakh hectares under old fallow. Both these categories formed 2.35 and 2.69 per cent respectively, leaving the net cultivated area equal to 41.63 per cent.

Area under forests was 31.96 per cent of the total geographical area of the State and 21.37 per cent of the total forest area in the country.

About 10 per cent of the area was not available for cultivation and 4.33 per cent land was cultivable waste. Another 6.82 per cent uncultivated land was under pastures, grazing land, tree crops and groves (Table 2.2)

2.15 Agricultural Holdings

2.15.1 Number and Area

There were 6410 thousand operational holdings in the state with operating area of 21931 thousand hectares according to the Agricultural Census 1980-81. The total area of holdings constituted 49.62 per cent of the total geographical area of the state.

2.15.2 Average Size of Holding

The average size of operational holding in the State was 3.4 hectares in 1980-81 as compared to the average of 3.6 hectares in 1976-77 and 4.0 hectares in 1970-71.

Table 2.2 Land use classification in Madhya Pradesh (1979-80)

P	Particulars	Area (Lakh Hect.)	Percentage to total geographical Area (%)
1.	Forest	141.28	31.96
2.	Not available for cultivation		
	a) Land put to non-agricultural	22.05	4.99
	b) Barren and un-cultivable Land	23.12	5.23
3.	Other un-cultivated land excluding fallow lands		
	a) Permanent pastures & grazing lands	28.71	6.49
	b) Land under misc.trees crops and groves	1.44	0.33
4.	Culturable waste land	19.14	4.33
5.	Fallow land		
	a) Current fallows	10.39	2.35
	b) Old fallows	11.88	2.69
6.	Cropped area		
	a) Net area sown	184.00	41.63
	b) Area sown more than once	24.26	-
	c) Total cropped area	208.26	-
	Total geographical area by village papers	442.01	100.00

2.15.3 Operational 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 (2102.5 thousand out of 6410.9 thousand) were less than one hectare each. These marginal and sub-marginal holdings together operated only 4.2 per cent of total area of operational holdings.

Marginal small and semi-medium holdings (i.e. below 4.0 hectares) formed 73.3 per cent to 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 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 (Table 2.3)

Table 2.3 Distribution of operational holdings in different Size groups, Madhya Pradesh(Agricultural Census 80-81)

Category & Size class(Hect)	Number of operational holdings (in'000)	Percentage Number of Operational holdings	Area of operational holdings ('000hect.)	Percentage	Average size of holdings (Hect.)
Marginal (Below 1.0 hect.	2102.5	32.8	930.1	4.2	0.4
Small 1-2 hect.	1226.4	19.1	1791.6	8.2	1.5
Semi-medium (2-4 hect)	1371.5	21.4	3871.5	17.7	2.8
Medium (4-10 hect)	1275.5	19.9	7875.9	35.9	6.2
Large (10 & above)	435.0	6.8	7462.0	34.0	17.2
Total :	6410.9	100.0	21931.1	100.0	3.4

Source : Agricultural situation in India- 1983, page-649, Table 3 and 4 Published by Directorate of Economics and Statistics, Department of Agriculture and Cooperation, Ministry of Agriculture.

2.16 Crop Zones

Madhya Pradesh is generally regarded to comprise three crop zones viz. rice-zone, wheat-zone, and jowar-zone. The last one is also known as cotton-jowar-zone because the major jowar growing districts also grow cotton. Some of the districts are, however, major with regard to more than one crop, thus the districts of Panna, Satna, Rewa, Jabalpur and Seoni which are major with regard to the areas of both rice and wheat are placed in the rice-wheat-zone. Similarly the district of Morena, Bhind, Gwalior, Datia, Shivpuri, Guna, Tikamgarh, Chhatarpur, Chhindwara and Betul are major from the view point of area of both jowar and wheat and therefore, categorised as jowar-wheat zone. Thus the state is divided in to the following five distinctly marked crop zones: (Map 2.7)

(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 and 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.

"These broad crop zones do present a general picture of the cropping pattern, however, these are highly heterogeneous with regard to specific agro-edaphic conditions and physical features of the region.....For the understanding of the full agricultural potential of the rainfed areas of this vast state, and any endevour to exploit this potential on the basis of this understanding one has to have a specific classification of the

regions. The grouping of areas on the basis of not only rainfall and its distribution but also on the basis of soil type, elevation and temperature pattern is essential. These groupings (Table 2.5) mainly done on the basis of rainfall and soil types, when viewed alongwith the cropzone delineation and physical features show that any one criteria does not depict the full picture of agricultural situation."[4]

'The five crop zones represent only broad divisions. If we examine topography, soil types and climatic parameters of a particular crop zone, we are struck by the fact that it is hardly a homogenous area. Therefore, it may not be worth while to make an effort to solve the agricultural problems on the basis of a crop zone. For instance, detailed study of the rice zone reveals that this vast area is clearly delineable into three more or less homogenous agro-climatic regions viz. (1) Chhatisgarh Plains, (2) Bastar Plateau and (3) Hill Regions of Chhatisgarh. Each of these regions is beset with its own specific problems. 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 identifying agro-climatic regions which should be treated as units for concentrating our 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 agroclimatic regions as given below[5].'

(Map 2.8)

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4. Strategy for Agricultural Develcpment of Rainfed Areas in Madhya Pradesh' D. Dharma, Laxman Singh and G.S. Tomar, Publoshed by Directorate of Research Services, J.N.Agriculture, University Jabalpur, 1973 Page 4.

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

Map. 2.7

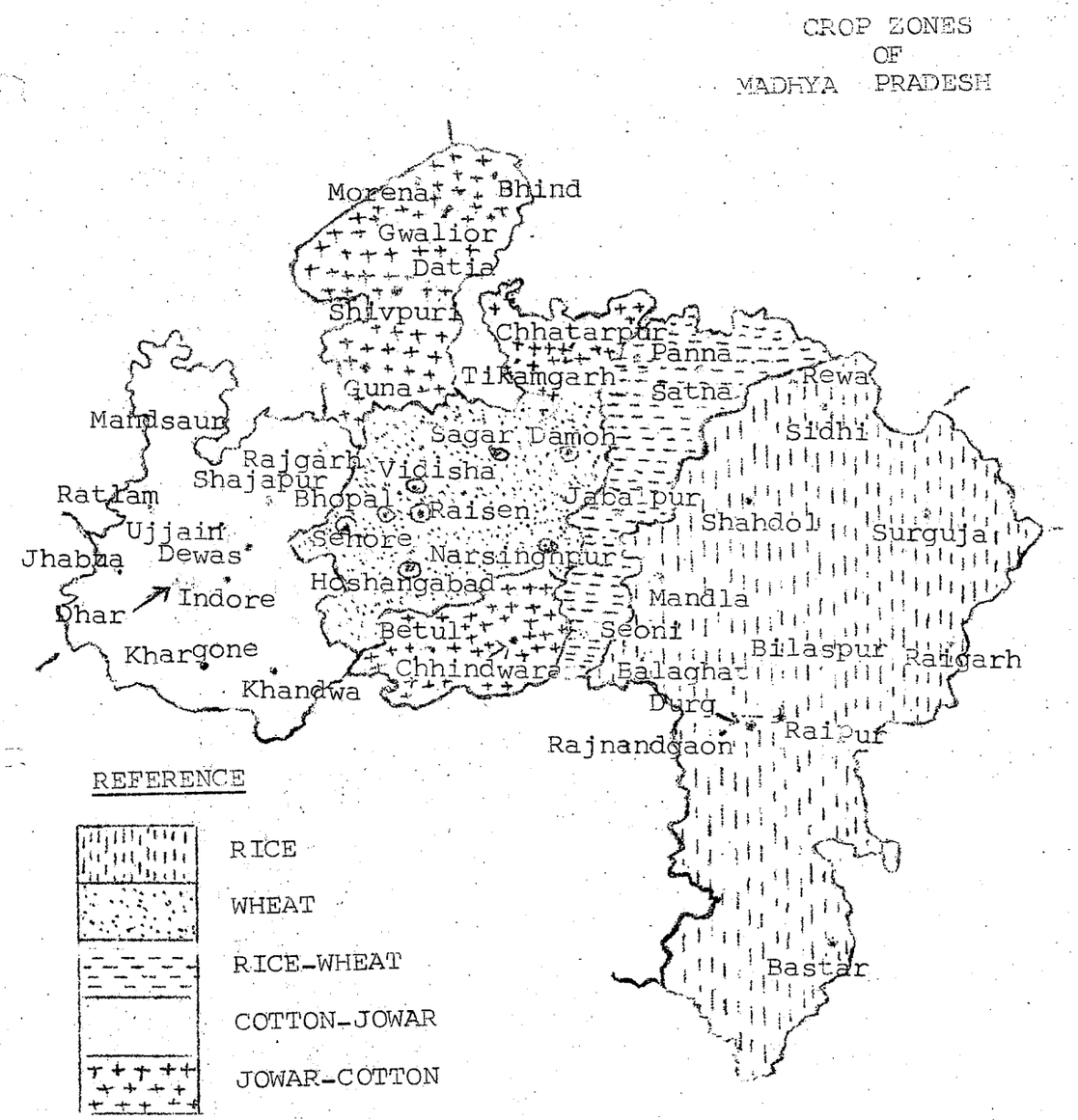
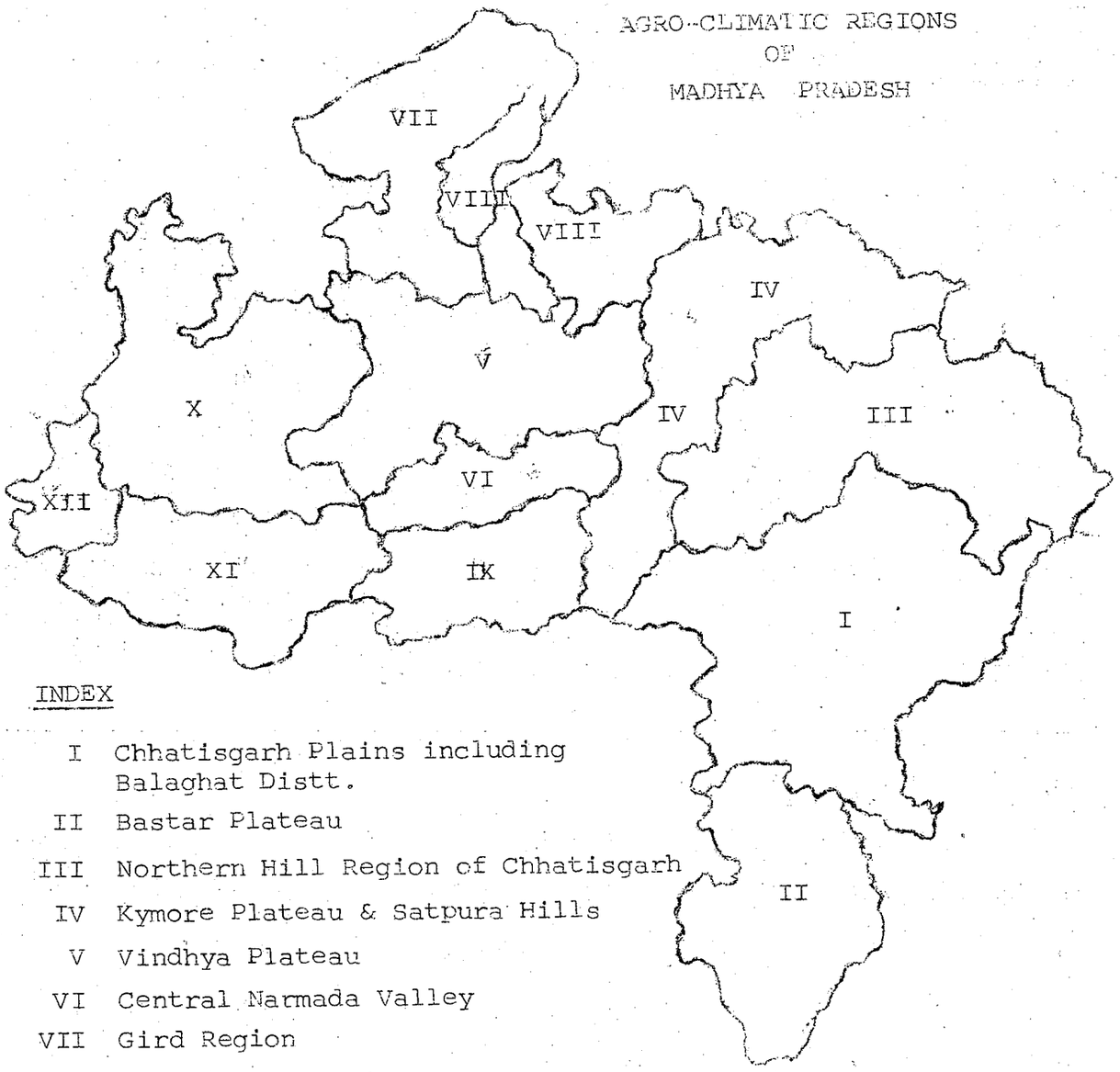

CROP ZONES
OF
MADHYA PRADESH
Morena
Bhind
Gwalior
Datia
Shivpuri
Chhatarpur
Panna
Tikamgarh
Rewa
Guna
Satna
Mandsaur
Sagar
Damoh
Sidhi
Rajgarh
Vidisha
Shajapur
Ratlam
Bhopal
Raisen
Jabalpur
Shahdol
Surguja
Ujjain
Sehore
Dewas
Narsinghpur
Jhabua
Hoshangabad
Indore
Mandla
Dhar
Betul
Seoni
Bilaspur
Raigarh
Khargone
Chhindwara
Balaghat
Khandwa
Durg
Raipur
Rajnandgaon
REFERENCE
RICE
WHEAT
RICE-WHEAT
COTTON-JOWAR
JOWAR-COTTON
Bastar

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

Crop Zone	Region	Area covered
Rice Zone	I Chhatisgarh plains including Balaghat district.	The districts of Raipur, Durg, Bilaspur, Rajnandgaon and Balaghat together with Kanker tahsil of Bastar, and Raigarh, Sarangarh and Gharghoda, tahsils of Raigarh district constitute the Chhatisgarh plains.
	II Bastar Plateau	Excepting the Kanker tehsil, the entire Bastar district is the jurisdiction of this region.
	III Northern Hill Regicn of Chhatisgarh	Singrauli tahsil of Sidhi District, the districts of Shahdol Surguja and Mandla and the Jespur and Dharmajaigarh tahsils of Raigarh district comprise this region.
Rice-wheat Zone	IV Kymore Plateau and Satpura Hills	Physical jurisdiction of the region is spread over the districts of Rewa, Satna, Panna Jabalpur and Seoni together with Gopadbanas and Deosar tahsils of Sidhi district.
Wheat zone	V Vindhyan Plateau	The districts of Damoh, Sagar, Vidisha, Bhopal, Raisen (Except Bareli tahsil) and Sehore (except Budni tahsil) and Chachoda and Raghogarh tahsils of Guna district constitute the Vindhyan Plateau.
	VI Central Narmada Valley	Narsinghpur and Hoshangabad districts (except Harda tahsil) Budni tahsil of Sehore and Bareli tahsil of Raisen district comprise this region.
Jowar-wheat Zone	VII Gird Region	Districts of Gwalior, Morena, Bhind and parts of Shivpuri (Shivpuri, Kolaras, Pohri tahsils) and Ashoknagar, Mungeli tahsils of Guna district constitute this region.

Cond...

Map. 2.8



INDEX

I	Chhatisgarh Plains including Balaghat Distt.
II	Bastar Plateau
III	Northern Hill Region of Chhatisgarh
IV	Kymore Plateau & Satpura Hills
V	Vindhya Plateau
VI	Central Narmada Valley
VII	Gird Region
VIII	Bundelkhand Region
IX	Satpura Plateau
X	Malwa Plateau
XI	Nimar Plateau
XII	Jhabua Hills

	VIII Bundelkhand Region	Districts of Datia, Tikamgarh Chhatarpur and parts of Shivpuri (Karera and Picchor tahsils) and Guna (Guna tahsil) districts constitute the region.
	IX Satpura Plateau	Districts of Betul and Chhindwara constitute this region.
Cotton-Jowar Zone	X Malwa Plateau	Districts of Mandsaur, Rajgarh, Ujjain, Indore, Dewas, Shajapur Ratlam and parts of Dhar (Badnawar and Sardapur tahsils) and Jhabua (Petlawad tahsil) districts constitute this region.
	XI Nimar Valley	Districts of Khandwa, Khargone and Harda tahsil of Hoshangabad district and Manawar tahsil of Dhar district constitute the Nimar Valley region.
	XII Jhabua Hills	Four tahsils of Jhabua district (Thandla, Jhabua, Jobat and Alirajpur) and Kukshi tahsil of Dhar district constitute this region.

2.17 Irrigation

Though ultimate irrigation potential of the State assessed by the Central Water Commission is 99.3 lakh hectares which is about 44 per cent of the total culturable area, the State lags much behind the all India 25.7 per cent of net irrigated area to net area sown. In this State only 11.6 per cent of net area sown and 12.2 per cent of gross area sown was irrigated in 1979-80. Districtwise proportion of irrigated area varied from less than two per cent in Vidisha Mandla, Shahdol and Bastar districts to more than forty per cent in Balaghat and Morena districts.

Table 2.5 : Classification and Characteristics of Different Regions on the basis of Rainfall, Soil Types, Topography and Irrigation Potential

Region	Range of rainfall in mm	Soil type	Districts	Normal mean rainfall in mm	Geographic regions	Crop zone
1.	600-850	Alluvial	Morena, Gwalior, Bhind	713.3	Northern Plain	Jowar-Wheat
2.		Mixed red and black	Datia	739.4	Bundelkhand	Jowar-Wheat
3.		Medium black	Jhabua, Mandsaur, Khargone and Dhar	829.3	Jhabua plateau Nimar plains Malwa plateau	Jowar-Cotton
4.	851-1050	Medium black	Indore, Ratlam, Ujjain, Shajapur and Khandwa	924.0	Malwa plateau and Nimar plains	Jowar-Cotton
5.		Mixed red and black	Tikamgarh and Shivpuri	908.7	Bundelkhand	Jowar-Wheat
6.	1051-1250	Mixed red and black	Rewa, Satna, Panna and Chhatarpur.	1146.7	Bundelkhand, Kymore plateau (Baghelkhand)	Rice-Wheat Jowar-Wheat
7.	1051-1250	Medium black	Sehore, Dewas, Guna, Vidisha, Rajgarh, Sagar, Damoh, Sidhi	1165.5	Malwa plateau and Vindhya plains	Wheat-Jowar-Cotton, Jowar Rice.
8.		Shallow black	Betul	1083.9	Satpura plateau	Jowar-Wheat
9.	251-1450	Red-Yellow	Raipur, Durg, Bilaspur, Shahdol	1360.9	Chhattisgarh & Shahdol plains.	Rice
10.		Medium black	Jabalpur, and Raisen	1303.3	Narbada Valley	Rice-Wheat
11.		Shallow black	Chhindwara and Seoni	1354.3	Satpura plateau	Jowar-Wheat
12.		Deep black	Hoshangabad and Narsinghpur	1297.7	Narbada Valley	Wheat
13.	1451-1650	Red-Yellow & Skeletal	Bastar, Raigarh, Surguja, Balaghat and Mandla.	1567.7	Bastar, plateau, Satpura plateau and Raigarh plains	Rice

Reference: Strategy for Agricultural Development of Rainfed Areas in Madhya Pradesh, By D. Sharma, Laxman Singh, G.S. Tomar Department of Plant Breeding and Genetics, Published by Directorate of Research Services, JNKVV, Jabalpur, 1973.

2.18 Cropping Pattern

In Madhya Pradesh about 87 per cent of the net area sown is mono-croped. In 1979-80 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 of the State, food grains occupy dominating position. As much as 60.21 per cent of the gross cropped area was occupied by cereals and 22.30 per cent by pulse crops. Other food crops like fruits vegetables, potato, sugarcane, condiments and spices which are also commercial crops covered only 1.54 per cent of the gross cropped area (Table 2.5)

Among commercial crops oil seeds were most important. They occupied as much as 8.37 per cent area followed by fibre crops (mainly cotton) which shared only 2.93 per cent area.

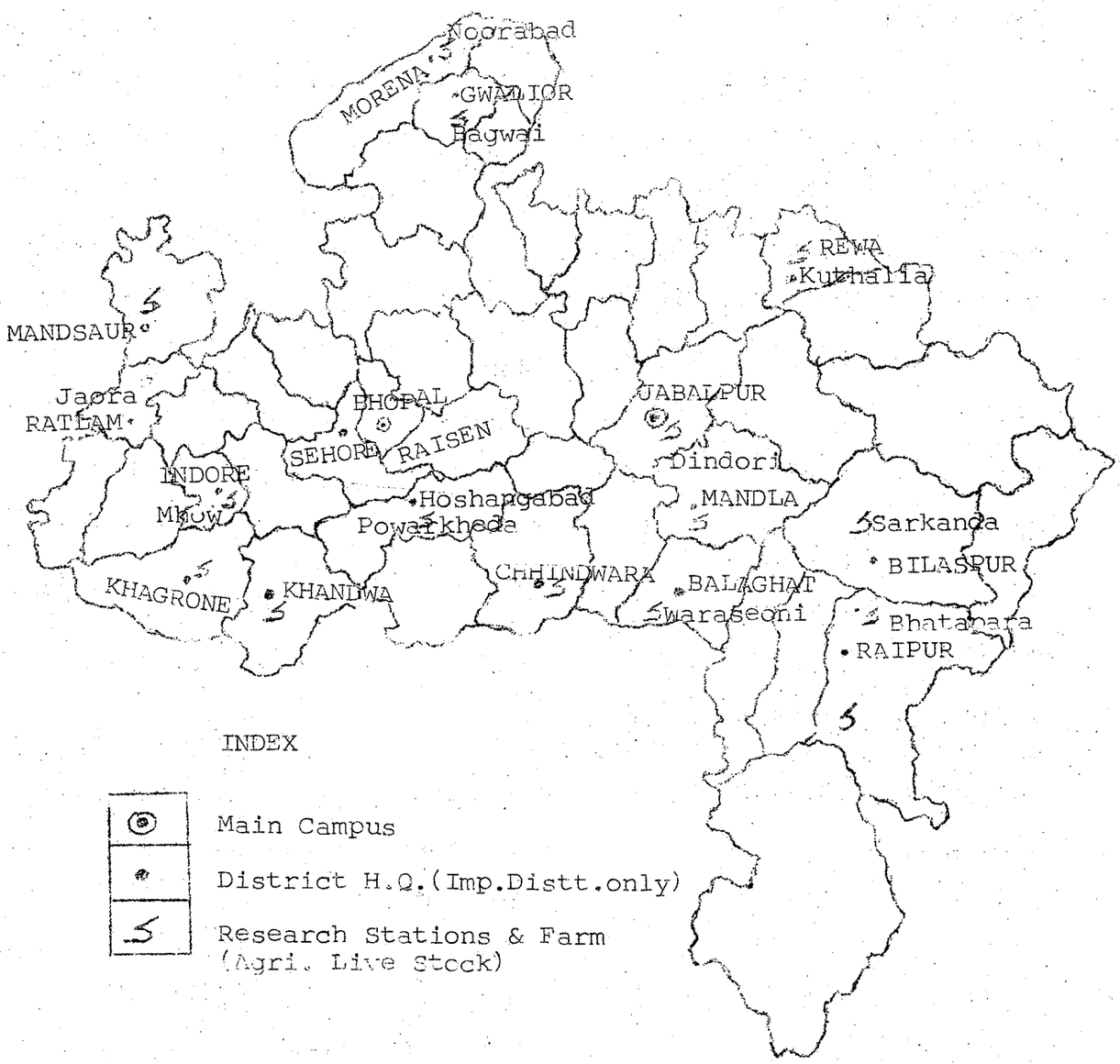
There were marked differences with regard to the importance of different crops in different crop zones of the State.

Table 2.6 Cropping Pattern of Madhya Pradesh (1979-80)

Crops/Crop	Categories	Area (Thousand Hect.)	Percentage to Gross cropped Area
I	Cereals	12607	60.21
II	Pulses	4669	22.30
Total	Food Grains	17276	82.51
III	Oil Seed crops	1753	8.37
IV	Sugarcane	36	0.17
V	Fibre Crops	614	2.93
VI	Fruits and Vegetables &Potato	179	0.86
VII	Spices	107	0.51
VIII	Miscellaneous Crops	973	4.65
Gross Cropped Area		20938	100.00

MADHYA PRADESH

Main & Constituent Campuses
Farm & Research Stations
of JNKVV, Jabalpur



2.19 Agricultural Research in Madhya Pradesh

With the reorganisation of the State in 1956 the present Madhya Pradesh was deprived of one of the old agricultural teaching and research Centre i.e. Nagpur. The two old research Stations- Raipur for rice and Powardheda (Hoshangabad) for wheat remained in the state and some new centres of Rewa, Gwalior, Sehore and Indore which were formerly in Vindhya Pradesh Madhya Bharat or Bhopal State, came under the jurisdiction of the present M.P. In the beginning i.e. from 1956 to 1964, agricultural research in the State was carried over by the Department of Agriculture. In 1964, when Jawaharlal Nehru Agricultural University was formed with its head quarters at Jabalpur and different campus at Indore, Gwalior, Mhow, Sehore, Raipur and Rewa, as well as farms at Pawarkheda (Hoshangabad) and seventeen other places the entire agricultural research work in the state was passed on to the University. The over all research infrastructure of this University at present is as given below :-

Category	No.	Location
I Zonal Stations	6	Jabalpur, Indore, Raipur Sehore, Gwalior and Powarkheda(Hoshangabad)
II Regional Stations	6	Ambikapur(Surguja), Jagdalpur, (Bastar)Rewa, Tikamgarh, Chhindwara, Khandwa.
III Special Stations	5	Dindori(Mandla)Sagar, Morena, Mandsaur and Khargone
IV Research Stations	20	Bilaspur, Waraseoni(Balaghat) Bagwai(Gwalior) Jaora(Ratlam) Ujjain, Badnawara (Dhar) Jhabua, Mhow (Indore)Chhatarpur, Entkhedi(Bhopal) Guna, Raigarh Raisen Harda(Hoshangabad) Kharperkheda (Hoshangabad)Bohani (Narsinghpur) Bari (Raisen) Sidhi, Betul, Barwaha(Khargone)

****

Part Two

R E V I E W

CHAPTER- III

INTRA-STATE DISPARITIES

3.1 Introduction

During last two or three decades several attempts were made to measure the levels of productivity, efficiency or development attained by various regions or districts in different States of the country. In Madhya Pradesh too some such studies were conducted in the past. In order to study the problem in correct perspective a retrospective account of some of the studies conducted to high light the regional disparities and measure or study the regional or district wise agricultural growth and development in the State of Madhya Pradesh may form a useful part of the report. A brief account of some of the earlier studies is given ahead.

3.2 Agricultural Development Regions :

In his paper "Regional Approach to Agricultural Development in India- Some Preliminary Results"[1], P.S. Sharma delineated regions on the basis of composite resource indices and composite productivity indices. The selected indicators, which he used for assessing the potential level of agricultural development, were: (i) Gross area irrigated as percentage of gross area sown, (ii) Average annual rainfall, (iii) Extent of cultivated area, (iv) Itensity of cropping, (v) Soil Characteristics topography, texture and structure, climatic suitability, salinity stoniness and tendency to erode (soil productivity), (vi) Gross area sown per capita.

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1. A Regional Approach to Agricultural Development in India- Some Preliminary Results, P.S. Sharma, Paper published in IndianJournal of Agricultural Economics, Conference Number January- March 1964.

He had computed 'composite resource indices' and 'composite productivity indices' for all districts. His results related to the districts of Madhya Pradesh are given in table 3.1.

Table 3.1 Delineation of Agricultural Regions on the Basis of Resource and Productivity Indices (By P.S. Sharma)

Region		District	Composite Resource Indices	Composite + Productivity Indices
(a) North Western (Madhya Bharat Low Lands)		Morena*	152	88
		Bhind	199	106
		Gwalior	218	121
		Datia	122	98
		Shivpuri	218	98
(b) Northern	b_1	Tikamgarh	208	179
		Chhatarpur	176	146
	b_2	Sagar	127	67
		Narsinghpur	123	N.A.
		Damoh	132	N.A.
(c) Eastern	c_1	Panna	143	81
		Satna	152	75
		Rewa	152	53
		Shahdol	141	85
		Sidhi	154	68
		Surguja	152	112
		Raigarh	118	118
	c_2	Bilaspur	216	120
		Raipur	252	109
		Bastar*	167	122
		Durg	233	120
		Balaghat	288	128

Contd....2/-

Region		District	Composite Resource Indices	Composite + Productivity Indices
(d)	Central Southern	Mandla	158	84
		Jabalpur	172	85
		Seoni	151	N.A.
		Chhindwara	149	91
		Betul	173	74
		Hoshangabad	148	81
(e)	Western			
(e_1)	Madhya Bharat Plateau & Bhopal Division	e_{1-1} Raisen	116	79
		Vidisha (Bhilsa)	103	53
		Guna	129	119
		Sehore	130	89
		Dewas	122	77
		E.Nimar(Khandwa)	124	92
		Indore	133	90
		Ujjain	112	57
		Shajapur	152	73
		Rajgarh	153	62
		Mandsaur	180	61
		Ratlam	146	55
(e_2)	Madhya Bharat Hills	Jhabua*	124	69
		Dhar	164	62
		W.Nimar(Khargone)	172	85

+ Productivity indices have been worked out on the basis of rice and wheat crops only.

* Districts geographically continuous but heterogeneous with regard to resources.

N.A. Information on productivity indices is not available.

3.3 Resource Development Regions and Divisions[2].

To demarcate the areas having similar conditions and development potentials, Planning Commission of India had divided the country into 15 regions with 61 divisions. It was based on the analysis of data on topography, soils, climate, geologic formations, land utilization, irrigation, cropping pattern and availability of mineral resources for each district of the country.

The State of Madhya Pradesh was covered by three resource Development Regions and divided into five Divisions: (Table 3.2 and Map 3.1)

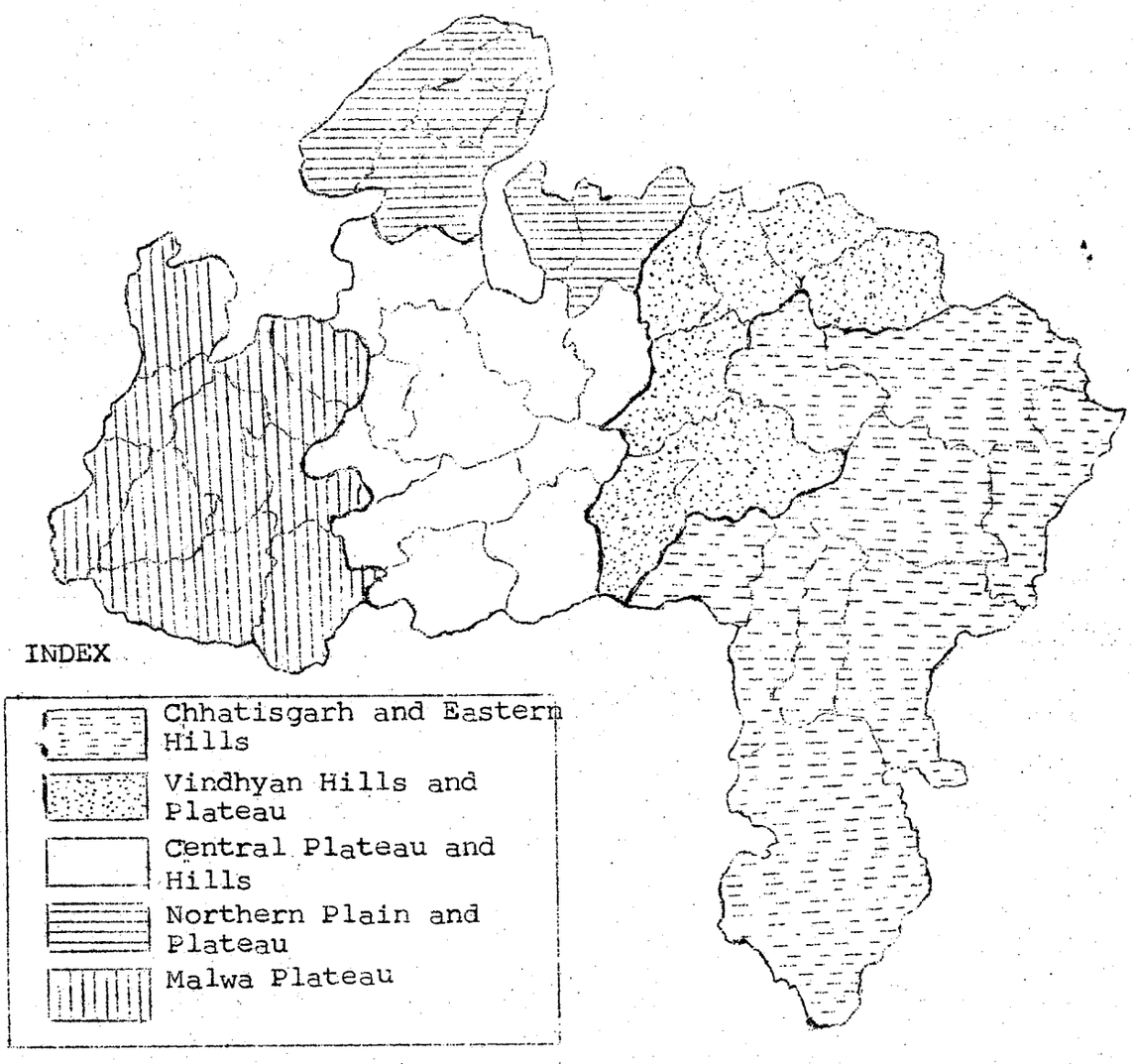
Table 3.2 Classification of Districts of Madhya Pradesh in Resource Development Regions and Divisions*

Region	Division in M.P.	Districts of M.P.
1. Eastern Plateaus and Hills	Eastern Hills and Chhatisgarh	Balaghat, Durg, Raipur, Bilaspur Surguja, Raigarh, Bastar, Shahdol.
2. Central Plateaus and Hills	Northern Plains and Plateaus	Bhind, Morena Gwalior, Shivpuri, Datia, Tikamgarh, Chhatarpur.
" "	Vindhyan Hills and Plateaus	Jabalpur, Mandla, Seoni, Rewa, Satna, Sidhi, Panna
" "	Central Plateaus	Sagar, Damoh, Hoshangabad, Narshinghpur, Betul, Chhindwara, Vidisha, Sehore, Raisen, Guna.
3. Western Plateaus	Malwa Plateau	Khandwa, Rajgarh, Shajapur, Ujjain, Ratlam, Mandsaur, Dewas, Indore, Khargone, Dhar, Jhabua.

2. Resource Development Regions & Divisions of India- Planning Commission, Govt. of India, New Delhi, 1965.

MAP 3.1

RESOURCE DEVELOPMENT DIVISIONS
OF
MADHYA PRADESH



Ref: "Resource Development Regions and Divisions of India"
By Planning Commission Govt.of India, 1964.

3.4 Regional Variations in Agricultural Productivity

In a study on 'Regional Variations in Agricultural Productivity in Madhya Pradesh[3], (1956-57 to 1962-63),Dr.S.P.Pant, studied the variations in yields per acre of eleven selected crops and constructing composite crop yield indices divided the districts into three categories:

1. High Agricultural Productivity Districts :-

Tikamgarh, Bhind, Gwalior, Chhatarpur, Morena, West Nimar (Khargone), Shivpuri, Dewas, Balaghat, Datia, Vidisha,Narsinghpur.

2. Average Agricultural Productivity Districts :

Durg, Bastar, Bilaspur, Shajapur, Sidhi, East Nimar(Khandwa), Sehore, Chhindwara, Raisen, Raipur, Guna, Raigarh, Jabalpur,Mandla, Panna.

3. Low Agricultural Productivity Districts :

Sagar, Indore, Mandsaur, Shahdol, Ujjain, Ratlam, Satna, Hoshangabad, Dhar, Betul, Damoh, Rajgarh, Seoni, Jhabua, Surguja, Rewa.

Concluding from the results of his study he mentioned,- "The study of variations of yields of individual crops has revealed regions where yield rates are increasing or decreasing. It has also helped us to locate regions which have improved their relative position in the state in respect of yield of the crop under reference. However, yields per acre in a region are observed to be high for some crops but low for the others. Similarly importance of crops too varies from region to region. On account of these characteristics overall comparison of regions is not possible without constructing some sort of a composite index which would take care of both the yield per acre of different crops as also their relative importance in the different regions".

3. Regional Variations in Agricultural Productivity in Madhya Pradesh (1956-57 to 1962-63) by Dr. S.P. Pant, Agricultural Economist, J.N. Agril. University, Jabalpur (Mimeographed).

The composite crop yield indices constructed for all the districts of the State, in the above study are given in table 3.3.

Table 3.3. Composite Crop Yield Indices for all Districts of Madhya Pradesh (By Dr. S.P. Pant)

Rank	High		Medium		Low	
1.	Tikamgarh	144.64	Durg	104.41	Sagar	94.40
2.	Bhind	142.75	Bastar	104.13	Indore	91.80
3.	Gwalior	142.23	Bilaspur	103.24	Mandsaur	91.42
4.	Chhatarpur	124.68	Shajapur	102.52	Shahdol	89.86
5.	Morena	122.44	Sidhi	102.08	Ujjain	89.76
6.	Khargone	116.59	Khandwa	101.68	Ratlam	88.19
7.	Shivpuri	114.05	Sehore	100.07	Satna	87.67
8.	Dewas	108.96	Chhirdwara	99.81	Hoshangabad	87.07
9.	Balaghat	108.68	Raisen	97.89	Dhar	86.82
10.	Datia	107.07	Raipur	97.76	Betul	85.94
11.	Vidisha	105.77	Guna	97.69	Damoh	85.92
12.	Narsinghpur	105.74	Raigarh	97.29	Rajgarh	84.40
13.	-	-	Jabalpur	95.91	Seoni	83.69
14.	-	-	Mandla	95.90	Jhabua	82.96
15.	-	-	Panna	95.71	Surguja	82.91
16.	-	-	-	-	Rewa	79.70

3.5 Regions with Different Levels of Food Grains Production

Dr. S.R. Sen[4] who had classified the districts of each State State into four regions with different levels of food grains production. His classification of the districts was based on volume and variation of rainfall, irrigation and crop yields.

4. Growth and Instability of Indian Agriculture Dr. S.R. Sen Address Delivered at the Twentieth Annual Conference of the Indian Society of Agricultural Statistics at Waltair on 10th January 1967.

: 46 :

He had classified the districts into four categories viz : A, B_1 B_2 and C. The characteristics of these four categories were as given below :

(A) Areas where there is an assured water supply both in volume and in spread either from assured rainfall or from sources of irrigation (e.g. tubewells, deep bore wells, canals from snowfed rivers or storage dams) which are not unduly dependent on the vegaries of the monsoon :

(B) Areas where supply of water rainfall or sources of irrigation largely dependent on the monsoon (e.g. tanks, ordinary wells, run of the river cannals depending entirely on the monsoon) is subject to large fluctuations in terms of volume or spread. These areas may again be divided into two broad sub-groups:

(B_1) Those where droughts are relatively less frequent; and

(B_2) Those where droughts are relatively more frequent:

(C) Areas where there is no dependable irrigation and where rainfall is scanty and precarious.

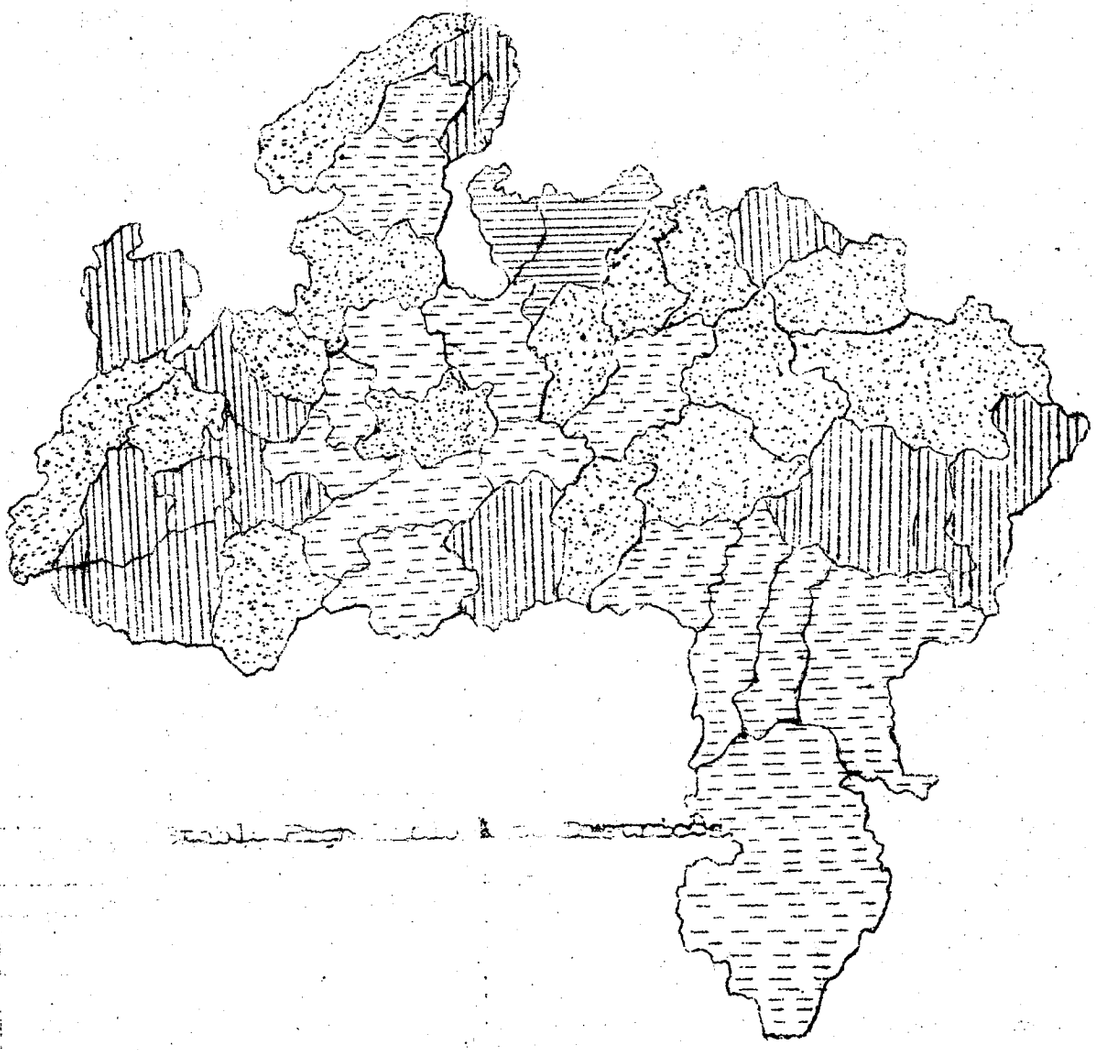
In his classification the districts of Madhya Pradesh were placed in the following categories (Table 3.4 and Map 3.2).

Table 3.4 Regions with Different levels of Food Grains Production (as classified by Dr. S.R. Sen)

A.	Stable High Yield Rate Districts	Tikamgarh, Chhatarpur
B1	Less Stable Medium Yield Rate Districts	Raipur, Balaghat, Durg, Bastar, Gwalior, Shivpuri, Jabalpur, Narsinghpur, Sagar, Vidisha, Sehore, Hoshangabad, Betul.
B2.	Unstable Medium Yield Rate Districts	Bhind, Datia, Mandsaur, Shajapur, Dewas, Indore, Dhar, Khargone, Raisen, Chhindwara, Rewa, Bilaspur, Raigarh.
C.	Unstable low Yield Rate Districts	Morena, Guna, Rajgarh, Ujjain, Raltam Jhabua, Khandwa, Damoh, Panna, Satna, Sidhi, Shahdol, Surguja, Seoni, Mandla.

MAP 3.2

REGIONS WITH DIFFERENT LEVELS OF FOOD-GRAINS PRODUCTION IN MADHYA PRADESH



- Stable High Yield Rate Districts
- Less Stable Medium Yield Rate Districts
- Unstable Medium Yield Rate Districts
- Unstable Low Yield Rate Districts

3.6 Inter District Comparison of Agricultural Development

In 1969, V.M. Jakhade and H.B. Shivmaggi conducted a study on "Inter-District comparison of Agricultural Development and Spread of Banking Facilities in the Rural Areas"[5]. They had done statewise ranking of districts according to the level of agricultural development. They constructed a composite index for each district in each State separately on the basis of important physical factors viz :

(i) Proportion of gross irrigated area to the gross cropped area
(ii) Normal rainfall and the degree of it's assuredness
(Iii) Intensity of cropping
(iv) Proportion of area under cash crops to the cropped area
(v) The fertility of soils
(vi) The extent of surplus or deficit in respect of cereals.

The study presented statewise picture, ranking the districts according to the level of their agricultural development. Ranking of the districts of Madhya Pradesh that emerged from the study was as given in Table 3.5.

3.7 District wise Economic Indicators

The Directorate of Economics and Statistics, Govt of Madhya Pradesh, broughtout its' publication entitled "Districtwise Economic Indicators of Madhya Pradesh.(1960-61 to 1970-71)[6] in 1973.

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5. "Inter District Comparison of Agricultural Development and Spread of Banking Facilities in the Rural Areas" by V.M.Jakhade and H.B.Shivamaggi, Reserve Bank of India, Bulletin, October, 1969.

6. Districtwise Economic Indicators of Madhya Pradesh(1960-61 to 1970-71) Economic Analysis Division, Directorate of Economics and Statistics Madhya Pradesh, Bhopal, 1973.

Table 3.5 Ranking of Districts according to the level of Agricultural development in Madhya Pradesh.

S.No.	Name of the districts	Composite Index	Rank
1.	Balaghat	188.8	1
2.	Raipur	174.3	2
3.	Tikamgarh	162.3	3
4.	Chhatarpur	133.0	4
5.	Gwalior	128.1	5
6.	Bilaspur	125.4	6
7.	Durg	121.4	7
8.	Shivpuri	114.7	8
9.	Mandsaur	106.0	9
10.	Bhind	104.4	10
11.	E. Nimar(Khandwa)	99.0	11
12.	W. Nimar (Khargone)	93.7	12
13.	Shajapur	92.2	13
14.	Bastar	91.2	14
15.	Seoni	90.9	15
16.	Dhar	88.6	16
17.	Rajgarh	86.3	17
18.	Ratlam	85.7	18
19.	Betul	84.7	19
20.	Chhindwara	84.7	20
21.	Morena	82.7	21
22.	Dewas	82.2	22
23.	Raigarh	82.0	23
24.	Hoshangabad	81.9	24
25.	Surguja	78.2	25
26.	Guna	77.7	26

Contd...

S.No.	Name of the Districts	Composite Index	Rank
27.	Sagar	76.6	27
28.	Sehore	74.1	28
29.	Jabalpur	72.9	29
30.	Ujjain	72.0	30
31.	Damoh	70.5	31
32.	Indore	70.0	32
33.	Mandla	67.3	33
34.	Jhabua	67.1	34
35.	Vidisha	67.1	35
36.	Panna	66.8	36
37.	Narsinghpur	66.8	37
38.	Sidhi	64.9	38
39.	Datia	64.2	39
40.	Shahdol	63.9	40
41.	Raisen	59.8	41
42.	Satna	59.6	42
43.	Rewa	55.7	43

It presented a comparative picture of all the district on various economic indicators e.g. population, literacy, working force, agriculture industries, communication and electrification etc. In the field of agriculture districtwise data on per capita land cultivated, percentages of irrigated area, double cropped area, gross value of agricultural output-per hectare on gross cropped area and per capita on rural population, were presented in time series for 1960-61 to 1970-71.

Considering the gross value of agricultural output an appropriate indicator to reflect the level of agricultural efficiency, its districtwise data for the years 1960-61 and 1970-71 with the linear growth rate of its time series data are given in table 3.6.

Table 3.6 Districtwise Gross Value of Agricultural Output Per Hectare in Madhya Pradesh (1960-61 and 1970-71)

S.No.	District	Gross Value * of Agri.Output per Hect.		Linear ** Growth Rate
		1960-61	1970-71	
1.	Raipur	343.11	1375.67	76.10
2.	Balaghat	388.89	1002.11	62.34
3.	Indore	311.82	841.30	55.91
4.	Bilaspur	380.57	870.59	51.33
5.	Shajapur	292.89	726.31	49.70
6.	Raigarh	325.34	754.54	47.77
7.	Dewas	314.85	624.70	44.86
8.	Ujjain	287.75	725.22	43.39
9.	Khandwa	312.59	679.64	41.11
10.	Seoni	219.23	617.96	39.58
11.	Bastar	350.12	691.04	39.41
12.	Bhind	420.08	685.12	37.74
13.	Damoh	274.24	557.60	36.89
14.	Ratlam	297.27	654.82	36.61
15.	Morena	401.17	613.87	35.99
16.	Durg	350.12	662.82	35.40
17.	Rewa	199.51	550.13	34.88
18.	Mandsaur	333.49	680.22	34.33
19.	Surguja	307.52	628.76	34.19

Contd....

S.No.	District	Gross Value* of Agri.Output per Hect.		Linear** Growth Rate
		1960-61	1970-71	
20.	Chhindwara	289.26	602.26	33.82
21.	Gwalior	551.12	736.30	33.68
22.	Khargone	335.12	613.26	32.15
23.	Rajgarh	267.64	516.97	31.79
24.	Narsinghpur	310.76	568.00	31.63
25.	Sagar	302.90	562.81	31.56
26.	Tikamgarh	397.44	628.75	30.46
27.	Jabalpur	277.25	618.54	29.75
28.	Mandla	228.50	504.98	29.46
29.	Raisen	280.14	511.40	29.21
30.	Panna	267.86	536.94	29.11
31.	Betul	274.58	561.21	28.54
32.	Satna	233.09	525.55	28.25
33.	Sehore	313.06	539.29	27.54
34.	Dhar	328.28	579.32	27.13
35.	Chhatarpur	305.84	539.28	26.58
36.	Shivpuri	319.43	527.61	25.66
37.	Vidisha	319.78	458.34	24.97
38.	Guna	296.60	474.87	20.83
39.	Shahdol	243.55	435.64	20.83
40.	Sidhi	268.87	420.30	20.60
41.	Datia	395.66	506.95	20.20
42.	Jhabua	279.55	430.30	19.29
43.	Hoshangabad	283.45	517.95	17.40
	Madhya Pradesh	311.30	644.63	36.84

* Source: Districtwise Economic Indicators of Madhya Pradesh Pradesh(1960-61 to 1970-71)Directorate of Economics & Statistics, M.P.

**Linear Growth Rate calculated on the data in time series from 1960-61 to 1970-71.

Note : The districts of Bhopal and Rajnandgaon not included here were formed at a later stage.

3.8 Regional Disparities in Agricultural Efficiency

A Study of "Regional Disparities in Agricultural Efficiency in Madhya Pradesh[7] was done by Dr. V.D. Nagar. He calculated agricultural efficiency index for all the 43 districts and divided them into four categories. The districts arranged in decending order of the average index values for the triennium ending 1969-70 is reproduced here (Table 3.7)

Table 3.7 Agricultural Efficiency in Madhya Pradesh
(Average for the triennium ending 1969-70)

District	Index Value	District	Index value
I. High Degree of Efficiency		III. Low Degree of Efficiency	
1. Bhind	135.04	25. East Nimar(Khandwa)	99.94
2. Gwalior	132.91	26. Seoni	98.04
3. Raisen	127.18	27. Betul	96.47
4. Tikamgarh	126.32	28. Durg	95.67
5. Chhatarpur	122.68	29. Chhindwara	95.41
6.		30. Ratlam	93.72
II. Medium Degree of Efficiency		31. Rajgarh	92.45
6. Balaghat	116.78	32. Surguja	91.69
7. Raipur	114.74	33. Ujjain	91.43
8. Vidisha	114.54	IV Very Low Degree of Efficiency	
9. Morena	113.65	34. Mandla	88.25
10. Dewas	112.87	35. Dhar	87.94
11. Indore	109.98	36. Jhabua	87.93
12. Shivpuri	109.48	37. Panna	87.11
13. Narsinghpur	109.19	38. Mandsaur	86.76
14. Raigarh	109.08	39. Jabalpur	81.57
15. Hoshangabad	107.98	40. Rewa	79.22
16. Datia	107.73	41. Satna	77.97
17. Sehore	107.67	42. Sidhi	72.21
18. Guna	105.29	43. Shahdol	67.17
19. Bastar	104.49		
20. West Nimar(Khargone)	104.32		
21. Damoh	103.82		
22. Shajapur	102.73		
23. Bilaspur	101.49		
24. Sagar	101.08		

7. "Regional Disparities in Agricultural Efficiency in M.P.". Dr. V.D. Nagar. The Research Journal of Madhya Pradesh Economic Association Vol.I No.1 Bhopal, August, 1973.

3.9 Inter-district Comparison of Agricultural Development in M.P.

In the above study author had used the selected economic indicator approach. The selected indicators used in the study[8] for assessing the level of agricultural development were divided into three categories, viz. agricultural resource base, adoption of new technology in agriculture and agricultural infra-structure. Over all agricultural development in the district was represented by the composite indicies of various selected indicators under the three broad categories mentioned above. The range of composite indices varied from the minimum of 56.00 to the maximum of 164.06. (Table 3.8 and Map 3.3)

According to overall agricultural development the top ranking five districts were Raipur, Balaghat, Tikamgarh, Indore and Mandsaur.

Categorizing the districts according to their level of agricultural development 9 districts were found 'Good'. Three districts- Raipur (1st) Balaghat (2nd) and Durg(8th) were from 'Rice Zone', Tikamgarh (3rd) Morena (6th) and Gwalior (7th) were from Jowar-Wheat Zone and Indore (4th) Mandsaur (5th) and Khandwa (9th) belonged to Jowar-Cotton zone.

Second category i.e. 'Fair' included 10 districts and the third comprising of 'Poor districts included 18 districts. Six most backward districts categorised as very Poor' were Bastar, Shahdol, Jhabua, Mandla, Rajgarh and Vidisha (Table 3.9)

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8. 'Inter-district Comparison of Agricultural Development in Madhya Pradesh', Agro-Economic Research Centre for M.P. J.N. Krishi Vishwa Vidyalaya, Jabalpur- 1977.

MAP 3.3

AGRICULTURAL DEVELOPMENT
OF
MADHYA PRADESH

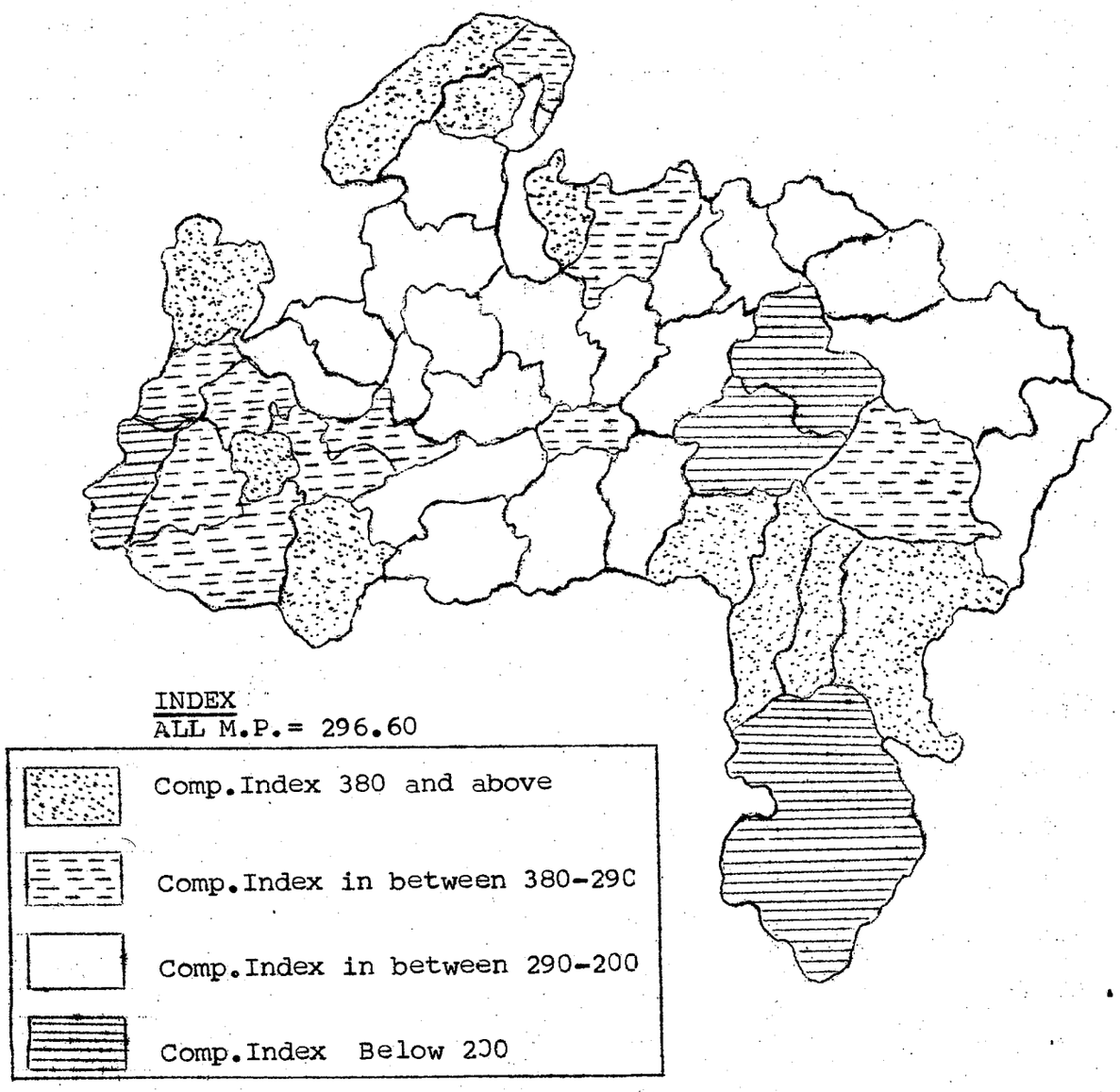


Table 3.8 Ranking of districts according to overall Composite Index of Indicators of Agricultural Development

District	Overall Composite Index	Rank	District	Overall Composite Index	Rank
Raipur	164.06	1	Hoshangabad	90.19	23
Balaghat	154.16	2	Datia	88.63	24
Tikamgarh	152.29	3	Rewa	88.28	25
Indore	150.39	4	Raisen	88.15	26
Mandsaur	143.39	5	Sagar	85.90	27
Morena	141.48	6	Shivpuri	85.79	28
Gwalior	138.64	7	Chhindwara	85.12	29
Durg	131.12	8	Damoh	84.68	30
Khandwa	128.31	9	Surguja	81.99	31
Ratlam	120.38	10	Betul	81.06	32
Bhind	119.07	11	Seoni	80.49	33
Bilaspur	118.63	12	Guna	80.33	34
Narsinghpur	113.52	13	Sidhi	76.80	35
Khargone	109.04	14	Panna	75.54	36
Ujjain	106.69	15	Raigarh	75.24	37
Dewas	106.42	16	Vidisha	74.68	38
Dhar	105.82	17	Rajgarh	73.15	39
Sehore	105.44	18	Mandla	72.37	40
Chhatarpur	104.10	19	Jhabua	66.56	41
Shajapur	98.40	20	Shahdol	62.30	42
Satna	97.71	21	Bastar	56.00	43
Jabalpur	91.57	22			
Madhya Pradesh				100.00	

'Inter-district comparison of Agricultural Development in Madhya Pradesh', Agro-Economic Research Centre for M.P. J.N. Krishi Vishwa Vidyalaya, Jabalpur (1977) Mimeographed.

Table 3.9 Classification of Districts in different categories of Agricultural Development in Madhya Pradesh.

Category	Crop Zones				
	Rice	Rice-Wheat	Wheat	Jowar-Wheat	Jowar-Cotton
Good	Raipur 1* Balaghat 2 Durg 8			Tikamgarh 3* Morena 6 Gwalior 7	Indore 4* Mandsaur 5 Khandwa 9
Fair	Bilaspur 12*		Narsinghpur 13 Sehore 18	Bhind 11 Chhatarpur 19	Ratlam 10 Khargone 14 Ujjain 15 Dewas 16 Dhar 17
Poor	Surguja 31 Sidhi 35 Raigarh 37	Satna 21 Jabalpur 22 Rewa 25 Seoni 33 Panna 36	Hoshangabad 23 Raisen 26 Sagar 27 Damoh 30	Datia 24 Shivpuri 28 Chhindwara 29 Betul 32 Guna 34	Shajapur 20
Very Poor	Mandla 40 Shahdol 42 Bastar 43		Vidisha 38		Raigarh 39 Jhabua 41

Note : Figures given against the district are rank numbers
* Overall rank in the State according to Composite Index of Selected Indicators of Agricultural Development.

Ref: Inter district Comparison of Agricultural Development in Madhya Pradesh, Agro-Economic Research Centre for M.P.Jabalpur.

3.10 Rank Coefficient of Productivity

An earlier attempt made by the author to compare the districts of Madhya Pradesh on the basis of average rank coefficient of Productivity was based on five years average data i.e. from 1970-71 to 1974-75. Though the result of that exercise might not be very useful for the evaluation of agricultural situation in the districts at present an account of the time lag but its utility in understanding the dynamics of the problem is still there. The average rank coefficient values of the districts are given in Table 3.10.

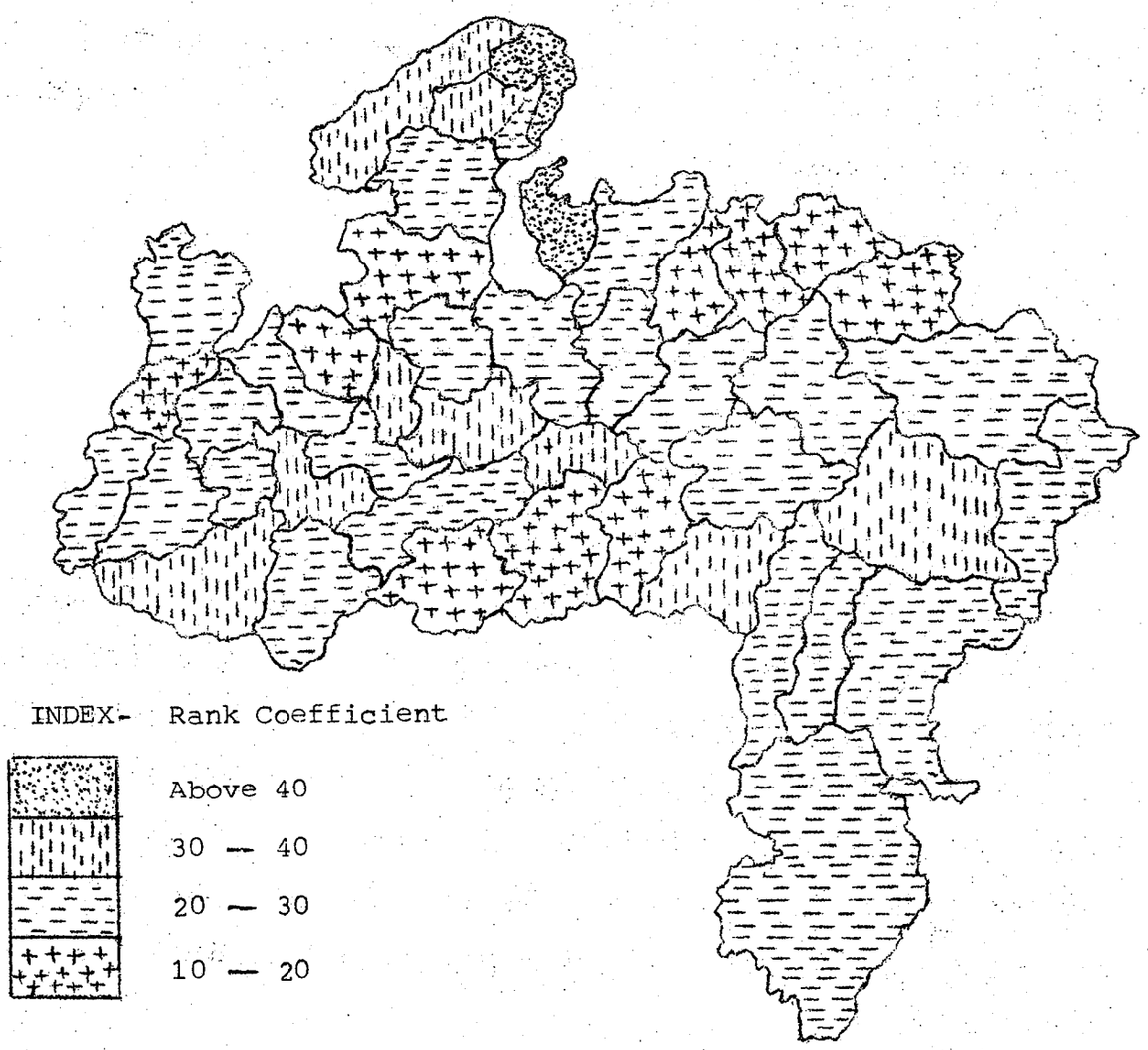
Table 3.10 Districtwise Rank coefficient of Productivity
(Based on five years Data 1970-71 to 1974-75)

S.No.	District	Rank Coeffi-cient.	Rank	S. No.	District	Rank coeffi-cient	Rank
1.	Raipur	28.76	15	24.	Shivpuri	24.10	26
2.	Durg	25.09	22	25.	Guna	17.12	40
3.	Rajnandgaon	20.62	32	26.	Datia	20.33	35
4.	Bastar	28.99	12	27.	Morena	35.58	4
5.	Bilaspur	30.92	10	28.	Bhind	40.72	2
6.	Raigarh	28.98	13	29.	Indore	25.68	20
7.	Surguja	24.18	25	30.	Ratlam	18.97	37
8.	Jabalpur	20.62	33	31.	Ujjain	23.16	28
9.	Balaghat	32.53	9	32.	Mandsaur	24.49	24
10.	Chhindwara	18.74	38	33.	Dewas	34.10	7
11.	Narsinghpur	39.26	3	34.	Dhar	26.78	16
12.	Seoni	20.36	34	35.	Jhabua	21.74	30
13.	Mandla	23.94	27	36.	Khargone	34.72	6
14.	Sagar	26.68	17	37.	Khandwa	26.52	18
15.	Damoh	20.01	36	38.	Bhopal	30.31	11
16.	Tikamgarh	44.41	1	39.	Sehore	22.70	29
17.	Chhatarpur	28.86	14	40.	Raisen	35.21	5
18.	Panna	15.28	42	41.	Vidisha	25.52	21
19.	Rewa	15.41	41	42.	Betul	12.26	45
20.	Sidhi	14.45	43	43.	Rajgarh	18.53	39
21.	Satna	12.45	44	44.	Shajapur	24.61	23
22.	Shahdol	21.08	31	45.	Hoshangabad	25.80	19
23.	Gwalior	33.50	8				

Results of Own Analysis (Un published)
Source of Data. Directorate of Land Records, M.P.

PRODUCTIVITY LEVEL IN DISTRICTS OF M.P.

MAP- 3.4



3.11 Regional Agricultural Development in M.P.

In the year 1978, Directorate of Economics and Statistics Madhya Pradesh brought out a brochure on 'Regional Agricultural Development in Madhya Pradesh[9]. In the said report analysis of the development of agriculture in the State, during the period 1960-61 to 1973-74, was done and a few important indicators were prepared to delineate the advanced and backward districts in the field of agriculture. In all 24 indicators were selected which were broadly grouped as under:-

1. Demographic particulars
2. Land use pattern
3. Agricultural resources and practices
4. Agricultural credit advanced through cooperatives
5. Gross value of agricultural out-put.
6. Yield rates of major crops.

In the said study a district was considered deficient in a particular indicator if its recorded value was below the state average. Summarised result of the study in the form of number of deficient indicators is reproduced here in Table 3.11. Higher the number of deficient indicators of a district more is the backwardness of that district. The districts which were deficient in only 10 or less than 10 indicators were considered to be fairly developed.

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9. Regional Agricultural Development in Madhya Pradesh (1960-61 to 1973-74) Economic Analysis Division, Directorate of Economic and Statistics, M.P. (1978) Mimeographed.

Table 3.11 Districts with Deficient Indicators

S.No.	District	No.of Deficient indicators	S.No.	District	No.of Deficient Indicators
1.	Narsinghpur	7	23.	Shajapur	12
2.	Balaghat	8	24.	Bastar	12
3.	Gwalior	8	25.	Shahdol	12
4.	Raipur	9	26.	Panna	13
5.	Mandsaur	9	27.	Ujjain	13
6.	Tikamgarh	10	28.	Sehore	13
7.	Chhatarpur	10	29.	Sidhi	13
8.	Bhind	10	30.	Jabalpur	13
9.	Bilaspur	10	31.	Dewas	13
10.	Khandwa	10	32.	Guna	13
11.	Morena	11	33.	Hoshangabad	13
12.	Shivpuri	11	34.	Satna	14
13.	Damoh	11	35.	Sagar	14
14.	Chhindwara	11	36.	Mandla	14
15.	Secni	11	37.	Betul	14
16.	Durg	11	38.	Raigarh	14
17.	Datia	11	39.	Khargone	14
18.	Indore	12	40.	Rajgarh	15
19.	Ratlam	12	41.	Jhabua	15
20.	Dhar	12	42.	Rewa	16
21.	Vidisha	12	43.	Sarguja	16
22.	Raisen	12			

The studies cited above are not enough to form a complete list of references on the subject. An interested research worker may find some other studies also, on the subject, which might be equally useful and informative.

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Part Three

D I S C U S S I O N

CHAPTER IV

INPUT STRUCTURE

4.1 Approach

Growth of agricultural output is largely determined by (a) an increase in inputs and (b) increase in farm productivity induced by technological changes. Inputs crucial for agricultural growth may be listed as :

(a) Cultivated area (net area sown),

(b) Proportion of area irrigated,

(c) area under high yielding varieties,

(d) use of fertilizers,

(e) use of plant protection measures.

In this chanpter an attempt has been made to study the existing use pattern of these inputs for various districts of Madhya Pradesh. Plant protection measures have not been dealt with as the required data on this aspect was not available.

4.2 Agricultural Land

The demand for food and other farm products rises with the growth of population and economic progress. An ever-increasing demand for agricultural products accentuates the scarcity of land. New opportunities placed before man by scientific developments may mitigate the limited character of land in terms of its productivity per unit, but the fact remains that the supply of land in physical terms is limited. By and large land constitutes the most important factor of production in agriculture.

Looking to the importance of 'land' as an essential factor of production, various measures have been adopted by the Government to protect and increase the available area of agricultural land. Upto the end of Fifth Five Year Plan about 20 per cent of such land which required land improvement and other soil conservation measures was brought under soil and water conservation programme in this State.

Total area of Madhya Pradesh for land utilisation purposes is reported to be 44.20 million hectares. Excluding the forest land and the land not available for cultivation remaining 25.56 million hectares i.e. 58.0 per cent land is available for agricultural purpose. Here the utilisation of this agricultural land has been studied.

4.2.1 Cultivable Area

Cultivable area includes cultivable waste lands, fallow land, area under miscellaneous tree crops groves and net area sown. In 1956-57 to 1958-59 triennium total cultivable area in the state was 218.51 lakh hectares which was 49.95 per cent of total reported area. In 1977-78 to 1979-80 triennium it increased to 222.98 lakh hectares, which formed 50.45 per cent of total area.

The percentage of cultivable area to total area reported in the district was highest in ujjain (79.34 per cent) closely followed by Bhind (79.28 per cent). In addition to these two districtssix other districts had more than 70 per cent of their reported area as cultivable. These districts were Datia, Durg,

Table 4.1 Cultivable Area in Districts of Madhya Pradesh (1977-78 to 1979-80, 3 years Average)

(Area in thousand hectares)

District	Cultivable Area	Percentage to total Geog. Area	Percentage to T.C.A. in State	District	Cultivable Area	Percentage to total Geog. Area	percentage to T.C.A. in State
(1)	(2)	(3)*	(4)+	(1)	(2)	(3)*	(4)+
Balaghat	335.17	36.34	1.50	Morena	502.83	43.04	2.25
Bastar	1030.97	26.39	4.61	Narsinghpur	316.10	61.58	1.42
Betul	505.90	50.20	2.26	Panna	312.97	44.50	1.40
Bhind	353.03	79.28	1.57	Raigarh	614.33	41.31	2.74
Bhopal	168.60	62.05	0.75	Raipur	1043.17	49.04	4.66
Bilaspur	919.10	46.75	4.10	Raisen	442.63	52.16	1.96
Chhatarpur	535.30	62.02	2.39	Rajgarh	442.77	69.25	1.96
Chhindwara	591.50	50.89	2.64	Rajnandgaon	566.87	51.08	2.50
Damoh	335.10	45.99	1.50	Ratlam	357.27	73.43	1.60
Datia	152.67	75.02	0.67	Rewa	426.30	67.80	1.90
Dewas	361.50	51.61	1.60	Sagar	569.43	55.66	2.54
Dhar	535.07	65.28	2.38	Satna	437.13	58.88	1.94
Durg	617.30	70.89	2.75	Sehore	386.87	59.79	1.71
Guna	710.03	64.65	3.16	Seoni	470.27	54.01	2.10
Gwalior	294.87	56.50	1.30	Shahdol	612.90	44.22	2.73
Hoshangabad	511.17	51.15	2.28	Shajapur	451.40	73.06	2.02
Indore	268.97	70.21	1.20	Shivpuri	556.17	54.67	2.45
Jabalpur	590.47	58.32	2.63	Sidhi	435.27	41.88	1.92
Jhabua	372.90	42.41	1.64	Surguja	701.27	31.86	3.12
Khandwa	463.23	45.93	2.06	Tikamgarh	292.47	58.03	1.31
Khargone	670.03	49.65	3.00	Ujjain	485.23	79.34	2.13
Mandla	595.40	44.90	2.65	Vidisha	537.90	73.66	2.40
Mandsaur	581.67	61.46	2.60	All M.P.	22297.97	50.45	100.00

*Col.3- Percentage of cultivable area in the district to total geographical area of district as reported for land utilisation purpose.

*Col.4- Percentage of total cultivable area in the district to total cultivable area in the state.

Indore, Ratlam, Shajapur and Vidisha, Fifteen districts had less than 50 per cent of cultivable area in each case. Lowest proportion of cultivable area existed in Bastar (26.39 per cent) preceded by surguja having 31.86 per cent(Table 4.1).

Percentage of cultivable area in the district to total cultivable area in the state was highest in Raipur (4.66 per cent) followed by Bastar (4.61 per cent) Bilaspur (4.10 per cent) Guna (3.16 per cent), Surguja (3.12 per cent) and Khargone (3.00 per cent). Thus about 20.00 per cent of total cultivable area of the state was shared by the above mentioned six districts. Datia being the smallest district of the State shared only 0.67 per cent of total cultivable area. It was preceded by Bhopal sharing 0.75 per cent area (Table 4.1).

Per capite availability of cultivable land in the state had been continuously falling. In 1960-61 the per capita cultivable area (on rural population) was 0.79 hectares which went down to 0.54 hectares in 1979-80. Distribution of districts in different size groups of per capita availability of cultivable land had considerably changed. In 1960-61 atleast six districts had per capita cultivable area between 1.01 to 1.50 hectares and 25 districts were between 0.76 to 1.00 hectare range while in 1979-80 only three districts were in the category of 0.76 to 1.0 hectare , otherwise all the remaining 42 districts had per capita average of 0.75 hectare or less. (Table 4.2)

Table 4.2 Districtwise Per Capita-cultivable area(as per Rural Population) in Madhya Pradesh in 1960-61 and 1979-80.

Size Group (in Hectares)	Y E A R	
	1960-61	1979-80
Upto 0-5 Hect.	Balaghat Bilaspur	Balaghat, Bilaspur, Rewa, Raipur, Bhind, Satna, Sidhi, Morena, Tikamgarh, Raigarh, Surguja, Khargone, Durg, Jabalpur.
0-51 to 0.75 Hect.	Bhind, Raipur, Tikamgarh, Rewa, Raigarh, Morena, Durg, Satna, Khandwa, Jhabua.	Jhabua, Damoh, Khandwa, Shahdol, Rajnandgaon, Dewas, Indore, Narsinghpur, Dhar, Mandsaur, Gwalior, Bastar, Sagar, Chhindwara, Mandla, Datia, Rajgarh, Shajapur, Seoni, Panna, Betul, Ratlam, Hoshangabad, Sehore, Raisen, Ujjain, Chhatarpur, Shivpuri.
0-76 to 1.00 Hect.	Jabalpur, Bastar, Sagar, Sehore, Sidhi, Rajgarh, Khargone, Mandsaur, Surguja, Dhar, Gwalior, Shahdol, Dewas, Chhindwara, Damoh, Datia, Mandla, Ratlam, Shajapur, Narsinghpur, Seoni, Ujjain, Hoshangabad, Betul, Indore.	Bhopal, Vidisha, Guna.
1.01 to 1-25 Hect.	Raisen, Chhatarpur, Shivpuri, Vidisha.	--
1-26 to 1-50 Hect.	Guna, Panna.	--

4.2.2 Cultivated Land

Cultivated area is estimated by adding the net area sown and fallow land. Its availability depends on

(i) cultivable area and

(ii) percentage of cultivable waste in the cultivable area.

In Madhya Pradesh 91.52 per cent of total cultivable area was cultivated (during triennium of 1977-78 to 1979-80). Highest acreage of cultivated land was recorded in Raipur (991.70 thousand hectares) followed by Bilaspur (884.50 thousand hectares) and Bastar (871-20 thousand hectares).

Percentage of cultivated land to total cultivable land was highest in Khandwa (98.87 per cent) followed by Dewas (98.09 per cent), Bhind (97.28 per cent), Rewa (96.95 per cent), Jhabua (96.89 per cent and Indore (96.67 per cent). The lowest percentage of cultivated land to cultivable land was 73.99 per cent in Shivpuri district (Table 4.3).

Table 4.3 :- Cultivated Area in Districts of Madhya Pradesh, (1977-78 to 1979-80, 3 years Average)

(Area in thousand hectares)

District (1)	Cultivated Area (2)	Percentage to total Cult. Area* (3)	Percentage to T.C.A. in State (4)+	District (1)	Cultivated Area (2)	Percentage to total Cult. Area* (3)	Percentage to T.C.A. in State (4)+
Balaghat	306.20	91.35	1.50	Morena	406.60	80.86	1.98
Bastar	871.20	84.50	4.24	Narsinghpur	290.70	91.96	1.40
Betul	462.10	91.34	2.24	Panna	250.10	79.91	1.70
Bhind	343.50	97.28	1.65	Raigarh	593.80	96.65	2.90
Bhopal	153.20	90.86	0.75	Raipur	991.70	95.06	4.83
Bilaspur	884.50	96.23	4.30	Raisen	410.30	92.69	2.01
Chhatarpur	424.20	79.24	2.05	Rajgarh	406.50	91.81	1.98
Chhindwara	560.40	94.74	2.72	Rajnandgaon	548.80	96.81	2.66
Damoh	299.70	89.43	1.44	Ratlam	309.10	86.52	1.50
Datia	136.40	89.34	0.64	Rewa	413.30	96.95	2.02
Dewas	354.60	98.09	1.71	Sagar	532.00	93.43	2.58
Dhar	507.70	94.88	2.45	Satna	384.70	88.38	1.86
Durg	595.70	96.50	2.90	Sehore	353.20	91.29	1.70
Guna	590.80	83.21	2.87	Seoni	436.66	92.84	2.13
Gwalior	264.60	89.73	1.28	Shahdol	590.40	96.33	2.84
Hoshangabad	469.80	91.91	2.30	Shajapur	419.50	92.93	2.83
Indore	260.00	96.67	1.25	Shivpuri	411.50	73.99	2.01
Jabalpur	544.40	92.20	2.64	Sidhi	405.90	93.25	1.92
Jhabua	361.30	96.89	1.75	Surguja	665.80	94.94	3.22
Khandwa	458.00	98.87	2.22	Tikamgarh	250.10	85.51	1.22
Khargone	635.80	94.89	3.10	Ujjain	465.10	95.85	2.27
Mandla	553.90	93.03	2.70	Vidisha	510.90	94.95	2.50
Mandsaur	523.30	89.96	2.54	All M.P.	20406.30	91.52	100.00

* Percentage of Cultivated area to total cultivable area in the district.

\+ Percentage of cultivated area in the district to total cultivated area in the state.

4.2.2.1 Fallow Land

Districtwise distribution of fallow land and its percentage to total cultivated area in the State (based on three years average data of 1977-78 to 1979-80) is given in Table 4.4. From the table it is evident that highest proportion of fallow land was in Mandla district (26.32 per cent) and lowest in Indore (1.29 per cent). Eighteen districts had higher proportion of fallow land than the State proportion of 9.43 per cent. These districts shared 72.76 per cent of total fallow area, while the first five districts i.e. Mandla, Shahdol, Chhatarpur, Sidhi and Panna showing highest proportion of fallow land shared 25.93 per cent of total fallow land in the State.

The highest acreage of 'old fallow' was in shahdol district 77.8 thousand hectares i.e. 13.18 per cent of total cultivated area in the district, followed by Mandla 77.1 thousand hectares which was 13.92 per cent. Other important districts following Shahdol and Mandla, were Surguja, Bastar and Chhatarpur.

With regard to 'current fallow' Mandla stood first with 68.7 thousand hectares (12.40 per cent of total cultivated land) followed by Shahdol, Surguja, Chhindwara and Chhatarpur. Lowest acreage of fallow land was in Bhopal district (2.4 thousand hectares which included 1.1 thousand hectares current fallow and 1.3 thousand hectares 'Old fallow') though its percentage to total cultivated area (1.57 per cent) was higher than Indore (1.29 per cent).

Table 4.4 Districtwise Area and Percentage of Fallow Land in Madhya Pradesh(1977-78 to 1979-80 three years average)

Area in thousand Hectares)

S.No.	District	Cultivated Area	Fallow Land			Percentage of fallow to Cultivated Area %
			Current Fallow	Old Fallow	Total Fallow	
1.	Balaghat	306.20	14.40	18.30	32.70	10.68
2.	Bastar	871.20	50.80	51.40	102.20	11.73
3.	Betul	462.10	35.50	34.80	70.30	15.31
4.	Bhind	343.50	4.00	5.60	9.60	2.79
5.	Bhopal	153.20	1.10	1.30	2.40	1.57
6.	Bilaspur	884.50	34.00	33.50	67.50	7.63
7.	Chhatarpur	424.20	41.10	51.10	92.20	21.74
8.	Chhindwara	560.40	41.70	39.80	81.50	14.54
9.	Damoh	299.70	10.90	13.10	24.00	8.01
10.	Datia	136.40	3.70	6.10	9.80	7.18
11.	Dewas	354.60	2.70	3.90	6.60	1.86
12.	Dhar	507.70	7.70	8.30	16.00	3.15
13.	Durg	595.70	19.90	20.80	40.70	6.83
14.	Guna	590.80	11.50	12.30	23.80	4.03
15.	Gwalior	264.60	7.30	8.40	15.70	5.93
16.	Hoshangabad	469.80	13.80	17.20	31.00	6.60
17.	Indore	260.00	1.40	1.70	3.10	1.29
18.	Jabalpur	544.40	39.40	45.30	84.70	15.66
19.	Jhabua	361.30	11.70	11.70	23.40	6.48
20.	Khandwa	458.00	9.20	11.20	20.40	4.46
21.	Khargone	635.80	7.70	9.60	17.30	2.72
22.	Mandla	533.90	68.70	77.10	145.80	26.32
23.	Mandsaur	523.30	4.50	3.90	8.40	1.61
24.	Morena	406.60	15.20	15.70	30.90	7.60
25.	Narsinghpur	290.70	8.30	10.30	18.60	6.40
26.	Panna	250.10	17.70	25.40	43.10	17.24
27.	Raigarh	593.80	40.90	37.90	78.80	13.27
28.	Raipur	991.70	33.80	35.90	69.70	7.03
29.	Raisen	410.30	3.50	4.10	7.60	1.85
30.	Rajgarh	406.50	5.30	7.10	12.40	3.05
31.	Rajnandgaon	548.80	29.70	27.70	57.40	10.46
32.	Ratlam	309.10	4.50	4.40	8.90	2.88
33.	Rewa	413.30	24.40	28.60	53.00	12.82
34.	Sagar	532.00	11.40	9.30	20.70	3.89
35.	Satna	384.70	35.50	25.90	61.40	15.96
36.	Sehore	352.20	2.40	2.70	5.10	1.44
37.	Seoni	436.60	31.40	37.40	68.80	15.76
38.	Shahdol	590.40	66.30	77.80	144.10	24.41
39.	Shajapur	419.50	3.60	4.80	8.40	2.00
40.	Shivpuri	411.50	30.20	37.10	67.30	16.35
41.	Sidhi	405.90	35.50	38.30	73.80	18.18
42.	Surguja	665.80	54.90	56.70	111.60	16.77
43.	Tikamgarh	250.10	13.60	18.00	31.60	12.64
44.	Ujjain	465.10	4.40	4.80	9.20	1.98
45.	Vidisha	510.90	4.10	4.70	8.80	1.72
46.	All M.P.	20406.30	904.10	1020.40	1924.50	9.43

4.2.3 Net Area Sown

Net area sown is the most important land use category. It acts as one of the basic input factor in the crop output.

Percentage of net area sown to total cultivated area was 91.55 per cent in the state. Among the districts it varied between 98.81 per cent in Indore to 73.66 per cent in Mandla (Table 4.5). Absolute area sown (net area sown) was highest in Raipur (922.07 thousand hectares) followed by Bilaspur and Bastar. Percentage share of districts in total net area sown of the state was lowest in Datia (0.68 per cent) preceded by Bhopal (0.81 per cent). Table 4.5

Table 4.5 Distribution of Net Area sown in districts of Madhya Pradesh(1977-78 to 1979-80, 3 years average)

(Area in thousand hectares)

District	Actual Area	P.C.to total cultivated area in the Distt.	P.C.to total Net Area Sown in the State	District	Actual Area	P.C.to total cultivated area in the Distt.	P.C.to total Net Area Sown in the State
Balaghat	270.43	38.31	1.46	Morena	375.87	92.40	2.01
Bastar	770.53	88.45	4.13	Narsinghpur	271.93	93.60	1.46
Betul	391.97	84.79	2.10	Panna	206.97	82.77	1.11
Bhind	334.00	97.20	1.79	Raigharh	515.20	86.73	2.76
Bhopal	150.87	98.43	0.81	Raipur	922.07	92.97	4.94
Bilaspur	817.03	92.36	4.37	Raisen	402.67	98.15	2.16
Chhatarpur	331.87	78.26	1.78	Rajgarh	394.17	96.95	2.11
Chhindwara	478.90	85.46	2.56	Rajnandgaon	491.30	89.52	2.63
Damoh	275.70	91.99	1.48	Ratlam	300.30	97.12	1.61
Datia	126.47	92.74	0.68	Rewa	360.13	87.18	1.92
Dewas	348.03	98.14	1.86	Sagar	506.57	95.22	2.71
Dhar	491.57	96.83	2.63	Satna	339.07	88.09	1.81
Durg	554.97	93.17	2.97	Sehore	348.03	98.53	1.86
Guna	566.90	95.97	3.03	Seoni	367.87	84.24	1.96
Gwalior	248.97	94.07	1.33	Shahdol	446.33	75.59	2.39
Hoshangabad	438.67	93.40	2.35	Shajapur	410.87	98.02	2.20
Indore	256.87	98.81	1.37	Shivpuri	344.17	83.64	1.84
Jabalpur	444.83	81.70	2.38	Sidhi	331.97	81.79	1.77
Jhabua	338.00	93.52	1.81	Surguja	554.13	83.22	2.97
Khandwa	437.57	95.54	2.34	Tikamgarh	218.60	87.36	1.17
Khargone	618.50	97.28	3.31	Ujjain	455.80	98.01	2.44
Mandla	407.97	73.66	2.18	Vidisha	502.10	98.28	2.69
Mandsaur	514.87	98.39	2.76	All M.P.	18681.63	91.55	100.00

Availability of per capita net area sown had also gone down. In 1960-61 the number of districts in the size group of 0.75 to 1.00 hectare per capita net area sown was four- Raisen, Vidisha, Hoshangabad and Ujjain. In 1979-80 except Vidisha the other three districts shifted to the lower size group i.e. 0.51 to 0.75 hectare.

In the lowest size group (i.e. 0-0.5 hectare of per capita net area sown) the number of districts in 1960-61 was eleven which increased to twentynine in 1979-80 (Table 4.6)

Table 4.6 Districtwise Per Capita Net Area Sown (As Per Rural Population) in Madhya Pradesh in 1960-61 and 1979-80

Size Group (Hectares)	Y E A R	
	1960-61	1979-80
Upto 0-5 Hect.	Bilaspur, Raigarh Surguja, Morena, Balaghat, Raipur, Rewa, Satna, Sidhi, Chhatarpur, Tikamgarh.	Balaghat, Bilaspur, Morena Tikamgarh, Sidhi, Satna, Rewa, Raipur, Jabalpur, Surguja, Raigarh, Shahdol, Panna, Bhind, Mandla, Damoh, Durg, Chhatarpur, Khargone, Bastar, Shivpuri, Jhabua, Rajnandgaon, Narsinghpur, Chhindwara, Seoni, Datia, Betul, Gwalior.
0-51 to 0-75 Hect.	Betul, Rajgarh, Sehore, Bhind, Datia, Guna, Gwalior, Shivpuri, Dewas, Dhar, Indore, Jhabua, Khandwa, Khargone, Mandsaur, Ratlam, Chhindwara, Jabalpur, Mandla, Narsinghpur, Seoni, Durg, Shahdol, Damoh, Panna, Sagar.	Mandsaur, Khandwa, Sagar, Dhar, Indore, Dewas, Ratlam, Rajgarh, Shajapur, Hoshangabad, Sehore, Raisen, Ujjain, Guna, Bhopal.
0-76 to 1-0 Hect.	Raisen, Vidisha Hoshangabad, Ujjain.	Vidisha
Above 1-0	Nil	Nil

Barring a few districts of the south east, entire State of Madhya Pradesh comes under Semi Arid Tropical Region. Nearly 87 per cent of the total cultivated area in the State is dependent entirely on monsoon and therefore about 85 per cent of the net area sown in the state is mono-cropped. The percentage of seasonal fallow during kharif (rainy season) was 28.15 per cent of net area sown while the percentage of seasonal fallow during rabi was 57.46 per cent.

A. Seasonal Fallow- Kharif :

Highest proportion of kharif fallow was in Raisen District (82.00 per cent of net area sown) followed by Vidisha (78.61 per cent) and Sagar (72.44 per cent). Table 4.7

The proportion of Kharif fallow was highest in Wheat Crop Zone (69.47 per cent) and lowest in Rice Zone (8.15 per cent).

Table 4.7 : Districtwise Area and Percentage of Seasonal Fallow Kharif to Net Area Sown (1977-78 to 1979-80 Three years average)

(Area in thousand Hectares)

District	Area '000 Hect.	Percent-age	Rank	District	Area '000 Hect.	Percen-tage	Rank
Balaghat	12.4	4.59	38	Morena	226.2	60.21	11
Bastar	6.7	0.87	41	Narsinghpur	175.2	64.39	8
Betul	67.3	17.18	28	Panna	111.4	53.82	12
Bhind	223.1	66.82	6	Raigarh	-	-	-
Bhopal	108.6	72.02	4	Raipur	31.1	3.37	39
Bilaspur	69.4	8.49	36	Raisen	330.2	82.00	1
Chhatarpur	142.9	43.04	17	Rajgarh	48.4	12.28	34
Chhindwara	72.8	15.20	31	Rajnandgaon	96.7	19.68	25
Damoh	168.1	60.97	10	Ratlam	37.2	12.39	33
Datia	87.8	69.41	5	Rewa	143.5	39.83	18
Dewas	64.7	18.59	26	Sagar	367.0	72.44	3
Dhar	87.4	17.78	27	Satna	176.9	52.20	13
Durg	120.1	21.64	23	Sehore	181.2	52.07	14
Guna	289.2	51.00	15	Seoni	142.6	38.77	19
Gwalior	153.4	61.63	9	Shahdol	43.4	9.72	35
Hoshangabad	287.5	65.52	7	Shajapur	65.1	15.83	30
Indore	87.8	34.18	20	Shivpuri	113.1	32.86	21
Jabalpur	215.9	48.54	16	Sidhi	44.9	13.52	32
Jhabua	0.8	0.24	43	Surguja	-	-	-
Khandwa	11.5	2.63	40	Tikamgarh	45.6	20.87	24
Khargone	4.8	0.78	42	Ujjain	105.9	23.23	22
Mandla	67.2	16.47	29	Vidisha	394.7	78.61	2
Mandsaur	25.7	4.99	37	All M.P.	5141.4	28.15	-

B. Seasonal Fallow Rabi :

The percentage of rabi fallow was 57.46 per cent in the State and 21 districts had higher percentage. Highest percentage of rabi fallow was in Bastar (94.89 per cent) followed by Raigarh (94 per cent) and Khargone (92.68 per cent). The first two belonged to the rice zone and the third to Cotton-Jowar zone. (Table 4.8)

The situation of rabi fallow was just reverse. It was lowest in Wheat Zone (26.66 per cent) and high in Cotton-Jowar Zone (72.20 per cent of the net area sown) and rice zone (72.20 per cent).

Table 4.8 Districtwise Area and Percentage of Seasonal Fallow Rabi to Net Area Sown(1977-78 to 1979-80 Three year average)

(Area in thousand Hectares)

Districts	Area '000 Hect.	Percentage	Rank	Districts	Area '000 Hect.	Percentage	Rank
Balaghat	176.8	65.38	16	Morena	104.3	27.76	38
Bastar	731.2	94.89	1	Narsinghpur	84.2	30.94	34
Betul	276.0	70.44	12	Panna	70.2	33.91	31
Bhind	90.7	27.16	40	Raigharh	484.1	94.00	2
Bhopal	44.0	29.18	42	Raipur	612.7	66.45	15
Bilaspur	575.0	70.38	13	Raisen	67.1	16.66	45
Chhatarpur	143.8	43.31	28	Rajgarh	303.2	76.94	8
Chhindwara	354.5	74.02	9	Rajnandgaon	286.0	58.20	21
Damoh	80.5	29.20	36	Ratlam	196.0	65.29	17
Datia	34.0	28.88	41	Rewa	123.3	34.22	30
Dewas	246.5	70.83	11	Sagar	117.6	23.21	43
Dhar	331.5	67.43	14	Satna	93.0	27.44	39
Durg	248.3	44.74	26	Sehore	145.7	41.87	29
Guna	252.9	44.60	27	Seoni	201.0	54.65	23
Gwalior	73.9	29.69	35	Shahdol	344.2	77.12	7
Hoshangabad	139.7	31.84	33	Shajapur	295.5	71.86	10
Indore	73.0	28.42	37	Shivpuri	183.8	53.40	25
Jabalpur	149.5	33.61	32	Sidhi	183.8	55.36	22
Jhabua	294.0	87.01	6	Surguja	487.0	87.89	5
Khandwa	397.8	90.90	4	Tikamgarh	117.8	53.91	24
Khargone	573.2	92.68	3	Ujjain	290.1	63.63	19
Mandla	262.3	64.29	18	Vidisha	93.4	18.60	44
Mandsaur	301.8	58.61	20	All M.P.	11416.8	57.46	-

4.2.4 Double Cropped Area

In the present situation the possibilities of expansicn in cultivated area in Madhya Pradesh have minimised as the percentage of culturable waste and fallow land together is only 8.27 per cent of total reporting area which limits the scope of further expansion in net area sown. Now, double cropping may appear to hold greater possibilities for an increase in total cropped area. Since only about 14 per cent of the cultivated land is double cropped, the situation warrants for sincere efforts towards minimising the seasonal fallow by increasing the area under double cropping.

Highest percentage of double cropped area (or area sown more than once) was in Sidhi district (37.11 per cent) followed by Mandsaur (36.40 per cent), Durg, (34.11 per cent) and Balaghat (30.04 per cent). Only nine districts of the state had more than 20.00 per cent of area under double cropping. Another group of nine districts viz. Raisen, Vidisha, Hoshangabad, Sagar, Narsinghpur, Guna, Datia, Bhopal and Bastar had less than 5 per cent of their net area sown under double cropping (Table 4.9)

4.3 Irrigation

The percentage of gross irrigated area to gross cropped area in the state was 10.7 per cent- much below the all India percentage of 26.64. However, some of the districts having higher percentage than the all India figures were: Morena (39.7 per cent), Balaghat (36.7 per cent) and Tikamgarh (28.7 per cent). Other districts having more than 20 per cent irrigated area were Bhind, Raipur, Durg, Gwalior and Datia. In all 28 districts had less than 10 per cent irrigated area and nine districts in between 10-20 per cent. (Table 4.11).

Net area irrigated to net area sown in the State was 11.6 per cent. Morena district had the highest percentage of 44.2 followed by Balaghat 41.6 per cent, Tikamgarh 35.2 per cent, Raipur 31.4 per cent and Durg 27.2 per cent. Twenty six districts had less than 10.0 per cent irrigated area to their net area sown. Lowest percentage of irrigated area was in Bastar (1.3 per cent) preceded by Mandla(1.4 per cent) and Vidisha (1.7 per cent). Table 4.11.

Table 4.9 :- Distribution of Area Sown More than Once in districts of Madhya Pradesh.(1977-78 to 1979-80 3 years average)

(Area in thousand hectares)

District	Actual Area	P.C.to* total Net Area Sown in the Distt.	P.C.to+ total area sown more than once in the State	District	Actual Area	P.C.to* total Net Area Sown in the Distt.	P.C.to+ total area sown more than once in the State
1.	2.	3.	4.	1.	2.	3.	4.
Balaghat	81.23	30.04	3.03	Morena	45.27	12.04	1.69
Bastar	32.67	4.11	1.22	Narsinghpur	12.73	4.68	0.48
Betul	48.57	12.39	1.81	Panna	25.50	12.32	0.95
Bhind	20.13	6.03	0.75	Raigharh	33.67	6.53	1.26
Bhopal	4.87	3.23	0.18	Raipur	278.13	30.16	10.38
Bilaspur	172.63	21.13	6.44	Raisen	5.37	1.33	0.20
Chhatarpur	45.30	13.65	1.69	Rajgarh	42.40	10.75	1.58
Chhindwara	51.60	10.77	1.93	Rajnandgaon	108.80	22.14	4.06
Damoh	27.13	9.84	1.02	Ratlam	66.97	22.30	2.50
Datia	4.67	3.69	0.17	Rewa	93.57	25.93	3.49
Dewas	36.90	10.60	1.38	Sagar	22.03	4.35	0.82
Dhar	72.73	14.97	2.72	Satna	69.00	20.35	2.58
Durg	189.30	34.11	7.07	Sehore	21.10	6.06	0.79
Guna	24.97	4.40	0.93	Seoni	24.20	6.58	0.90
Gwalior	21.60	8.67	0.81	Shahdol	58.67	13.14	2.19
Hoshangabad	11.67	2.66	0.44	Shajapur	50.60	12.31	1.89
Indore	47.07	18.32	1.76	Shivpuri	47.27	13.73	1.76
Jabalpur	79.40	17.85	2.96	Sidhi	103.20	37.11	3.85
Jhabua	43.10	12.75	1.61	Surguja	70.87	12.79	2.65
Khandwa	28.30	6.47	1.06	Tikamgarh	55.13	25.22	2.06
Khargone	60.40	9.17	2.25	Ujjain	60.00	13.16	2.24
Mandla	78.43	19.22	2.93	Vidisha	14.00	2.79	0.52
Mandsaur	187.43	36.40	7.00	All M.P.	2678.63	14.34	100.00

*Column 3- Percentage of area sown more than once to total net area sown in the district.

+Column 4- Percentage of area sown more than once in the district to total area sown more than once in the state.

Table 4.11 : Districtwise Irrigated Area in Madhya Pradesh, 1979-80.

S.No.	District	Gross Irrigated Area		Net Irrigated Area		Area Irrigated more than once ('000 hect.)
		Area ('000Hect)	Percent to GCA	Area ('000 Hect.	Percent to NAS.	
1.	Balaghat	113.1	36.7	108.6	41.6	4.5
2.	Bastar (Jagdalpur)	10.5	1.3	10.4	1.3	0.1
3.	Betul	44.3	10.2	44.3	11.5	-
4.	Bhind	93.1	26.2	81.0	24.6	12.1
5.	Bhopal	9.6	6.1	9.6	6.3	-
6.	Bilaspur	124.1	14.0	121.3	15.0	2.8
7.	Chhatarpur	68.3	18.7	67.8	21.4	0.5
8.	Chhindwara	46.7	8.9	46.7	9.9	-
9.	Damoh	10.3	3.5	9.4	3.5	0.9
10.	Datia	26.8	20.2	26.7	21.5	0.1
11.	Dewas	37.3	9.6	35.9	10.3	1.4
12.	Dhar	59.5	10.4	58.4	11.9	1.1
13.	Durg	156.5	23.1	150.1	27.2	6.4
14.	Guna	15.7	2.6	15.3	2.7	0.4
15.	Gwalior	65.0	24.0	60.4	24.7	4.6
16.	Hoshangabad	55.4	12.2	55.4	12.6	-
17.	Indore	43.6	14.1	40.4	15.7	3.2
18.	Jabalpur	21.2	4.6	20.2	5.0	1.0
19.	Jhabua	21.3	5.5	20.2	6.0	1.1
20.	Khandwa	44.2	9.4	44.2	10.1	-
21.	Khargone	90.7	13.2	89.4	14.4	1.3
22.	Mandla	5.6	1.3	5.6	1.4	-
23.	Mandsaur	86.0	11.2	74.3	14.2	11.7
24.	Morena	171.0	39.7	165.1	44.2	5.9
25.	Narsinghpur	26.1	9.2	26.1	9.7	-
26.	Panna	11.4	5.4	11.4	5.9	-
27.	Raigarh	23.2	4.3	16.5	3.2	6.7
28.	Raipur	290.6	25.8	287.1	31.4	3.5
29.	Raisen	8.6	2.1	8.6	2.1	-
30.	Rajgarh	20.7	4.7	19.7	5.0	1.0
31.	Rajnandgaon	48.3	8.6	46.8	9.5	1.5
32.	Ratlam	29.5	7.6	28.4	9.4	1.1
33.	Rewa	17.1	4.0	17.1	4.9	-
34.	Sagar	16.9	3.2	15.8	3.1	1.1
35.	Satna	10.3	2.7	10.3	3.2	-
36.	Sehore	24.7	6.6	24.7	7.1	-
37.	Seoni	24.5	6.5	23.6	6.6	0.9
38.	Shahdol	5.5	1.3	5.5	1.4	-
39.	Shajapur	35.4	7.5	33.6	8.1	1.8
40.	Shivpuri	65.0	16.9	59.7	18.0	6.3
41.	Sidhi	8.1	2.0	8.1	2.6	-
42.	Surguja (Ambikapur)	12.3	2.1	10.5	2.6	1.8
43.	Tikamgarh	76.9	28.7	74.8	35.2	2.1
44.	Ujjain	44.8	8.4	42.9	9.4	1.9
45.	Vidisha	8.5	1.6	8.4	1.7	0.1
46.	All M.P.	2228.2	10.7	2139.3	11.6	88.9

G.C.A. = Gross Cropped Area; N.A.S.= Net Area Sown.

Percentage change in net irrigated area in triennium 1977-78 to 1979-80 over 1956-57 to 1958-59 was highest 1596.03 per cent in Hoshangabad followed by Rewa (1546.49 per cent), Satna (1473.08 per cent). Sidhi (1233.21 per cent) and Vidisha (1096.10 per cent). In Bastar alone the net and gross irrigated area decreased by 34.80 and 41.36 per cent respectively- this may be due to wrong reporting at the earlier stage and improvement in the survey and reporting procedure at later stage.

Highest increase in irrigation ratio was recorded in Morena (Net 38.9 per cent and gross 34.6 per cent) followed by Datia, Raipur, Indore, Hoshangabad, Tikamgarh and Bhind. Though the percentage of net irrigated area to net area sown went down in few district-viz. Bastar, Bhopal, Damoh and Seoni, the percentage of gross irrigated area to gross cropped area had increased in all the districts (Table 4.12).

Table 4.12 Percentage change in Net and Gross Area Irrigated and Irrigation Ratio in various Districts of Madhya Pradesh in Triennium 1977-78 to 1979-80 Over 1956-57 to 1958-59.

S.No.	Districts	Irrigated Area (Percentage change)		Irrigation Ratio (Percent)	
		Net	Gross	Net	Gross
1.	Balaghat	28.53	37.77	7.4	12.1
2.	Bastar(Jagdalpur)	-34.80	-41.36	-1.1	1.0
3.	Betul	208.75	208.73	6.4	5.5
4.	Bhind	161.62	290.23	9.4	16.0
5.	Bhopal*	14.37	14.38	-0.5	0.6
6.	Bilaspur	53.47	58.53	4.0	6.3
7.	Chhatarpur	83.78	84.79	4.3	2.8
8.	Chhindwara	231.78	243.58	6.4	5.6
9.	Damoh	65.97	101.90	-0.2	0.1
10.	Datia	563.64	565.23	17.8	16.6
11.	Dewas	962.87	868.26	8.8	8.1
12.	Dhar	260.96	259.16	7.9	6.8
13.	Durg*	31.83	35.83	7.6	8.8
14.	Guna	154.48	159.28	0.2	0.2
15.	Gwalior	78.23	95.61	0.3	0.1
16.	Hoshangabad	1596.03	1321.54	11.3	11.0
17.	Indore	618.38	584.34	12.8	11.0
18.	Jabalpur	108.38	150.88	1.9	1.9
19.	Jhabua	537.92	514.41	4.7	4.3
20.	Khandwa	371.64	371.65	7.6	7.0
21.	Khargone	330.97	329.79	10.8	9.9
22.	Mandla	358.01	364.81	1.1	1.1
23.	Mandsaur	151.42	143.44	4.4	4.9
24.	Morena	950.10	959.77	38.9	34.6
25.	Narsinghpur	1024.38	571.62	8.8	8.2
26.	Panna	331.05	335.72	3.4	3.2
27.	Raigarh	90.71	158.85	2.3	3.4
28.	Raipur	91.73	94.13	14.5	13.2
29.	Raisen	450.34	442.19	1.3	1.3
30.	Rajgarh	123.28	126.39	0.5	0.3
31.	Rajnandgaon*	35.70	40.23	3.4	3.7
32.	Ratlam	225.97	210.24	3.6	2.7
33.	Rewa	1546.49	1546.48	4.4	3.6
34.	Sagar	239.57	271.69	1.6	1.7
35.	Satna	1473.08	1348.63	2.9	2.4
36.	Sehore*	63.80	66.67	2.3	1.9
37.	Seoni	14.57	22.68	-0.1	0.4
38.	Shahdol	473.10	474.71	1.3	1.2
39.	Shajapur	262.88	250.47	4.7	4.1
40.	Shivpuri	95.69	101.54	4.6	4.6
41.	Sidhi	1233.21	977.58	2.3	1.7
42.	Surguja(Ambikapur)	346.67	417.69	1.5	1.6
43.	Tikamgarh	95.89	101.51	9.8	6.6
44.	Ujjain	672.31	614.89	8.0	6.9
45.	Vidisha	1096.10	1085.85	1.5	1.4

* For Bhopal, Durg, Rajnandgaon and Sehore base period is 1972-73 instead of 1956-58 (triennium)

4.4 Cultivation of High Yielding Varieties

New opportunities placed before the man by scientific development have mitigated the limited charater of land in terms of its productivity per unit. Introduction of high yielding varieties of different crops have opened immense opportunities. Increasing the area of high yielding varieties is therefore an important step towards higher production as well as development of the area.

Out of the total area cultivated under high yielding varieties in the state, largest proportion i.e. 8.87 per cent was in Raipur district. The other districts ranking high in this regard were : Bilaspur (7.00 per cent), Mandsaur (6.42 per cent), Durg (5.84 per cent), Rajnandgaon (5.06 per cent), Surguja, (4.90 per cent) and Morena (4.16 per cent). Table 4.13.

The district having highest percentage of area under high yielding varieties to gross cropped area was Morena with 26.96 per cent. Other important districts and their percentage of area under high yielding were: Bhind (25.63 per cent), Mandsaur (24.96 per cent), Rajnandgaon (22.99 per cent), Durg (21.40 per cent), Surguja (21.39 per cent) and Raipur (20.16 per cent). Lowest percentage of area under high yielding varieties was in Guna (3.57 per cent), preceded by Sagar (4.03 per cent), Jhabua (4.23 per cent), Vidisha (4.52 per cent), Sidhi (4.91 per cent) and Shahdol (4.96 per cent). Table 4.13

Table 4.13 Districtwise Area of High Yielding Varieties and its Percentage (1977-78 to 1979-80, 3 years Average)

(Area in '000 Hect.)

S.No.	District	H.Y.V.Area ('000Hect.)	Percentage of H.Y.V.Area in the District to		
			Total HYV Area in M.P.(%)	Total Area of HYV crops in Distt.(%)	Gross Cropped Area in Distt(%)
1.	Balaghat	65.66	2.41	26.41	18.61
2.	Bastar(Jagdalpur)	70.80	2.60	13.43	8.81
3.	Betul	67.00	2.46	34.26	15.21
4.	Bhind	90.73	3.33	55.66	25.63
5.	Bhopal	18.40	0.67	19.72	11.82
6.	Bilaspur	190.96	7.00	27.75	19.30
7.	Chhatarpur	30.13	1.10	21.35	7.99
8.	Chhindwara	28.83	1.06	15.17	5.43
9.	Damoh	24.73	0.91	13.94	8.17
10.	Datia	16.73	0.61	25.08	12.75
11.	Dewas	49.80	1.83	30.90	18.54
12.	Dhar	43.43	1.59	19.45	7.31
13.	Durg	159.26	5.84	41.87	21.40
14.	Guna	21.16	0.78	6.06	3.57
15.	Gwalior	52.56	1.93	35.99	19.43
16.	Hoshangabad	43.73	1.60	24.21	9.71
17.	Indore	34.00	1.25	25.54	11.61
18.	Jabalpur	52.20	1.91	16.57	9.96
19.	Jhabua	16.10	0.59	10.43	4.23
20.	Khandwa	50.97	1.87	28.78	10.94
21.	Khargone	98.16	3.60	34.62	14.46
22.	Mandla	28.23	1.03	10.99	5.80
23.	Mandsaur	175.26	6.42	57.98	24.96
24.	Morena	113.50	4.16	57.87	26.96
25.	Narsinghpur	29.13	1.07	40.67	10.23
26.	Panna	17.23	0.63	12.25	7.41
27.	Raigarh	104.23	3.82	27.86	19.00
28.	Raipur	242.00	8.87	29.80	20.16
29.	Raisen	34.10	1.25	19.69	8.36
30.	Rajgarh	23.66	0.86	10.37	5.42
31.	Rajnandgaon	138.00	5.06	45.50	22.99
32.	Ratlam	36.20	1.32	24.98	9.86
33.	Rewa	36.40	1.32	14.03	8.02
34.	Sagar	21.30	0.78	7.29	4.03
35.	Satna	41.23	1.51	16.17	10.11
36.	Sehore	30.10	1.10	16.36	8.15
37.	Seoni	34.30	1.26	17.95	8.75
38.	Shahdol	25.06	0.92	8.78	4.96
39.	Shajapur	50.56	1.85	23.46	10.95
40.	Shivpuri	33.80	1.24	17.70	8.64
41.	Sidhi	21.36	0.78	13.77	4.91
42.	Surguja (Ambikapur)	133.70	4.90	51.13	21.39
43.	Tikamgarh	44.90	1.65	34.75	16.41
44.	Ujjain	65.36	2.40	25.62	12.67
45.	Vidisha	23.33	0.86	7.52	4.52
46.	All M.P.	2728.28	100.00	23.80	12.77

4.5 Fertilizers

Statewise consumption of fertilizers in the country reveals that in Madhya Pradesh the biggest state in area possessing highest acreage of net area sown- the consumption of fertilizers was only 3.89 per cent of the total fertilizer consumption of India in 1981-82. Consumption of fertilizers per unit of gross cropped area was only 7.4 kg/hect. in Madhya Pradesh as compared to 106.8 kg/hect in Punjab, 69.3 kg/hect in Tamil Nadu, 43.3 kg/hect in Uttar Pradesh 39.7 kg/hect. in Haryana during 1979-80. Though the situation seems very disappointing but the trend of fertilizer consumption in the state is towards increase. In 1956-57 total fertilizer consumption in the state was 2.96 thousand tonnes which had increased to 192.59 thousand tonnes in 1978-79. The consumption of fertilizers varied considerably among the district. In Mandsaur district consumption of fertilizer was 14.25 thousand tonnes where as in Sidhi district it was only 0.54 thousand tonnes in 1978-79.

Districtwise variation in consumption of fertilizers per unit of gross cropped area given in Table 4.14 shows that Morena with the consumption of 23.26 kg per hectare ranked first followed by Indore (22.95 kg/hect), Ratlam (18.19 kg/hect), Tikamgarh (17.72 kg/hect) khargone (16.60 kg/hect.) and Bhind 16.08 kg/hect). Lowest consumption of fertilizer was in Mandla (0.81 kg/hect) preceded by Bastar (0.94 kg/hect). Table 4.14

Increase in fertilizer consumption per unit of cropped area had been 1462 per cent in Madhya Pradesh during trienniums of 1977-78 to 1979-80 over 1961-62 to 1963-64. Highest increase recorded among the districts was in Datia (9757 per cent) followed by Dewas (8892 per cent), Indore (6650 per cent) and Rewa (5985 per cent). Lowest increase in fertilizer use had been in Mandla (350 per cent)preceded by Rajnandgaon(393 per cent).Table 4.14

Table 4.14 Districtwise Change in use of Fertilizers per unit of cropped area in triennium 1977-78 to 1979-80 over 1961-62 to 1963-64 (3 years average)

S.No.	Name of District	Use of Fertilizers kg/hect			Percentage Change
		1961-62 to 63-64 (3 yrs. Average	1977-78 to 79-80 (3 yrs. Average	Difference	
1.	Balaghat	1.11	5.92	4.81	433.33
2.	Bastar	0.09	0.94	0.85	944.44
3.	Betul	0.28	5.25	4.97	1775.00
4.	Bhind	0.43	16.08	15.65	3639.53
5.	Bhopal	0.66*	10.21	9.55	1446.97
6.	Bilaspur	0.97	7.83	6.86	707.22
7.	Chhatarpur	0.21	5.00	4.79	2280.95
8.	Chhindwara	0.34	4.92	4.58	1347.06
9.	Damoh	0.20	3.32	3.12	1560.00
10.	Datia	0.14	13.80	13.66	9757.14
11.	Dewas	0.13	11.69	11.56	8892.30
12.	Dhar	0.32	13.22	12.90	4031.25
13.	Durg	0.96	6.50	5.54	577.08
14.	Guna	0.09	1.27	1.18	1311.11
15.	Gwalior	0.70	15.94	15.28	2182.86
16.	Hoshangabad	0.17	8.74	8.57	5041.18
17.	Indore	0.34	22.95	22.61	6650.00
18.	Jabalpur	0.19	7.30	7.11	3742.11
19.	Jhabua	0.31	6.43	6.12	1974.19
20.	Khandwa	1.32	11.43	10.11	765.91
21.	Khargone 3	0.73	16.60	15.87	2172.97
22.	Mandla	0.18	0.81	0.63	350.00
23.	Mandsaur	0.69	15.47	14.78	2142.03
24.	Morena	0.40	23.26	22.86	5715.00
25.	Narsinghpur	0.23	7.97	7.74	3365.22
26.	Panna	0.13	3.63	3.50	2692.31
27.	Raigarh	0.76	7.21	6.45	848.68
28.	Raipur	1.69	12.64	10.95	647.93
29.	Raisen	0.85	5.94	5.09	598.82
30.	Rajgarh	0.15	2.40	2.25	1500.00
31.	Rajnandgaon	0.96+	4.74	3.78	393.75
32.	Ratlam	0.56	18.19	17.63	3148.21
33.	Rewa	0.14	8.52	8.38	5985.71
34.	Sagar	0.18	3.55	3.37	1872.22
35.	Satna	0.12	5.95	5.83	4858.33
36.	Sehore	0.66	5.38	4.72	715.15
37.	Seoni	0.14	1.61	1.47	1050.00
38.	Shahdol	0.07	1.40	1.33	1900.00
39.	Shajapur	0.19	5.31	5.12	2694.74
40.	Shivpuri	0.11	5.35	5.24	4763.64
41.	Sidhi	0.12	1.08	0.96	800.00
42.	Surguja	0.07	2.14	2.07	2957.14
43.	Tikamgarh	0.47	17.72	17.25	3670.21
44.	Ujjain	0.18	14.04	13.86	7700.00
45.	Vidisha	0.08	3.61	3.53	4412.50
	All M.P.	0.51	7.97	7.46	1462.74

* Data for Bhopal in 1961-64 taken from Sehore district before formation of Bhopal.

\+ Data for Rajnandgaon in 1961-64 taken from Durg district before formation of Rajnandgaon.

Table 4.15 Categorisation of Districts on the basis of Indices for Fertilizer Consumption per unit of Gross Cropped Area (Kg/hect)

Base: All India average of 30.5 Kg=100

Category	Index Range	No.of Distt.	Name of Districts
Good	More than 130	Nil	-
Fair	110-130	Nil	-
Moderate	90-110	Nil	-
Poor	70-90	2	Morena, Indore
Very Poor	Below 70	43	Ratlam, Tikamgarh, Khargone, Bhind, Gwalior, Ujjain, Datia, Dhar, Raipur, Dewas, Mandsaur, Khandwa, Bhopal, Jhabua, Hoshangabad, Rewa, Narsinghpur, Bilaspur, Jabalpur, Raigarh, Durg, Satna, Raisen, Balaghat, Sehore, Shivpuri, Shajapur, Betul, Chhatarpur, Chhindwara, Rajnandgaon, Panna, Vidisha Sagar, Damoh, Rajgarh, Surguja, Seoni, Shahdol, Guna, Sidhi, Bastar, Mandla.

Table 4.16 Categorisation of Major States on the basis of Indices for Fertilizer Consumption Per unit of Gross Cropped Area (Kg/Hect) 1979-80.

Base: All India Average of 30.5 Kg= 100

Category	Index Range	Name of Districts
Good	More than 130 130	Punjab(106.8 kg) Tamil Nadu (69.3 kg) Uttar Pradesh (43.3 kg) Andhra Pradesh (42.7 kg) Haryana (39.7 kg)
Fair	110-130	Gujrat (36.6 Kg) Kerala (36.2 Kg)
Moderate	90-110	Karnatak (33.2 Kg), West Bengal(30.6kg)
Poor	70-90	Jammu and Kashmir (23.5 Kg), Maharashtra (21.3 Kg)
Very Poor	Below 70	Bihar (15.9 Kg), Himachal Pradesh (15.0 Kg) Rajasthan (8.6 kg), Orissa (8.5 Kg), Madhya Pradesh (7.4 Kg).

CHAPTER V

CROP PERFORMANCE AND ADJUSTMENT

5.1 Approach

'In our prevailing agricultural situation many types of maladjustments are found. Irrational use of land and hapazard allocation of area to different crops are examples, of some important maladjustments in agriculture.[1]'

Madhya Pradesh is a vast state representing a mosaic of soil crop complex. There are appreciable differences in the importance of different crops in the cropping pattern of different districts. Hapazard allocation of area to different crops has created maladjustment in different pockets. The study of 'Cropping Pattern in Madhya Pradesh' revealed that- 'even under the existing physical conditions there is considerable scope for improving the cropping pattern in all the districts of the State[2].' With this background here an attempt has been made to study the localization of crops and their adjustment of maladjustment in different districts of Madhya Pradesh. The underlying hypothesis is that under high degree of crop adjustment, greater extent of cultivation (high degree of localization) should correspond with higher yield.

5.1.2. Crops Studied

Cropwise discussion, which follows in the subsequent part of this Chapter, is related to ten selected crops- which together covered 69.23 per cent of the gross cropped area in the State and fairly represented the different crop categories. The crop categories and the selected crops are

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1. 'Studies in utilisation of Agricultural land' Dr. D.S.Chauhan
2. 'Cropping Pattern in Madhya Pradesh' by National Council of Applied Economic Research, New Delhi (1967) p.39.

I	Cereals	- Rice, Wheat, Jowar
II	Pulses	- Gram, Arhar (Tur)
III	Oil Seeds	- Groundnut, Sesamum, Linseed, Rape and Mustard
IV	Fibre Crop	- Cotton

Districtwise performance, of the above mentioned selected crops, has been analysed and studied on the following aspects:

1. 'Studies in utilisation of Agricultural land' Dr. D.S. Chauhan.
2. 'Cropping Pattern in Madhya Pradesh' by National council of Applied Economic Research, New Delhi (1967) p.39.

I. Extent of cultivation

a) Percentage of the crop area to gross cropped area in the district.

b) Percentage of the crop area in the district to total area of the crop in the State.

II. Out put share

Percentage of the crop production in the district to total production of the crop in the State.

III. Yield Level

Crop yield index based on the three years average yield of the crop

IV Crop Adjustment

Degree of crop adjustment with regard to the extent of cultivation and yield level.

5.1.3 Crop Adjustment- Method of Study

For studying crop adjustment in the districts indices of extent of cultivation and the crop yields were computed for each selected crop and all important districts. Three years average (i.e.1977-78 to 1979-80) of both percentage of area and the yields were converted into indices by taking the State data as base equal to 100.

All the forty five districts were classified into five groups representing different degrees of localization or different levels of yield. Taking the State as base equal to 100 the groups were formed on the degree and direction of departure from the base as given below :

Group/Category	Extent of Variation	Index Level
A	More than 30	Above 130
B	+ 10 to 30	110-130
C	± 10	90-110
D	- 10 to 30	70-90
E	Below- 30	Below 70

On the basis of the class limits of area percentage and yield indices as mentioned above, each district was placed under some particular category according to the extent of cultivation (i.e. percentage of area) and also according to the yield index. On the basis of corresponding categories of area and yield indices 25 combinations emerged which were further pooled to form five categories-called crop adjustment categories. For classifying each district into a particular crop adjustment category following method was adopted.

By arranging the districts in different situations according to their extent of cultivation and yield index their crop adjustment category was finally determined for each crop as given in the following table:

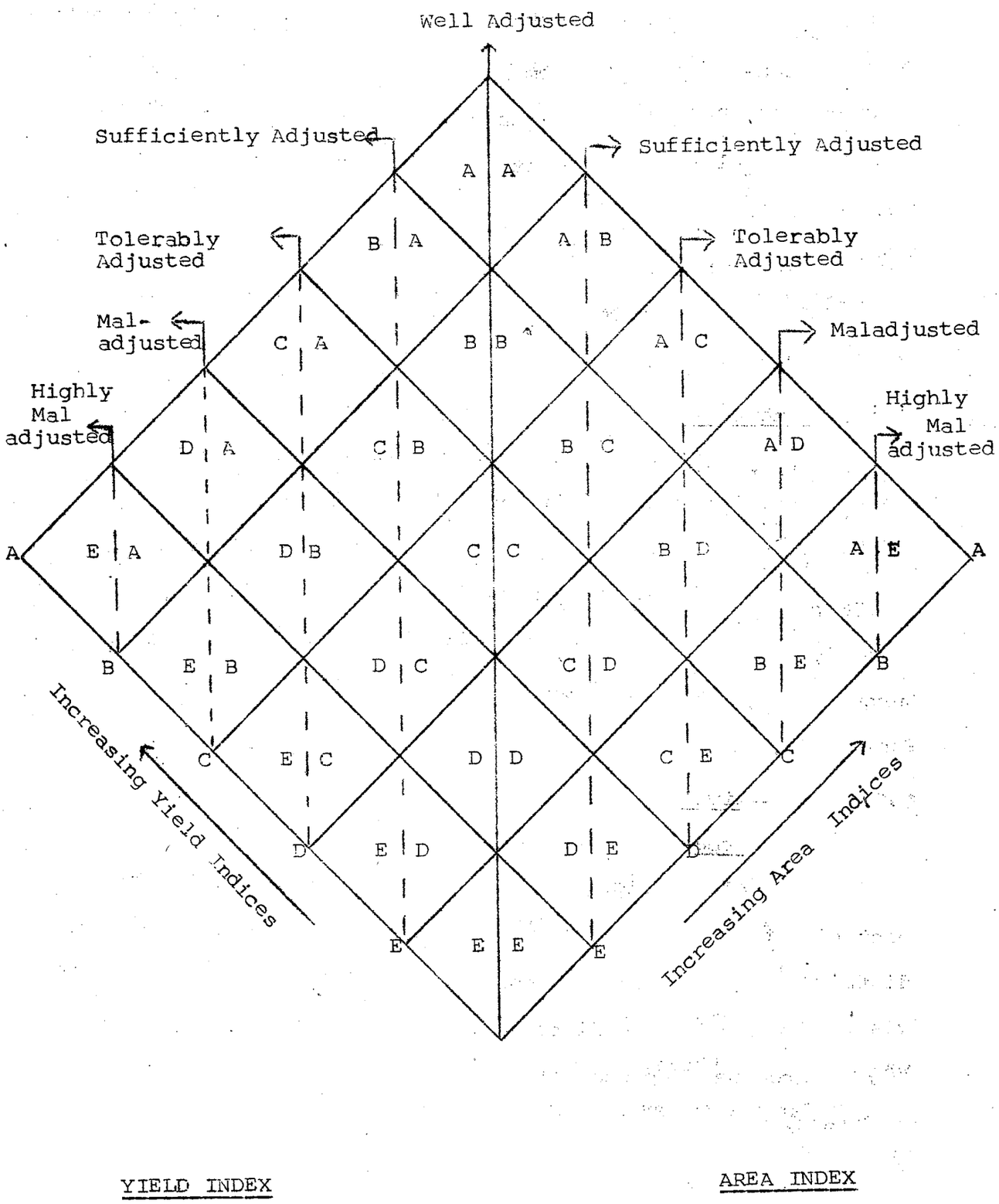
Crop Adjustment Category		Combinations representing different set of Situations	
		Area Dominating	Yield Dominating
I	Well Adjusted	AA, BB, CC,	DD, EE
II	Sufficiently Adjusted	AB, BC, CD, DE,	BA, CB, DC, ED,
III	Tolerably Adjusted (Having some maladjustment)	AC, BD, CE,	CA, DB, EC,
IV	Maladjusted	AD, BE,	DA, EB,
V	Highly Maladjusted	AE,	EA.

Thus on the basis of the extent of cultivation and yield index the crop adjustment category of each district for each crop determined separately. The details are given in the cropwise discussion given ahead.

5.2 Cropwise Discussion

Crop performance and localization has been dealt with cropwise. Ten important crops (as mentioned in para have been studied under the heads: distribution, extent of cultivation, relative share in area and output, yield level and crop adjustment. The discussion on each is confined to all important districts growing that crop.

Fig. 5.1 Diagram showing combinations of Different Crop Adjustment Categories.



5.3 RICE (Oryza sativa)

5.3.1 Distribution

In Madhya Pradesh cultivation of rice is mainly concentrated in the south-eastern part comprising- Balaghat, Bastar, Bilaspur, Durg, Mandla, Rajnandgaon, Raipur, Raigarh, Shahdol and Surguja districts. All these districts alongwith Sidhi district are contiguous and form the rice crop zone of the State. In five adjacent districts (Jabalpur, Rewa, Panna, Satna and Seoni) which comprise rice wheat zone the crop of rice and wheat are of equal importance.

5.3.2 Extent of Cultivation

The percentage of rice area to gross cropped area in the districts was highest in Bilaspur (65.82 per cent) followed by Raigarh (65.58 per cent), Balaghat (63.91 per cent), Bastar (60.56 per cent), and Raipur (51.88 per cent). Other important rice districts of the state ranked in the following order: Surguja, Rajnandgaon, Durg, Shahdol, Rewa, Mandla, Jabalpur, Panna, Seoni, Satna and Sidhi (Table 5.1)

5.3.3 Relative Share

i) Area

The eleven rice-zone districts together shared 80.61 per cent of total rice area in the State. Taking the rice-zone district (11) and the rice wheat zone district (5) together, it was observed that 90.76 per cent of total rice area in the state was shared by these 16 districts. The remaining 9.24 per cent of rice area was spread all over the remaining 29 districts of the state.

Table 5.1 Districtwise percentage of Rice area to gross cropped area and relative share of district in area and output of Rice in Madhya Pradesh

S.No.	District	Percentage to gross cropped area		Relative share in M.P.			
				Area		Output	
		percent	Rank	percent	Rank	Percent	Rank
1.	Balaghat	63.91	3	4.71	8	6.18	5
2.	Bastar	60.56	4	10.37	3	11.62	3
3.	Betul	8.20	21	0.76	18	0.78	17
4.	Bhind	5.17	25	0.38	27	0.79	16
5.	Bhopal	1.01	39	0.03	41	0.02	42
6.	Bilaspur	65.82	1	13.64	2	14.33	2
7.	Chhatarpur	7.94	22	0.42	24	0.39	24
8.	Chhindwara	4.99	26	0.55	23	0.41	22
9.	Damoh	17.06	17	1.08	17	0.76	19
10.	Datia	1.14	38	0.03	42	0.01	44
11.	Dewas	1.00	40	0.08	39	0.05	39
12.	Dhar	2.42	31	0.29	30	0.23	30
13.	Durg	42.28	8	7.37	5	4.55	7
14.	Guna	0.72	41	0.09	38	0.07	38
15.	Gwalior	9.65	19	0.55	22	1.01	15
16.	Hoshangabad	2.50	30	0.23	32	0.30	27
17.	Indore	0.25	43	0.02	43	0.01	43
18.	Jabalpur	25.46	12	2.79	10	2.24	10
19.	Jhabua	9.55	20	0.70	19	0.37	25
20.	Khandwa	7.15	23	0.70	20	0.75	20
21.	Khargone	2.84	29	0.40	26	0.29	28
22.	Mandla	25.79	11	2.63	11	1.78	12
23.	Mandsaur	0.17	44	0.02	44	0.02	41
24.	Morena	1.51	35	0.13	36	0.21	32
25.	Narsinghpur	5.45	24	0.32	28	0.39	23
26.	Panna	23.75	13	1.16	16	0.51	21
27.	Raigarh	65.58	2	7.37	4	8.04	4
28.	Raipur	51.88	5	16.55	1	20.40	1
29.	Raisen	1.40	37	0.12	37	0.09	37
30.	Rajgarh	2.27	32	0.21	33	0.14	33
31.	Rajnandgaon	43.04	7	5.41	7	3.35	8
32.	Ratlam	1.76	34	0.13	35	0.09	36
33.	Rewa	26.01	10	2.47	12	1.42	13
34.	Sagar	2.93	28	0.32	29	0.27	29
35.	Satna	21.60	15	1.87	14	0.77	18
36.	Sehore	1.83	33	0.14	34	0.12	34
37.	Seoni	22.96	14	1.88	13	2.02	11
38.	Shahdol	40.31	9	4.26	9	3.35	9
39.	Shajapur	1.41	36	0.41	25	0.11	35
40.	Shivpuri	3.09	27	0.25	31	0.22	31
41.	Sidhi	19.46	16	1.77	15	1.05	14
42.	Surguja	48.65	6	6.37	6	5.58	6
43.	Tikamgarh	10.33	18	0.59	21	0.35	26
44.	Ujjain	0.11	45	0.01	45	0.01	45
45.	Vidisha	0.35	42	0.04	40	0.02	40
	ALL M.P.	22.35	-	100.00	-	100.00	-

Relative share of area was highest in Raipur (16.55 per cent) followed by Bilaspur (13.64 per cent), Bastar (10.37 per cent), Raigarh and Durg each sharing 7.30 per cent of total rice area (Table 5.1)

ii) Output

Raipur alone shared 20.40 per cent of total rice output in the state and stood first in this regard. The position of other districts were: Bilaspur, Bastar, Raigarh, Balaghat, Surguja, Durg, Rajnandgaon and Shahdol. These nine districts together with Mandla and Sidhi forming the rice zone contributed 80.23 per cent of total rice output in the state (Table 5.1)

5.3.4 Yield Level

Among the important rice growing districts of the state Balaghat had the highest yield index of 130 (yield = 943 kg.per hectare), followed by Raipur (143), Bastar (113), Durg and Seoni (107), Raigarh (106) and Bilaspur (104) (Table 5.2)

A few districts coventionally not included in the category of rice growing districts of the state had very high yield index for rice (even higher than Balaghat). These districts are Bhind (Index 167 and yield 1217 kg per hectare), Morena (Index 164, yield 1196 kg/Hect.) and Gwalior (Index 149 yield 1085 kg/hect.) Table 5.2 However, these three districts shared only 1.06 per cent of total rice area and 2.01 per cent of total rice production in the state.

Table 5.2 Districtwise yield of Rice in Madhya Pradesh (Three years average, 1977-78 to 1979-80).

Base: M.P.= 100

District	Yield kg/hect.	Yield Index	Rank	District	Yield kg/hect	Yield Index	Rank
Balaghat	943	130	4	Morena	1196	164	2
Bastar	824	113	6	Narsinghpur	744	103	13
Betul	608	83	16	Panna	310	42	44
Bhind	1217	167	1	Raigarh	775	106	9
Bhopal	473	65	30	Raipur	892	123	5
Bilaspur	759	105	11	Raisen	473	65	28
Chhatarpur	553	76	19	Rajgarh	408	56	39
Chhindwara	444	61	31	Rajnandgaon	748	103	12
Damoh	415	57	37	Ratlam	416	57	35
Datia	319	43	42	Rewa	411	56	38
Dewas	409	56	40	Sagar	492	67	25
Dhar	486	67	23	Satna	290	39	45
Durg	776	107	7	Sehore	522	71	20
Guna	480	66	27	Seoni	779	107	8
Gwalior	1085	149	3	Shahdol	558	76	18
Hoshangabad	767	105	10	Shajapur	479	66	26
Indore	430	59	33	Shivpuri	515	71	21
Jabalpur	583	80	17	Sidhi	422	58	34
Jhabua	317	43	43	Surguja	627	86	15
Khandwa	648	89	14	Tikamgarh	355	48	41
Khargone	435	59	32	Ujjain	417	57	36
Mandla	488	67	24	Vidisha	361	65	29
Mandsaur	494	68	22	All M.P.	725	100	--

5.3.5 Crop Adjustment

The tendency of localization in rice crop is quite high in this state. Nearly 83 per cent of rice area was found more or less adjusted. It included 19 well adjusted districts contributing 5.70 per cent area, 11 sufficiently adjusted districts sharing 50.55 per cent area and 8 tolerably adjusted districts sharing 26.84 per cent area. Four districts covering 15.84 per cent area were maladjusted and three districts covering only 1.07 per cent area were highly maladjusted (Table 5.3)

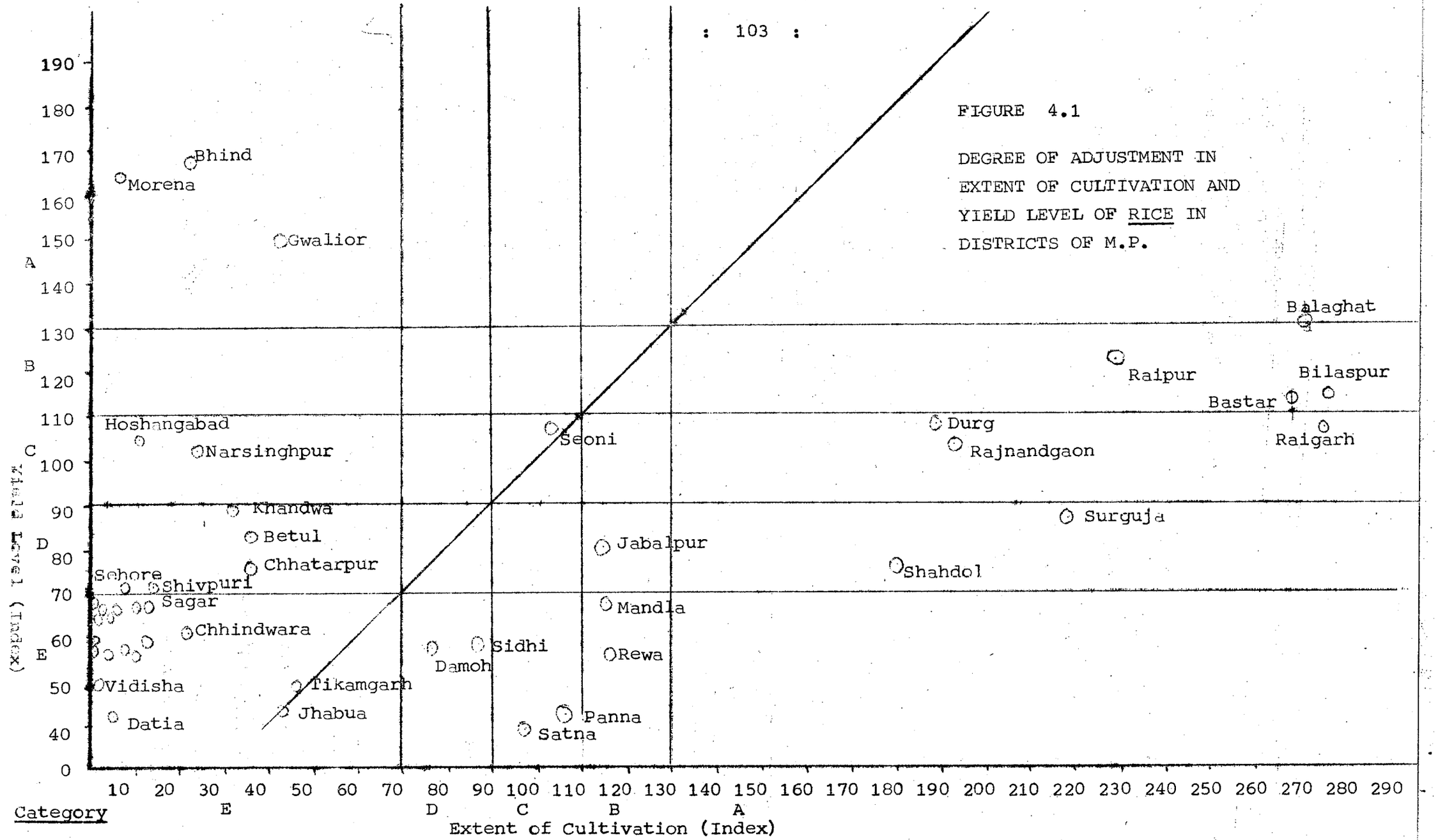
The major rice growing districts i.e. Bilaspur, Balaghat Bastar and Raipur were area dominating sufficiently adjusted districts. Yield level of rice crop-in these districts did not commensurate with the extent of cultivation i.e. area. Sidhi and Damoh districts also exhibited similar situation but at the lowest level.

Their combination of situation was DE i.e. D category for extent of cultivation (represented by area index) and E category for the yield level i.e. yield index (Table 5.3 and Figure 5.1)

Similarly, five districts i.e. Chhatarpur, Betul, Khandwa, Shivpuri and Sehore were yield dominating sufficiently adjusted districts. None of these districts is conventionally a rice growing district, however, the yield indices of these districts being in the range of 110 to 130 give justification of increasing rice area to some extent by subtituting some other poorly adjusted crops.

FIGURE 4.1

DEGREE OF ADJUSTMENT IN EXTENT OF CULTIVATION AND YIELD LEVEL OF RICE IN DISTRICTS OF M.P.



Morena, Bhind and Gwalior districts were highly maladjusted districts. The yield indices of these districts were quite high (higher than the sufficiently adjusted rice growing districts of rice zone i.e. Bilaspur, Balaghat, Bastar and Raipur), but the area of rice in these districts was quite low. Increase of rice area in these districts was possible atleast to the extent of their irrigated area.

The districts of Surguja, Shahdol and Mandla (all belonging to the rice zone) and Rewa district of rice wheat zone were maladjusted. Their acreage of rice were highly disproportionate to their low yield level thus indicating for vigorous efforts to increase their yield level.

Table 5.3 Classification of Districts in different crop Adjustment categories for Rice.

Category with Range of Indices	Yield Dominating District	Area Dominating District	Rice	
			Area (Hect)	%
Well I Adjusted Above 130	Seoni, Tikamgarh, Chhindwara, Khargone, Sagar, Rajgarh, Dhar, Ratlam, Shajapur, Datia, Dewas, Guna, Vidisha, Ujjain, Indore, Mandsaur, Raisen, Bhopal.	Jhabua	270532	5.70
Sufficiently Adjusted II 110-130	Chhatarpur, Betul, Khandwa, Shivpuri, Sehore	Bilaspur, Balaghat, Bastar, Raipur, Sidhi, Damoh.	2397967	50.55
Tolerably Adjusted III 90- 110	Hoshangabad, Narsinghpur	Raigarh, Rajnandgaon, Durg, Jabalpur, Panna, Satna.	1273534	26.84
Maladjusted 70-90 IV		Surguja, Shahdol Mandla, Rewa,	751134	15.84
Highly Maladjusted V Below 70	Gwalior, Morena, Bhind.		50767	1.07
Total	28 districts	17 districts	4743934	100.00

5.4 W H E A T (Tritricum aestivum)

5.4.1 Distribution

Wheat occupies second position in the cropping pattern of the state, Sharing nearly fifteen per cent of the gross cropped area. Though its cultivation is more spread out than rice, still the cultivation of the crop is more concentrated in the central districts i.e. Vidisha, Raisen, Sagar, Damoh, Narsinghpur, Hoshangabad, Sehore and Bhopal. These districts comprise wheat zone of the state.

5.4.2 Extent of Cultivation

Percantage of wheat area to the gross cropped area in the district was highest in Vidisha, (50.40 per cent) followed by Sagar (47.33 per cent) and Raisen (37.95 per cent). Satna, Damoh, Chhatarpur and Sehore district each had more than one third of its gross cropped area under wheat. In addition to the above mentioned seven districts the other nine districts having more than 25.00 per cent of gross cropped area under wheat, were- Panna, Gwalior, Datia, Jabalpur, Morena, Hoshangabad, Rewa, Bhind and Indore. Thus, in all, sixteen districts, had more than 25.00 per cent of their gross cropped area occupied by wheat (Table 4.12). In fourteen districts wheat area was in between 10 to 25 per cent. Districts having less than 10.00 per cent area under wheat were fifteen- out of these ten districts belonged to rice crop zone and the rest five were- Rajgarh, Mandsaur, Khargone, Khandwa and Jhabua- which belonged to the Jowar-Cotton zone (Table 5.4).

5.4.3 Relative Share

i) Area

With regard to percentage of wheat area in the district to total wheat area in the state, Vidisha, occupied first position with 7.49 per cent area, followed by Sagar (7.20 per cent), Jabalpur (4.53 per cent), Sehore (4.52 per cent) and Raisen (4.46 per cent), The districts individually sharing less than one per cent of wheat area mainly belonged to the rice crop zone and together shared only 5.86 per cent of total wheat area. The other districts outside the rice zone having less than one per cent area of wheat were Khandwa and Jhabua. (Table 5.4)

ii) Out put

The top ranking three districts, each sharing more than five per cent of wheat output were Vidisha (7.17) per cent), Sagar (6.85 per cent) and Morena (5.69 per cent). Other important districts contributing more than four per cent each were Raisen (4.76 per cent), Sehore (4.13 per cent), Satna (4.02 per cent) and Guna (4.00 per cent). These seven districts together shared one third of total wheat production of the state. Twelve districts which individually shared less than one per cent of wheat output mainly belonged to the rice crop zone and the two other districts included in the category were Khandwa and Jhabua, (Table 5.4)

Table 5.4 Districtwise percentage of Wheat area to gross Cropped area and relative share of district in area and output of Wheat in Madhya Pradesh

S.No.	District	Percentage to gross cropped area		Relative share in M.P.			
				Area		Out put	
		Percent	Rank	Percent	Rank	Percent	Rank
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1.	Balaghat	5.27	37	0.53	41	0.27	43
2.	Bastar	0.39	45	0.09	45	0.08	45
3.	Betul	15.85	22	2.01	24	1.18	27
4.	Bhind	25.34	15	2.58	12	3.77	8
5.	Bhopal	14.62	25	2.09	21	1.86	24
6.	Bilaspur	2.39	42	0.68	38	0.49	39
7.	Chhatarpur	34.36	6	2.48	14	2.71	15
8.	Chhindwara	13.70	28	2.09	23	1.12	30
9.	Damoh	34.83	5	3.04	11	2.42	20
10.	Datia	31.01	10	1.17	32	1.03	32
11.	Dewas	14.86	24	1.65	26	1.90	23
12.	Dhar	14.05	26	2.28	17	2.03	21
13.	Durg	3.51	40	0.75	36	0.42	40
14.	Guna	19.70	20	3.36	9	4.00	7
15.	Gwalior	31.36	9	2.44	15	2.94	13
16.	Hoshangabad	29.85	12	3.87	7	3.66	9
17.	Indore	25.26	16	2.21	19	2.82	14
18.	Jabalpur	30.01	11	4.53	3	3.03	12
19.	Jhabua	3.61	39	0.36	43	0.54	37
20.	Khandwa	5.29	36	0.71	37	0.85	34
21.	Khargone	6.04	35	1.18	31	1.97	22
22.	Mandla	14.97	23	2.09	22	1.67	25
23.	Mandsaur	8.19	33	1.65	27	3.10	11
24.	Morena	26.17	14	3.17	10	5.69	3
25.	Narsinghpur	13.74	27	1.13	34	1.05	31
26.	Panna	31.64	8	2.12	20	1.65	26
27.	Raigarh	0.91	44	0.14	44	0.15	44
28.	Raipur	1.35	43	0.59	40	0.52	38
29.	Raisen	37.95	3	4.46	5	4.76	4
30.	Rajgarh	9.44	32	1.18	30	1.14	29
31.	Rajnandgaon	3.78	38	0.65	39	0.36	41
32.	Ratlam	10.66	30	1.13	33	1.15	28
33.	Rewa	26.41	13	3.45	8	2.64	17
34.	Sagar	47.33	2	7.20	2	6.85	2
35.	Satna	37.00	4	4.35	6	4.02	6
36.	Sehore	33.09	7	4.52	4	4.13	5
37.	Seoni	20.08	19	2.26	18	1.02	33
38.	Shahdol	9.51	31	1.38	29	0.76	35
39.	Shajapur	13.13	29	1.75	25	2.53	19
40.	Shivpuri	22.81	17	2.57	13	2.69	16
41.	Sidhi	7.78	34	0.97	35	0.64	36
42.	Surguja	2.81	41	0.39	42	0.32	42
43.	Tikamgarh	22.06	18	1.47	28	3.37	10
44.	Ujjain	15.98	21	2.37	16	2.59	18
45.	Vidisha	50.40	1	7.49	1	7.17	1
	All M.P.	16.25	--	100.00	-	100.00	-

5.4.4 Yield Level

Highest yield of wheat, 1696 kg per hectare was obtained in Tikamgarh district followed by Mandsaur (1627 kg/hect) and Morena (1572 kg/hect). Twenty districts had higher yield level than the average for the state. Among the low yielding districts Seoni was at the bottom with 396 kg per hectare preceded by Balaghat, Shahdol, Durg and Rajnandgaon (Table 5.5)

Table 5.5 Districtwise yield of wheat in Madhya Pradesh (three years average 1977-78 to 1979-80)

Base: M.P.=100

District	Yield kg/hect	Yield Index	Rank	District	Yield kg/Hect	Yield Index	Rank
Balaghat	444	50.97	44	Morena	1572	180.54	3
Bastar	864	99.19	20	Narsinghpur	808	92.79	24
Betul	518	59.49	40	Panna	680	78.09	32
Bhind	1270	145.86	7	Raigharh	914	104.93	16
Bhopal	783	89.93	25	Raipur	773	88.74	26
Bilaspur	610	70.03	36	Raisen	937	107.61	15
Chhatarpur	946	108.61	14	Rajgarh	771	88.50	27
Chhindwara	472	85.22	29	Rajnandgaon	486	55.78	41
Damoh	696	79.93	31	Ratlam	874	100.38	18
Datia	749	86.02	28	Rewa	663	76.14	34
Dewas	871	100.03	19	Sagar	833	95.67	23
Dhar	1122	128.86	10	Satna	584	67.07	37
Durg	481	55.10	42	Sehore	1042	119.67	11
Guna	653	75.00	35	Seoni	396	45.48	45
Gwalior	1042	119.67	12	Shahdol	444	50.98	43
Hoshangabad	835	95.90	22	Shajapur	1271	145.97	6
Indore	1122	128.86	9	Shivpuri	911	104.64	17
Jabalpur	568	65.23	38	Sidhi	562	64.52	39
Jhabua	1313	150.74	4	Surguja	699	80.25	30
Khandwa	1217	139.64	8	Tikamgarh	1696	194.79	1
Khargone	1312	150.63	5	Ujjain	955	109.68	13
Mandla	668	76.72	33	Vidisha	839	96.36	21
Mandsaur	1627	186.78	2	All M.P.	871	100.00	-

5.4.5 Crop Adjustment

The tendency of localization in wheat crop is not so high as in the case of rice crop in this state. Its cultivation is wide spread.

As regards the adjustment of crop in respect to its area and yield twelve districts sharing 18.63 per cent of total wheat area in the state were well adjusted. These districts were: Tikamgarh, Morena, Bhind, Ujjain, Dewas, Chhindwara from Jowar-Wheat or Jowar-Cotton zones and Balaghat, Bilaspur, Durg, Rajnandgaon, Shahdol and Sidhi districts of rice zone (Table 5.6 and Fig. 5.2)

Among the 'sufficiently adjusted districts' Narsinghpur, Rajgarh, Surguja and Raipur were yield dominating districts and Sehore, Gwalior, Indore and Mandla, were area dominating. All these together shared 13.60 per cent of total wheat area.

The districts of Vidisha, Sagar, Raisen, Hoshangabad, (all belonging to wheat-zone) and Chhatarpur, Shivpuri, Guna, and Betul of Jowar-Wheat-zone were area dominating tolerably adjusted districts. Dhar, Ratlam, Raigarh and Bastar, were yield dominating tolerably adjusted districts. Total wheat area of these districts was 39.03 per cent (Table 5.6)

The districts in which wheat crop was maladjusted were: Shajapur, Bhopal, Damoh, Panna, Datia, Rewa, and Seoni. These districts shared 15.92 per cent wheat area.

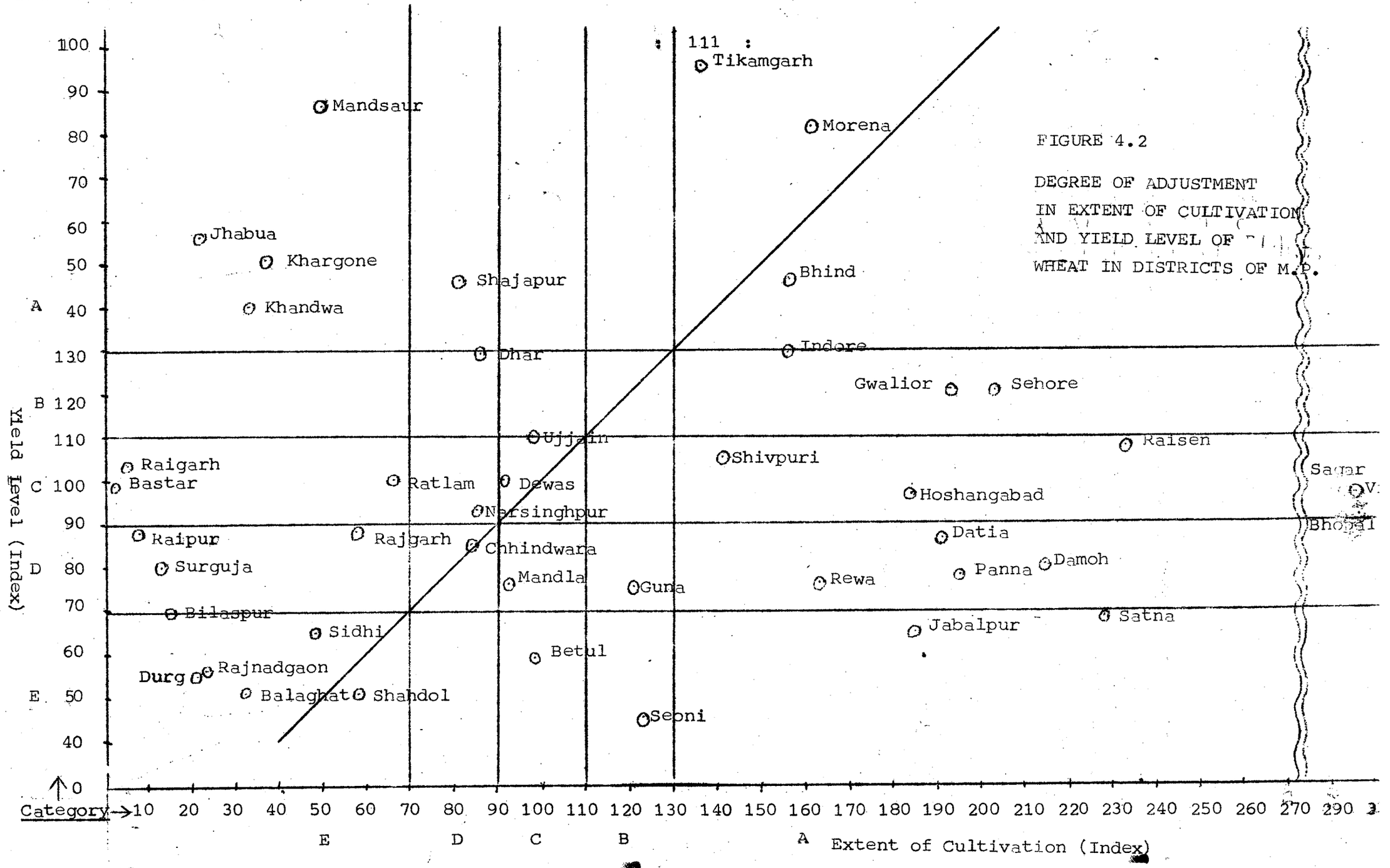


FIGURE 4.2

DEGREE OF ADJUSTMENT IN EXTENT OF CULTIVATION AND YIELD LEVEL OF WHEAT IN DISTRICTS OF M.P.

Six districts which were highly maladjusted in respect to wheat crop were Mandsaur, Khargone, Khandwa, Jhabua (all yield dominating) and Satna Jabalpur (area dominating). Total wheat area shared by these districts was 12.82 per cent.

Mandsaur district occupied second position according to yield index of wheat, eleventh position in output share and twenty seventh position in area. Being one of the highly maladjusted districts it has enough possibility of raising wheat area.

Table 5.6 Classification of Districts in different crop Adjustment Categories for wheat.

Category/ Range	Yield dominating Districts	Area Dominating District	Wheat Area	%
I Well Adjusted Above 130	Morena, Tikamgarh, Ujjain, Dewas, Chhindwara, Sidhi, Balaghat, Rajnandgaon, Durg, Bilaspur.	Shahdol, Bhind	645500	18.53
II Sufficiently Adjusted 110-130	Narsinghpur, Rajgarh, Surguja, Raipur	Sehore, Gwalior, Indore, Mandla.	471198	13.60
III Tolerably Adjusted 90-110	Dhar, Ratlam, Raigarh, Bastar	Vidisha, Sagar, Raisen, Hoshangabad Shivpuri, Guna, Betul, Chhatarpur	1352232	39.03
IV Mal Adjusted 70-90	Shajapur	Bhopal, Damoh, Panna, Datia, Rewa, Seoni.	551533	15.92
V Highly Mal Adjusted Below 70	Mandsaur, Khargone, Khandwa, Jhabua.	Satna, Jabalpur	444033	12.82
Total	23 districts	22 districts	3464496	100.00

5.5 JOWAR (Sorghum Vulgare)

5.5.1 Distribution

Jowar is the third important cereal crop grown in this state. It's cultivation is concentrated in the Jowar-Wheat and Jowar-Cotton crop zones. The twenty one districts included in these crop zones shared 82.39 per cent of total Jowar area in the state. Excluding the eleven rice zone districts which shared only 3.49 per cent of Jowar area, cultivation of this crop is spread in all the remaining thirty four districts of the state.

5.5.2 Extent of Cultivation

The eight important Jowar growing districts where Jowar occupied more than 20 per cent of their gross cropped area were Rajgarh (33.92 per cent), Ujjain (29.76 per cent), Shajapur (28.40 per cent), Dewas (26.48 per cent), Khandwa (24.68 per cent), Guna (22.65 per cent), Mandsaur (22.41 per cent) and Khargone (22.20 per cent). These districts together shared 54.89 per cent of total Jowar area in the state (Table 5.7)

5.5.3 Relative share

i) Area

The top ranking five districts having largest relative share in Jowar area of the state were; Mandsaur (7.92 per cent), Ujjain (7.72 per cent), Khargone (7.58 per cent), Rajgarh (7.45 per cent), and Guna (6.74 per cent). These districts together shared 37.41 per cent of total Jowar area in the state (Table 5.7)

ii) Output

Relative share in Jowar production was highest in Ujjain (10.04 per cent) followed by Shajapur (8.83 per cent), Dewas (7.87 per cent), Rajgarh (6.96 per cent) and Khargone (6.73 per cent). These five districts contributed 40.43 per cent of total Jowar production in the state (Table 5.7)

Table 5.7 Districtwise percentage of Jowar area to gross cropped area and relative share of district in area and output of Jowar in Madhya Pradesh

S.No.	District	Percentage to gross cropped area		Relative share in M.P.			
				Area		Output	
		Percent	Rank	Percent	Rank	Per-Cent	Rank
1.	Balaghat	-	-	-	-	-	-
2.	Bastar	-	-	-	-	-	-
3.	Betul	16.49	10	3.65	9	3.17	10
4.	Bhind	6.19	24	1.10	24	1.17	22
5.	Bhopal	9.95	20	0.78	30	0.82	28
6.	Bilaspur	-	-	-	-	-	-
7.	Chhatarpur	13.78	15	1.75	18	1.71	18
8.	Chhindwara	12.52	17	3.34	10	3.00	11
9.	Damoh	6.03	25	0.92	27	0.95	25
10.	Datia	16.65	9	1.10	25	0.76	29
11.	Dewas	26.48	4	5.12	8	7.87	3
12.	Dhar	11.59	19	3.29	11	2.70	13
13.	Durg	-	-	-	-	-	-
14.	Guna	22.65	6	6.74	5	4.86	8
15.	Gwalior	11.79	18	1.60	20	2.12	16
16.	Hoshangabad	7.31	22	1.65	19	2.15	15
17.	Indore	14.99	13	2.29	14	2.82	12
18.	Jabalpur	3.06	33	0.81	28	0.75	30
19.	Jhabua	7.11	23	1.24	21	1.08	24
20.	Khandwa	24.68	5	5.78	7	5.61	7
21.	Khargone	22.20	8	7.58	3	6.73	5
22.	Mandla	-	-	-	-	-	-
23.	Mandsaur	22.41	7	7.92	1	6.69	6
24.	Morena	5.75	26	1.22	22	1.09	23
25.	Narsinghpur	5.67	27	0.81	29	0.94	26
26.	Panna	3.94	30	0.46	35	0.48	35
27.	Raigarh	-	-	-	-	-	-
28.	Raipur	-	-	-	-	-	-
29.	Raisen	2.62	35	0.54	34	0.87	27
30.	Rajgarh	33.92	1	7.45	4	6.96	4
31.	Rajnandgaon	-	-	-	-	-	-
32	Ratlam	15.00	12	1.97	16	2.17	14
33.	Rewa	4.20	29	0.96	26	0.63	31
34.	Sagar	4.21	28	1.12	23	1.40	20
35.	Satna	3.61	32	0.74	32	0.51	34
36.	Sehore	13.69	16	2.54	13	3.33	9
37.	Seoni	3.83	31	0.75	31	0.56	32
38.	Shahdol	-	-	-	-	-	-
39.	Shajapur	28.40	3	6.58	6	8.83	2
40.	Shivpuri	15.24	11	3.00	12	1.38	21
41.	Sidhi	2.70	34	0.59	33	0.55	33
42.	Surguja	-	-	-	-	-	-
43.	Tikamgarh	14.15	14	1.95	17	2.05	17
44.	Ujjain	29.76	2	7.72	2	10.04	1
45.	Vidisha	7.87	21	2.04	15	1.68	19
	All M.P.	9.32	-	100.00	-	100.00	-

5.5.4 Yield Level

Average yield of Jowar was highest (1042.61 kg per hectare) in Raisen district. The other top ranking districts were: Dewas Balaghat, Shajapur, Raigarh, Gwalior, Hoshangabad, and Ujjain. Among these districts Balaghat and Raigarh districts belonging to rice zone were not Jowar growing districts. Twenty districts had higher yield level than the average for the state. Some major districts of Jowar tract exhibiting very poor yield were Shivpuri, Bhind, Guna, Datia, Ratlam, Dhar, Chhatarpur, Mandsaur, Betul, Jhabua, Khargone, Chhindwara, Morena, Rajgarh, and Khandwa. Yield level of Jowar in all these districts was below the state average (Table 5.8)

Table 5.8 Districtwise yield of Jowar in Madhya Pradesh
(3 years average i.e. 1977-78 to 1979-80)

Base : M.P.= 100

District	Yield kg/hect	Yield Index	Rank	District	Yield kg/hect	Yield Index	Rank
Balaghat	984	150.99	3	Morena	616	94.47	25
Bastar	826	126.73	11	Narsinghpur	748	114.75	15
Betul	559	85.87	33	Panna	652	100.00	21
Bhind	433	66.36	44	Raigharh	869	133.33	5
Bhopal	676	103.88	19	Raipur	827	126.88	10
Bilaspur	713	109.37	16	Raisen	1042	159.91	1
Chhatarpur	543	83.26	35	Rajgarh	621	95.24	24
Chhindwara	587	90.10	28	Rajnandgaon	816	125.19	12
Damoh	666	102.15	20	Ratlam	509	78.19	38
Datia	494	75.73	39	Rewa	431	66.15	43
Dewas	995	152.68	2	Sagar	780	119.66	14
Dhar	535	82.03	36	Satna	445	68.20	42
Durg	573	87.86	30	Sehore	829	127.19	9
Guna	478	73.27	41	Seoni	479	73.42	40
Gwalior	859	131.79	6	Shahdol	567	86.94	31
Hoshangabad	846	129.80	7	Shajapur	875	134.25	4
Indore	785	120.43	13	Shivpuri	295	45.31	45
Jabalpur	598	91.70	27	Sidhi	601	92.16	26
Jhabua	563	86.33	32	Surguja	697	106.91	17
Khandwa	630	96.62	23	Tikamgarh	677	103.84	18
Khargone	582	89.25	29	Ujjain	842	129.18	8
Mandla	636	97.54	22	Vidisha	531	81.41	37
Mandsaur	548	84.02	34	All M.P.	651	100.00	--

5.5.5 Crop Adjustment

Though the cultivation of Jowar in Madhya Pradesh is wide spread, still the tendency of it's localization is in favour of the north-western districts. The districts where the cultivation of Jowar, was well adjusted were: Jhabua, Shajapur, Dewas, Bhopal, Vidisha, Bhind, Rewa and Satna. Among these districts Jhabua, Rewa and Satna districts were yield dominating and the rest were area dominating districts (Figure 5.3). Other important districts where the crop was sufficiently adjusted were Ujjain, Indore and Sehore(area dominating), Gwalior, Seoni, Shahdol and Durg (yield dominating). Combining both the categories (I and II) 34.89 per cent of jowar area in the state was adjusted and another 26.52 per cent area was tolerably adjusted. Important districts included in the third category were Morena, Rajgarh, Khandwa, Tikamgarh, Chhindwara and Dhar (Table 4.17)

Thirty five per cent of the Jowar area in the state was maladjusted. Some important Jowar growing districts under this category were: Guna, Mandsaur, Khargone, Datia, Betul, Ratlam and Chhatarpur-all area dominating maladjusted districts (Table 5.9).

Four districts i.e. Raisen of wheat zone, Shivpuri of Jowar-wheat zone and Balaghat and Raigarh of rice zone were highly maladjusted districts. These districts shared 3.70 per cent of total Jowar area in the state.

FIGURE 4.3

DEGREE OF ADJUSTMENT IN EXTENT OF CULTIVATION AND YIELD LEVEL OF JOWAR IN DISTRICTS OF M.P.

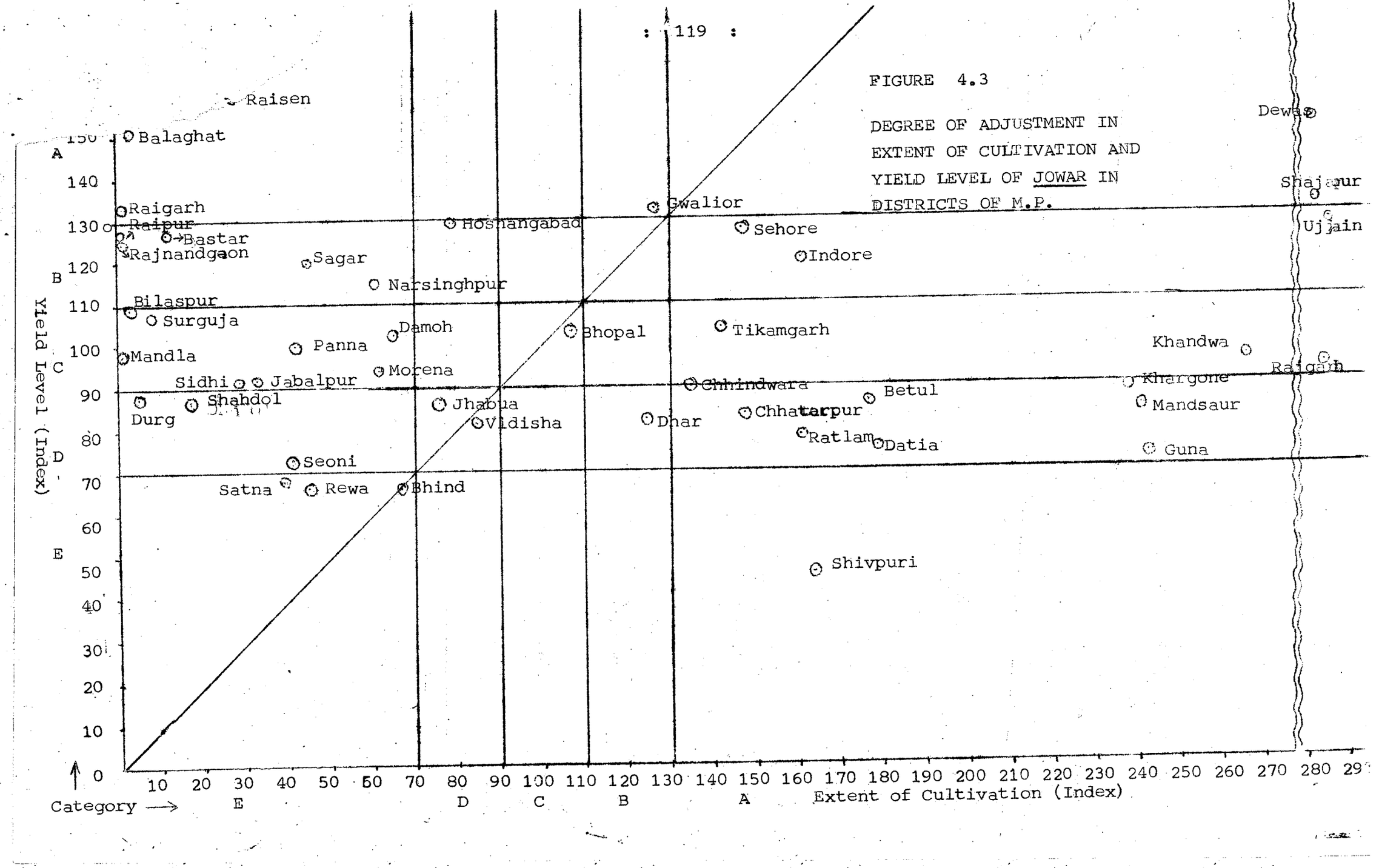


Table 5.9 Classification of Districts in different crop adjustment categories for Jowar.

Category/ Range	Yield dominating	Area dominating	Jowar Area (Hect)	%
I Well Adjusted Above 130	Jhabua, Rewa, Satna	Shajapur, Dewas, Bhopal, Vidisha, Bhind.	369466	19.11
II Sufficiently Adjusted 110- 130	Gwalior, Seoni, Shahdol, Durg	Ujjain, Indore, Sehore	305133	15.78
III Tolerably Adjusted 90-110	Hoshangabad, Damoh, Morena, Panna, Jabalpur, Sidhi, Surguja, Bilaspur, Mandla.	Rajgarh, Khandwa, Tikamgarh, Chhindwara, Dhar.	512733	26.52
IV Mal Adjusted 70-90	Narsinghpur, Sagar, Bastar, Rajnandgaon, Raipur.	Guna, Mandsaur, Khargone, Datia, Betul, Ratlam, Chhatarpur.	674333	34.89
V Highly Mal Adjusted Below 70	Raisen, Raigarh, Balaghat.	Shivpuri	71633	3.70
Total	24 districts	21 districts	1933298	100.00

5.13 Crop Adjustment Coefficient

Crop adjustment with regard to ten selected crop in each district was studied with the method explained in para 5.1.3. On the basis of results for individual crops i.e. categorization of the districts in respect to each crop a composite index called crop adjustment coefficient was developed for each district.

Method of computing crop adjustment coefficient was as given below :

i) Each crop adjustment category was assigned a weight:

Category	Weight
Well Adjusted	1.0
Sufficiently Adjusted	0.8
Tolerably Adjusted	0.65
Maladjusted	0.50
Highly Maladjusted	0.40

ii) For each district the wrighted value' was derived by multiplying the percentage of area under the crop to gross cropped area in the district, by the weight of category in which that district stood with regard to the crop.

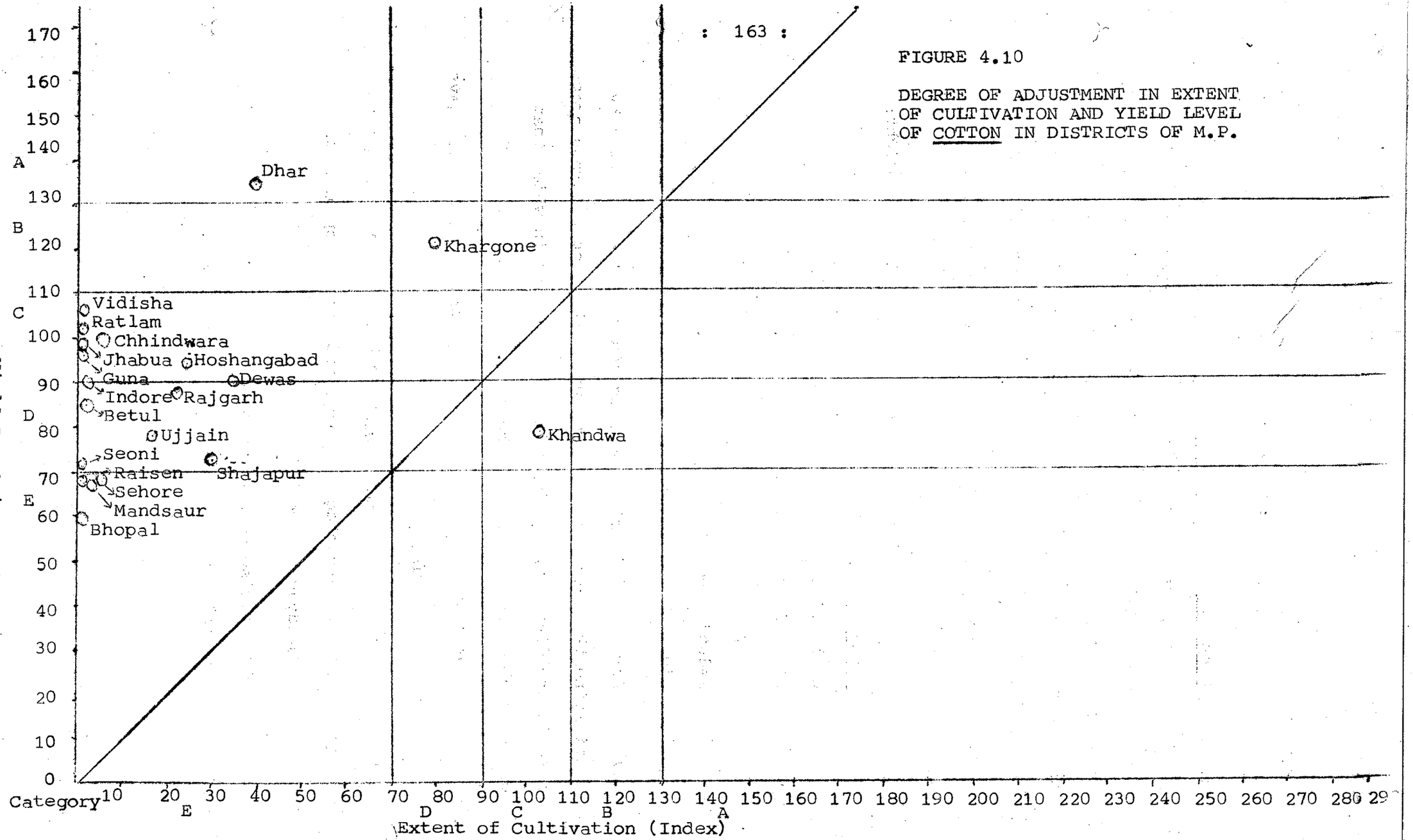
iii) Addition of all the weighted values for a district gave 'total weighted value'.

iv) Multiplying the total 'wighted value' by 100 and dividing it by the sum of percentages of area under all crops(in selected crops under study)gave 'coefficient of crop adjustment'.

Districtwise percentage of crop area covered and crop adjustment coefficient is presented in table 5.31.

FIGURE 4.10

DEGREE OF ADJUSTMENT IN EXTENT OF CULTIVATION AND YIELD LEVEL OF COTTON IN DISTRICTS OF M.P.



5.12.5 Crop Adjustment

The two important Cotton producing districts of the state which were in well adjusted category were Dhar and Mandsaur. Other two districts in the same category were Bhopal and Raisen. Khargone along with Betul and Sehore districts belonged to the category of sufficiently adjusted. Tolerably adjusted category included seven districts of which Dewas, Ratlam, Indore and Jhabua belonged to Cotton- Jowar zone. Four districts i.e. Khandwa, Rajgarh, Shajapur and Ujjain, all from Cotton- Jowar zone were area dominating maladjusted districts indicating that the yield of cotton in these districts were low where as the acrease was considerable. Table 5.30 and Fig.5.10)

Table 5.30 Classification of Districts in Different Crop Adjustment Categories for Cotton.

(Area in thousand hect.)

Category	Yield Dominating	Area Dominating	Cotton Area	%
Well Adjusted	Mandsaur, Bhopal, Raisen	Dhar	71.17	10.82
Sufficiently Adjusted	Betul, Sehore	Khargone	177.89	27.04
Tolerably Adjusted	Chhindwara, Guna, Indore.	Dewas, Hoshangabad, Jhabua, Ratlam.	151.41	23.01
Mal Adjusted		Khandwa, Rajgarh, Shajapur, Ujjain.	254.44	38.67
Highly Mal Adjusted				

Table 5.29 Districtwise yield of cotton (Kapas) in Madhya Pradesh (1977-78 to 1979-80, 3 years average)

Base : M.P.-100

District	Yield kg/hect	Yield Index	Rank	District	Yield kg/hect	Yield Index	Rank
Balaghat	-	-	-	Morena	-	-	-
Bastar	-	-	-	Narsinghpur	193	87.73	15
Betul	188	85.45	16	Panna	-	-	-
Bhind	-	-	-	Raigarh	194	88.12	13
Bhopal	134	60.91	24	Raipur	164	74.55	19
Bilaspur	-	-	-	Raisen	152	69.09	23
Chhatarpur	-	-	-	Rajgarh	194	88.18	12
Chhindwara	219	99.55	6	Rajnandgaon	-	-	-
Damoh	-	-	-	Ratlam	226	102.73	5
Datia	-	-	-	Rewa	-	-	-
Dewas	201	91.36	10	Sagar	-	-	-
Dhar	296	134.55	1	Satna	230	104.55	4
Durg	-	-	-	Sehore	154	70.00	22
Guna	214	97.27	9	Seoni	158	71.82	21
Gwalior	-	-	-	Shahdol	-	-	-
Hoshangabad	216	98.18	8	Shajapur	162	73.64	20
Indore	199	90.45	11	Shivpuri	-	-	-
Jabalpur	-	-	-	Sidhi	-	-	-
Jhabua	217	98.64	7	Surguja	193	87.73	14
Khandwa	175	79.55	17	Tikamgarh	-	-	-
Khargone	264	120.00	2	Ujjain	172	78.18	18
Mandla	-	-	-	Vidisha	237	107.73	3
Mandsaur	149	67.73	-	All M.P.	220	100.00	-

ii) Output

Major share in cotton output 31.39 per cent was contributed by Khargone followed by Khandwa (18.18 per cent). Other important districts having greater share in total output of cotton were Dhar (12.71 per cent), Dewas (5.98 per cent) Ratlam (5.45 per cent). Table 5.28.

5.12.4 Yield Level

Highest average yield of cotton (Kapas) was obtained in Dhar (296 Kg/Hect) followed by Khargone(264 Kg/hect), Vidisha (237 Kg/hect) and Satna (230 Kg/Hect) which is outside the cotton belt (Table 5.29). Over all average of cotton yield in the state was 220 Kg/hect and only five districts had higher yield level. The fifth district was Ratlam (226 Kg/hect).

Table 5.28 : Districtwise percentage of Cotton area to gross cropped area and relative share of district in area and output of Cotton in Madhya Pradesh.

S.No.	District	Percentage to gross cropped area		Relative share in M.P.			
				Area		Out put	
		Percent	Rank	Percent	Rank	Percent	Rank
1.	Betul	0.52	15	0.34	14	0.29	14
2.	Chhindwara	1.85	11	1.50	11	1.48	11
3.	Dewas	10.71	4	6.27	5	5.98	4
4.	Dhar	12.23	3	9.64	3	12.71	3
5.	Hoshangabad	7.99	6	5.47	6	5.38	6
6.	Indore	0.84	14	0.30	15	0.27	15
7.	Jhabua	7.21	7	4.17	10	4.11	9
8.	Khandwa	31.96	1	22.63	2	18.18	2
9.	Khargone	24.79	2	25.59	1	31.39	1
10.	Mandsaur	1.10	13	1.17	12	0.85	12
11.	Rajgarh	6.96	8	4.62	9	4.21	8
12.	Ratlam	6.76	9	5.29	7	5.45	5
13.	Sehore	1.80	12	1.01	13	0.70	13
14.	Shajapur	9.28	5	6.52	4	4.70	7
15.	Ujjain	6.25	10	4.89	8	3.69	10
Other District		-	-	1.59	-	0.61	-
All M.P.		2.92	-	100.00	-	100.00	-

5.12 COTTON (Gassypium Spp.)

5.12.1 Distribution

Among the commercial crops in the state, cotton is the most important and accounts for about 3.00 per cent of total cropped area. It is a Kharif crop. The districts which have a larger proportion of area under cotton cultivation are : Khandwa, Khargone, Dhar, Dewas, Ratlam and Shajapur. All these districts are contiguous forming the cotton belt. Jowar being another important crop in this area these districts constitute Cotton-Jowar zone.

5.12.2 Extent of Cultivation

Khandwa district having 31.96 per cent of total cropped area under cotton ranks first in the state. Other districts : Khargone (24.79 per cent), Dhar (12.23 per cent) Dewas (10.71 per cent) and shajapur (9.28 per cent) rank in succession behind Khargone (Table 5.28)

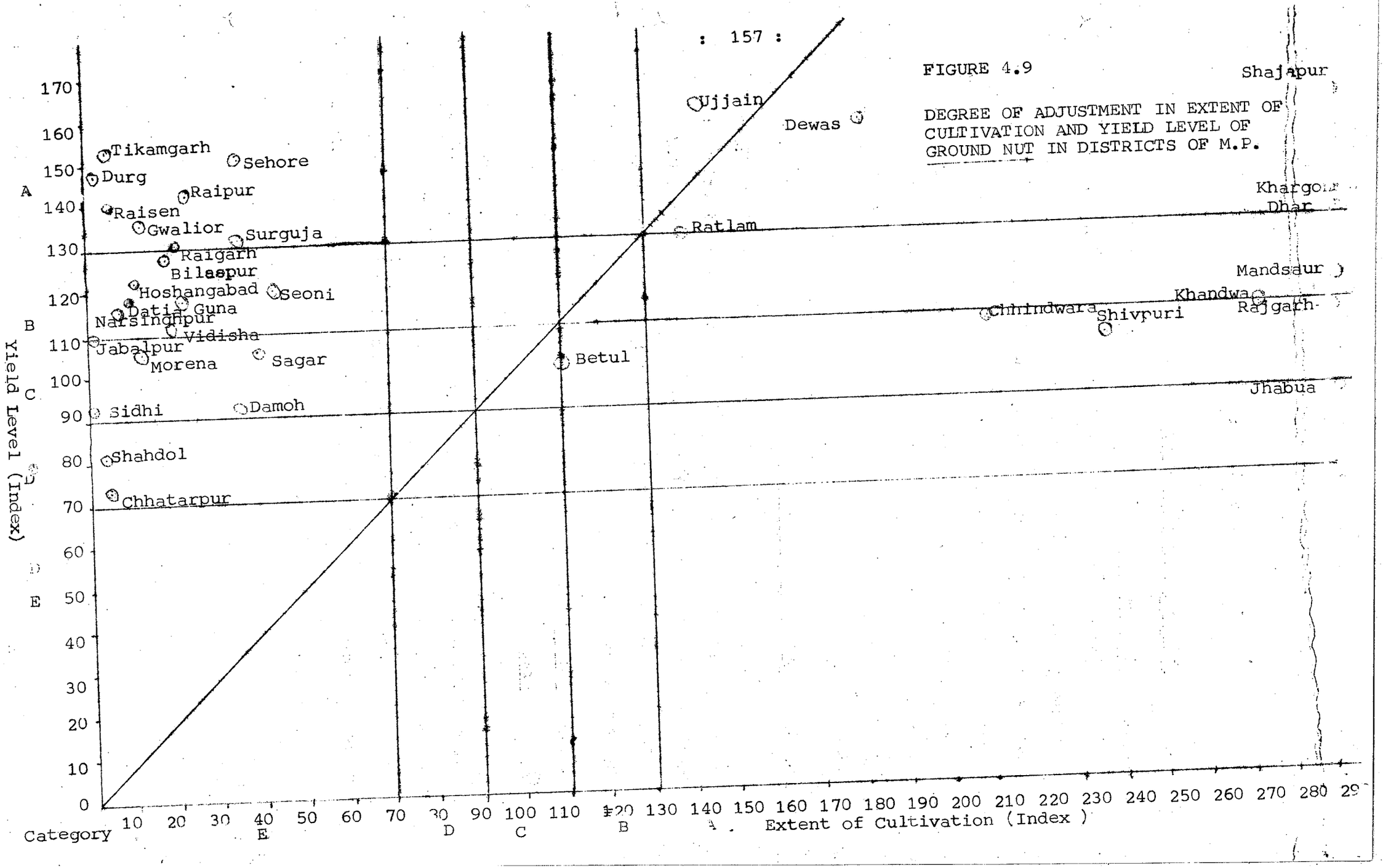
5.12.3 Relative Share

i) Area

Out of the total area under cotton in the state Khargone shared 25.59 per cent and Khandwa 22.63 per cent. Other districts in succession were Dhar (9.64 per cent) Shajapur (6.52 per cent) and Dewas (6.27 per cent). These five districts together shared seventy per cent of total cotton area in the state (Table 5.28).

FIGURE 4.9

DEGREE OF ADJUSTMENT IN EXTENT OF CULTIVATION AND YIELD LEVEL OF GROUND NUT IN DISTRICTS OF M.P.



5.11.5 Crop Adjustment

Nearly 82 per cent of the groundnut area was more or less adjusted, it included 43.26 per cent area shared by 6 districts as well adjusted, 18.74 per cent area spread in 5 districts as sufficiently adjusted and 19.98 per cent area contributed by 8 districts as tolerably adjusted. (Table 5.27). Among the important groundnut growing districts Jhabua was one of the maladjusted districts where area under groundnut was sufficient but the yield level was quite low (Fig.5.9). Nine districts were highly maladjusted which included Raipur, Surguja, Raigarh and Durg of rice zone Bhopal, Sehore and Raisen of wheat zone and Gwalior and Tikamgarh of Wheat-Jowar zone.

Table 5.27 : Classification of Districts in different Crop Adjustment Categories for Groundnut

Category	Yield dominating	Area dominating	Groundnut Area	%
Well Adjusted	Ujjain	Dewas, Betul, Shajapur, Khargone, Dhar.	164833	43.26
Sufficiently Adjested	Chhatarpur, Shahdol	Mandsaur, Khandwa, Ratlam.	71399	18.74
Tolerably Adjusted	Sagar, Damoh, Morena, Sidhi, Jabalpur.	Rajgarh, Shivpuri, Chhindwara.	76133	19.98
Mal Adjusted	Indore, Seoni, Guna, Vidisha, Bilaspur, Hoshangabad, Datia, Narsinghpur.	Jhabua	40466	10.62
Highly Mal Adjusted	Bhopal, Sehore, Surguja, Raipur, Raigarh, Gwalior, Raisen, Tikamgarh, Durg.	-	28201	7.40
Total			381032	100.00

Table 5.26 Districtwise yield of Madhya Pradesh (1977-78 to 1979-80, 3 years in average)

Base: M.P.- 100

District	Yield (Kg/Hect)	Yield Index	Rank	District	Yield Kg/Hect	Yield Index	Rank
Balaghat	-	-	-	Morena	472	106.07	28
Bastar	-	-	-	Narsinghpur	517	116.18	22
Betul	451	101.35	31	Panna	-	-	-
Bhind	-	-	-	Raigarh	585	131.46	14
Bhopal	597	134.16	10	Raipur	637	143.15	7
Bilaspur	570	128.09	17	Raisen	631	141.80	8
Chhatarpur	330	74.16	37	Rajgarh	474	106.52	27
Chhindwara	484	108.76	26	Rajnandgaon	-	-	-
Damoh	410	92.13	34	Ratlam	578	129.89	16
Datia	533	119.77	20	Rewa	-	-	-
Dewas	695	156.18	2	Sagar	468	105.17	30
Dhar	587	131.91	12	Satna	-	-	-
Durg	674	151.46	5	Sehore	673	151.23	6
Guna	527	118.43	21	Seoni	537	120.67	19
Gwalior	607	136.40	9	Shahdol	366	82.25	36
Hoshangabad	559	125.62	18	Shajapur	694	155.95	3
Indore	589	130.34	15	Shivpuri	421	94.61	32
Jabalpur	491	110.34	24	Sidhi	414	93.03	33
Jhabua	399	89.66	35	Surguja	587	131.91	13
Khandwa	489	109.89	25	Tikamgarh	682	153.26	4
Khargone	590	132.58	11	Ujjain	711	159.77	1
Mandla	-	-	-	Vidisha	498	111.68	23
Mandsaur	472	106.06	29	All M.P.	445	100.00	-

5.11.3 Relative Share

i) Area

Percentage of groundnut area in the district to total groundnut area in the state was highest in Khargone(15.12 per cent) followed by Dhar (12.07 per cent), Mandsaur (9.84 per cent). Shajapur (8.08 per cent) and Rajgarh (6.64 per cent). Other districts sharing more than 5.0 per cent area were: Jhabua, Khandwa and Chhindwara (Table 5.25).

ii) Output

Relative share in output of groundnut was also highest in Khargone district (16.29 per cent). Other districts sharing more than 5.0 per cent of total output were: Dhar, Shajapur, Mandsaur, Rajgarh and Khandwa (Table 5.25).

5.11.4 Yield level

Average yield of groundnut in the state, during 1977-78 to 1979-80 triennium, was 445 kg/hectare. Highest average yield was obtained in Ujjain (711 kg/hect) followed by Dewas (695 kg/hect) and Shajapur (694 kg/hect). Some districts like Tikamgarh, Durg and Raipur conventionally not considered as groundnut producing districts had yield level higher than the state average(Table 5.26).

Table 5.25 : Districtwise percentage of Groundnut area to gross cropped area and relative share of district in area and output of Groundnut in Madhya Pradesh.

S.No.	District	Percentage to gross cropped area		Relative share in M.P.			
				Area		Output	
		Percent	Rank	Percent	Rank	Percent	Rank
1.	Balaghat	-	-	-	-	-	-
2.	Bastar	-	-	-	-	-	-
3.	Betul	2.01	13	2.28	15	1.99	16
4.	Bhind	-	-	-	-	-	-
5.	Bhopal	0.79	17	0.31	25	0.36	26
6.	Bilaspur	0.35	25	0.88	18	0.93	18
7.	Chhatarpur	-	-	-	-	-	-
8.	Chhindwara	3.83	9	5.23	8	4.60	8
9.	Damoh	0.65	19	0.50	23	0.39	25
10.	Datia	-	-	-	-	-	-
11.	Dewas	3.13	10	3.09	12	3.74	10
12.	Dhar	8.32	2	12.07	2	13.02	2
13.	Durg	-	-	-	-	-	-
14.	Guna	0.43	22	0.65	21	0.61	22
15.	Gwalior	0.25	26	0.17	28	0.22	27
16.	Hoshangabad	0.18	28	0.21	27	0.20	28
17.	Indore	0.95	15	0.74	20	0.79	20
18.	Jabalpur	-	-	-	-	-	-
19.	Jhabua	6.56	4	6.42	6	4.68	7
20.	Khandwa	4.98	7	5.96	7	5.26	6
21.	Khargone	8.66	1	15.12	1	16.29	1
22.	Mandla	-	-	-	-	-	-
23.	Mandsaur	5.45	6	9.84	3	8.58	4
24.	Morena	0.24	27	0.25	26	0.46	24
25.	Narsinghpur	0.14	29	0.10	30	0.09	30
26.	Panna	-	-	-	-	-	-
27.	Raigarh	0.39	23	3.12	11	3.35	12
28.	Raipur	0.44	21	1.74	16	2.04	15
29.	Raisen	0.11	30	0.12	29	0.13	29
30.	Rajgarh	5.92	5	6.64	5	6.00	5
31.	Rajnandgaon	-	-	-	-	-	-
32.	Ratlam	2.54	12	2.29	14	2.56	13
33.	Rewa	-	-	-	-	-	-
34-	Sagar	1.87	14	2.53	13	2.28	14
35.	Satna	-	-	-	-	-	-
36.	Sehore	0.66	18	0.62	22	0.77	21
37.	Seoni	0.80	16	0.80	19	0.82	19
38.	Shahdol	0.07	32	0.09	31	0.08	31
39.	Shajapur	6.81	3	8.08	4	9.75	3
40.	Shivpuri	4.33	8	4.36	9	3.42	11
41.	Sidhi	-	-	-	-	-	-
42.	Surguja	0.65	20	1.04	17	1.15	17
43.	Tikamgarh	0.10	31	0.06	32	0.08	32
44.	Ujjain	2.62	11	3.48	10	4.44	9
45.	Vidisha	0.37	24	0.49	24	0.47	23
	All M.P.						

5.11 GROUNDNUT (Arachis hypogaea)

5.11.1 Distribution

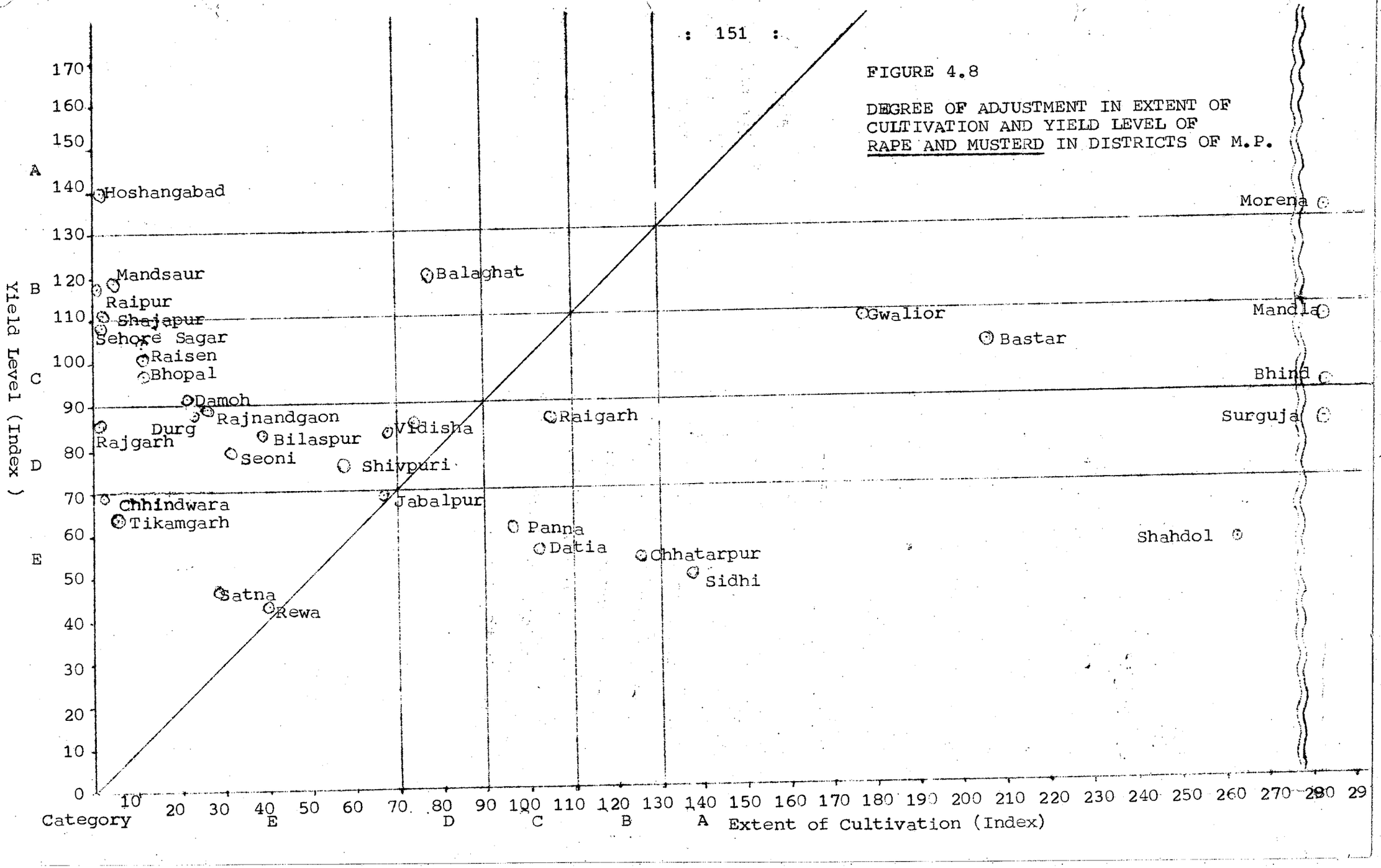
India grows more than seven million hectares and harvests about 6 million tonnes of nuts which is approximately 34 per cent of the total world production. Madhya Pradesh shared 5.5 per cent of total groundnut area in the country in 1979-80. This crop covers nearly two percent of total cropped area in the state. The concentration of this crop is in the districts of: Khargone, Dhar, Mandsaur, Shajapur, Rajgarh and Jhabua.

5.11.2 Extent of Cultivation

Percentage of groundnut area to gross cropped area in the district was highest in Khargone (8.66 per cent) followed by Dhar (8.32 per cent), Shajapur (6.81 per cent) and Jhabua (6.56 per cent). In addition to the above four districts another nine districts which had more than 2.0 per cent of their total cropped area devoted to groundnut were: Rajgarh, Mandsaur, Khandwa, Shivpuri, Chhindwara, Dewas, Ujjain, Ratlam and Betul (Table 5.25). These 13 districts together shared about 85 per cent of total groundnut area in the state.

FIGURE 4.8

DEGREE OF ADJUSTMENT IN EXTENT OF CULTIVATION AND YIELD LEVEL OF RAPE AND MUSTERD IN DISTRICTS OF M.P.



5.10.5 Crop Adjustment

About thirty four per cent of total area under this crop in the state was well adjusted. Out of the eight districts- seven i.e. Guna, Jabalpur, Rewa, Satna, Tikamgarh, and Chhindwara were yield dominating where as Morena was area dominating well adjusted district. Another group of eight districts belonged to the sufficiently adjusted category and shared 9.25 per cent of total area. Five districts- Shajapur, Mandsaur, Raipur, Surguja and Chhatarpur were maladjusted and three districts- Hoshangabad, Shahdol and Sidhi highly maladjusted (Table 5.24 Fig. 5.8).

5.24 Classification of Districts in different crop Adjustment Categories for Rape and Mustard.

Category	Yield dominating	Area dominating	Area	%
Well Adjested	Guna, Jabalpur, Rewa, Satna, Tikamgarh, Chhindwara	Morena	75334	33.78
Sufficiently Adjested	Vidisha, Shivpuri, Bilaspur, Seoni, Rajnandgaon, Durg, Rajgarh.	Raigarh	20633	9.25
Tolerably Adjested	Balaghat, Sagar, Damoh, Bhopal, Raisen, Sehore.	Bhind, Mandla, Bastar, Gwalior Panna, Datia.	77633	34.80
Mal Adjested	Shajapur, Mandsaur, Raipur.	Surguja, Chhatarpur.	28766	12.89
Highly Mal Adjested	Hoshangabad,	Shahdol, Sidhi	20700	9.28
			223066	

Table 5.23 : Districtwise yield of Rape and Mustard in Madhya Pradesh (1977-78 to 1979-80, 3 years average)

Base : M.P.- 100

District	Yield kg/Hect	Yield Index	Rank	District	Yield kg/Hect	Yield Index	Rank
Balaghat	391	119.94	3	Morena	439	134.66	2
Bastar	336	103.07	12	Narsinghpur	-	-	-
Betul	-	-	-	Panna	199	61.04	29
Bhind	297	91.10	15	Raigarh	283	86.81	18
Bhopal	330	101.23	13	Raipur	386	118.40	5
Bilaspur	270	82.82	23	Raisen	344	105.52	10
Chhatarpur	178	54.60	32	Rajgarh	282	86.50	19
Chhindwara	225	69.02	27	Rajnandgaon	291	89.26	16
Damoh	298	91.41	14	Ratlam	-	-	-
Datia	182	55.83	31	Rewa	141	43.25	35
Dewas	-	-	-	Sagar	356	109.20	9
Dhar	-	-	-	Satna	153	46.93	34
Durg	387	88.03	17	Sehore	358	109.81	8
Guna	281	86.19	20	Seoni	257	78.83	24
Gwalior	358	109.81	7	Shahdol	185	56.75	30
Hoshangabad	456	139.88	1	Shajapur	362	111.04	6
Indore	-	-	-	Shivpuri	248	76.07	25
Jabalpur	228	69.44	26	Sidhi	163	50.00	33
Jhabua	-	-	-	Surguja	273	83.74	22
Khandwa	-	-	-	Tikamgarh	211	64.72	28
Khargone	-	-	-	Ujjain	-	-	-
Mandla	343	105.21	11	Vidisha	275	84.35	21
Mandsaur	388	119.02	4	All M.P.	326	100.00	-

ii) Output

In output too Morena district stood first sharing 36.58 per cent of total rape and mustard production in Madhya Pradesh. Ranking at the second position Mandla shared 11.30 per cent and Bhind 9.30 per cent of total production (Table 5.22).

5.10.4 Yield Level

Average yield of rape and mustard in the state was 326 kg/hect. Highest yield was recorded in Hoshaangabad (456 kg/hect) followed by Morena (439 kg/hect) Balaghat (391 kg/hect) and Mandsaur (388 kg/hect). In thirteen districts average yield of rape and mustard was above the state average of 326 kg/hect). Lowest yield level of 141 kg/hect was recorded in Rewa (Table 5.23).

Table 5.22 Districtwise percentage of Rape and Mustard area to gross cropped area and relative share of district in area and output of Rape and Mustard in Madhya Pradesh

S.No.	District	Percentage to gross cropped area		Relative share in M.P.			
				Area		Output	
		Percent	Rank	Percent	Rank	Percent	Rank
1.	Balaghat	0.81	13	1.26	15	1.56	10
2.	Bastar	2.17	6	7.23	5	7.83	5
3.	Betul	-	-	-	-	-	-
4.	Bhind	6.38	2	10.03	4	9.30	3
5.	Bhopal	0.13	26	0.08	29	0.04	26
6.	Bilaspur	0.41	18	1.78	11	1.51	13
7.	Chhatarpur	1.33	9	1.48	14	0.66	16
8.	Chhindwara	0.04	30	0.08	31	0.09	24
9.	Damoh	0.22	24	0.29	25	0.36	21
10.	Datia	1.09	11	0.63	21	0.40	20
11.	Dewas	-	-	-	-	-	-
12.	Dhar	-	-	-	-	-	-
13.	Durg	0.25	23	0.82	19	-	-
14.	Guna	0.78	14	2.05	10	2.14	9
15.	Gwalior	1.87	7	2.25	9	2.58	7
16.	Hoshangabad	0.02	33	0.04	35	-	-
17.	Indore	-	-	-	-	-	-
18.	Jabalpur	0.71	16	1.64	13	1.47	14
19.	Jhabua	-	-	-	-	-	-
20.	Khandwa	-	-	-	-	-	-
21.	Khargone	-	-	-	-	-	-
22.	Mandla	4.82	3	10.40	3	11.30	2
23.	Mandsaur	0.06	29	0.17	27	0.02	29
24.	Morena	15.08	1	28.15	1	36.58	1
25.	Narsinghpur	-	-	-	-	-	-
26.	Panna	1.02	12	1.05	17	0.76	15
27.	Raigarh	1.12	10	2.74	8	2.36	8
28.	Raipur	0.01	35	0.10	28	0.13	23
29.	Raisen	0.13	27	0.23	26	0.23	22
30.	Rajgarh	0.02	34	0.04	34	-	-
31.	Rajnandgaon	0.28	22	0.75	20	0.05	25
32.	Ratlam	-	-	-	-	-	-
33.	Rewa	0.41	19	0.83	18	0.03	28
34.	Satna	0.31	21	0.50	23	0.03	27
35.	Sagar	0.18	25	0.41	24	0.49	18
36.	Sehore	0.04	31	0.07	33	0.01	30
37.	Seoni	0.34	20	0.59	22	0.44	19
38.	Shahdol	2.83	5	6.35	6	4.18	6
39.	Shajapur	0.04	32	0.08	30	-	-
40.	Shivpuri	0.61	17	1.06	16	0.49	17
41.	Sidhi	1.45	8	2.81	7	1.51	12
42.	Surguja	3.97	4	11.01	2	9.21	4
43.	Tikamgarh	0.07	28	0.07	32	0.01	31
44.	Ujjain	-	-	-	-	-	-
45.	Vidisha	0.72	15	1.64	12	1.51	11
	All M.P.	-	-	100.00	-	100.00	-

5.10 RAPE AND MUSTARD (Brassica Spp.)

5.10.1 Extent of Cultivation

It is also an important oilseed crop grown in the state. Except the Malwa tract forming cotton Jowar zone the crop is grown in all other crop zones. It is grown as a rabi crop (winter crop)

5.10.2 Extent of cultivation

Rape and mustard area as percentage to gross cropped area in the district was highest in Morena (15.08 per cent) followed by Bhind (6.38 per cent), Mandla (4.82 per cent) and Surguja (3.97 per cent). Table 5.22 gives the percentage of rape and mustard area to gross cropped area in each district of the state.

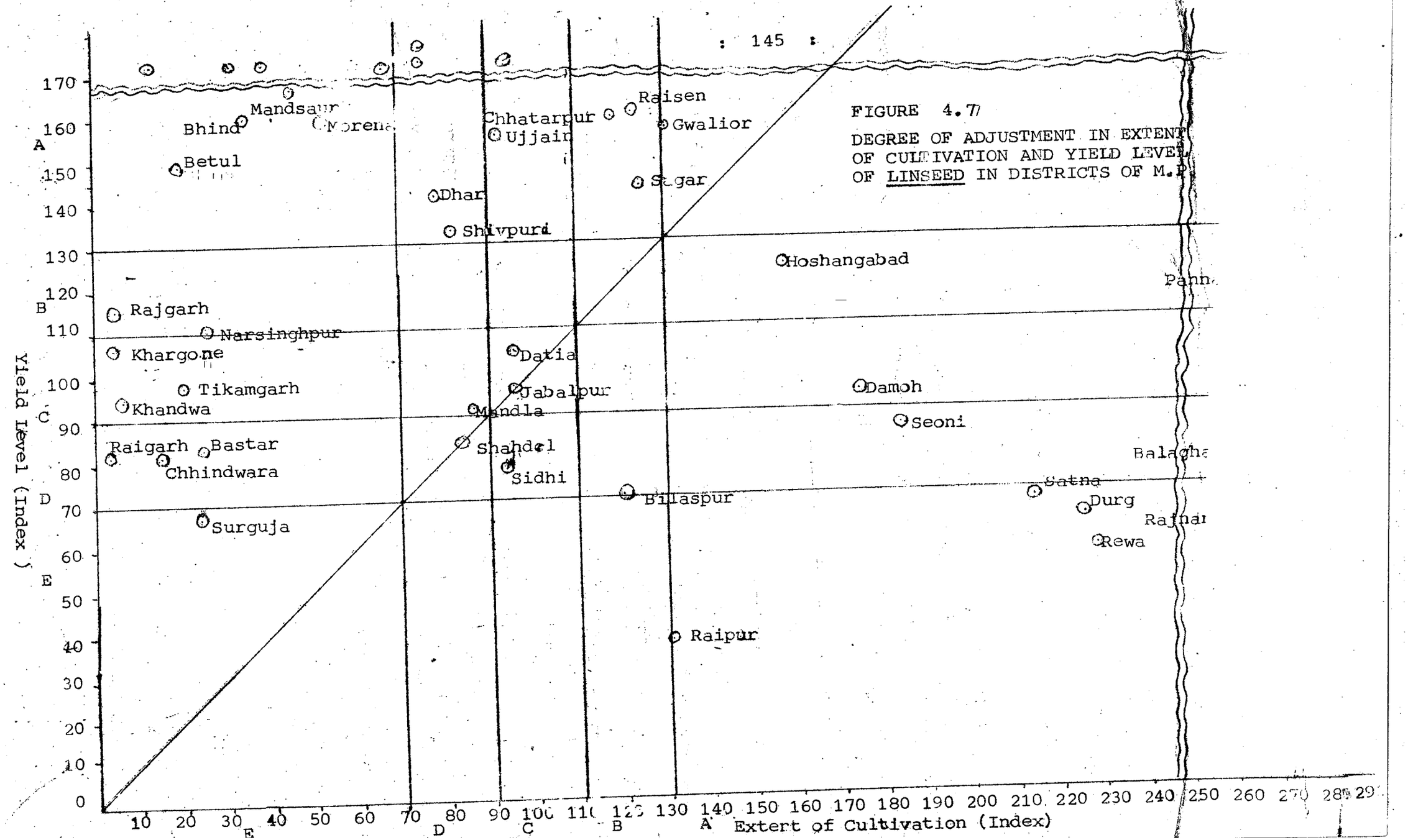
5.10.3 Relative Share

i) Area

District Morena alone shared 28.15 per cent of area under this crop in the state and stood first in this regard. The other districts ranking behind Morena were: Surguja, Mandla, Bhind, Bastar, Shahdol, Sidhi, Raigarh, Gwalior and Guna (Table 5.22).

FIGURE 4.7

DEGREE OF ADJUSTMENT IN EXTENT OF CULTIVATION AND YIELD LEVEL OF LINSEED IN DISTRICTS OF M.P.



5.9.5 Crop Adjustment

In twenty three districts, sharing about forty per cent of linseed area in the state, linseed cultivation was more or less adjusted. Gwalior, Datia, Surguja and Jabalpur were yield dominating well adjusted districts while Shahdol was area dominating well adjusted district.

Sixty per cent of the linseed area distributed in twenty two districts was maladjusted. Eight districts- Vidisha, Sehore, Dhar, Shivpuri, Narsinghpur, Rajgarh, Balaghat and Seoni- sharing 16.94 per cent of linseed area were maladjusted in respect to linseed cultivation.

Out of the fourteen districts, which were highly maladjusted nine districts- Guna, Dewas, Morena, Mandsaur, Bhopal, Bhind, Ratlam, Betul and Shajapur- were yield dominating; while five districts- Rajnandgaon, Rewa, Durg, Satna and Raipur were area dominating highly maladjusted districts (Table 5.21 fig. 5.7)

Table 5.21 Classification of Districtsin different crop Adjustment categories for Linseed.

Category	Yield dominating	Area dominating	Area	%
Well Adjusted	Gwalior, Datia, Surguja, Jabalpur	Shahdol	46301	7.11
Sufficiently Adjusted	Mandla, Raisen, Chhatarpur, Bastar Chhindwara, Raigarh Sagar.	Panna, Hoshangabad Sidhi	131933	20.25
Tolerably Adjusted	Indore, Ujjain, Tikamgarh, Khargone Khandwa.	Damoh, Bilaspur	80867	12.41
Mal Adjusted	Vidisha, Sehore, Dhar Shivpuri, Narsinghpur, Rajgarh.	Balaghat, Seoni	107734	16.54
Highly Mal Adjusted	Guna, Dewas, Morena, Mandsaur, Bhopal, Bhind, Ratlam, Betul, Shajapur.	Rajnandgaon, Rewa, Durg, Satna, Raipur	284566	43.69
			651401	100.00

Table 5.20 : Districtwise yield of Linseed in Madhya Pradesh (3 years average 1977-78 to 1979-80)

Base : M.P.-100, Weight-

District	Yield Kg/Hect	Yield Index	Rank	District	Yield kg/hect	Yield Index	Rank
Balaghat	142	73.57	37	Morena	307	159.07	13
Bastar	161	83.42	33	Narsinghpur	215	111.40	23
Betul	288	149.22	16	Panna	226	117.09	21
Bhind	308	159.58	10	Raigarh	159	82.38	35
Bhopal	407	210.88	1	Raipur	72	37.48	44
Bilaspur	137	70.81	38	Raisen	308	159.58	11
Chhatarpur	307	159.07	12	Rajgarh	225	116.58	22
Chhindwara	158	81.86	36	Rajnandgaon	113	58.55	42
Damoh	181	93.78	29	Ratlam	381	197.41	4
Datia	204	105.70	25	Rewa	108	55.96	43
Dewas	369	191.19	7	Sagar	276	143.00	17
Dhar	373	141.45	18	Satna	132	68.09	40
Durg	124	64.25	41	Sehore	396	205.18	3
Guna	369	191.19	6	Seoni	167	86.53	31
Gwalior	301	155.96	14	Shahdol	162	83.94	32
Hoshangabad	239	123.83	20	Shajapur	342	177.20	8
Indore	380	196.89	5	Shivpuri	258	133.68	19
Jabalpur	186	93.37	27	Sidhi	160	82.90	34
Jhabua	-	-	-	Surguja	132	68.39	39
Khandwa	183	94.82	28	Tikamgarh	189	97.93	26
Khargone	207	107.25	24	Ujjain	301	155.96	15
Mandla	177	91.71	30	Vidisha	406	210.36	2
Mandsaur	322	166.84	9	All M.P.	193	100.00	-

Jhabua (Nil), Rajgarh (0.11 per cent), Raigarh (0.12 per cent) Khandwa (0.15 per cent) and Khargone (0.16 per cent) Table 5.19.

ii). Output

The largest, linseed producing district of the state was Hoshangabad (Producing 5.98 per cent) of total linseed production in the state), followed by Rajnandgaon (5.46 per cent), Durg (4.96 per cent) Panna (4.47 per cent) and Sagar (4.27 per cent). These districts together produced 25.14 per cent of total linseed in the state. The other important linseed producing districts were : Sehore, Bilaspur, Vidisha, Guna, Balaghat, Raisen and Raipur, together producing 25.66 per cent (Table 5.19).

5.9.4 Yield Level

Highest yield of 407 kg/per hectare linseed was recorded in Bhopal district, closely followed by Vidisha, recording 406 kg per hectare. Other districts giving higher yield of linseed were Sehore, Ratlam and Indore. In these districts yield rate was higher than the state average (193 kg per hectare). Except the above mentioned five districts all the remaining 39 districts had lower yield rate than the state average (Table 5.20).

Table 5.19 : Districtwise percentage of Linseed area to gross cropped area and relative share of district in area and output of Linseed in Madhya Pradesh.

S.No.	District	Percent to gross cropped area		Relative share in M.P.			
				Area		Out put	
		Percent	Rank	Percent	Rank	Percent	Rank
1.	Balaghat	9.15	2	4.93	5	3.80	10
2.	Bastar	0.79	35	0.96	30	0.80	32
3.	Betul	0.64	38	0.42	35	0.57	34
4.	Bhind	1.11	33	0.59	33	0.99	31
5.	Bhopal	1.20	32	0.28	39	0.05	44
6.	Bilaspur	3.70	14	5.60	4	3.95	7
7.	Chhatarpur	3.64	15	1.40	25	1.83	25
8.	Chhindwara	0.49	39	0.39	36	0.32	38
9.	Damoh	5.34	8	2.48	12	2.58	19
10.	Datia	2.95	18	0.59	34	0.63	33
11.	Dewas	1.82	28	1.05	28	1.96	23
12.	Dhar	2.72	20	2.36	14	3.13	15
13.	Durg	6.85	5	7.82	3	4.96	3
14.	Guna	2.12	27	1.92	20	3.80	9
15.	Gwalior	4.02	11	1.67	22	2.53	20
16.	Hoshangabad	4.79	9	3.33	9	5.98	1
17.	Indore	2.97	16	1.38	26	2.61	18
18.	Jabalpur	2.63	21	2.12	16	2.36	21
19.	Jhabua	-	-	-	-	-	-
20.	Khandwa	0.21	41	0.15	42	0.12	43
21.	Khargone	0.16	42	0.16	41	0.15	42
22.	Mandla	2.62	22	1.95	18	1.83	26
23.	Mandsaur	1.44	30	1.52	23	2.29	22
24.	Morena	1.65	29	1.04	29	1.74	29
25.	Narsinghpur	0.80	34	0.34	37	0.39	37
26.	Panna	8.58	3	3.06	11	4.47	4
27.	Raigarh	0.14	44	0.12	43	0.15	41
28.	Raipur	4.03	10	9.40	2	3.55	12
29.	Raisen	3.79	13	2.37	13	3.72	11
30.	Rajgarh	0.17	43	0.11	44	0.15	40
31.	Rajnandgaon	11.68	1	9.65	1	5.46	2
32.	Ratlam	1.22	31	0.67	32	1.24	30
33.	Rewa	6.96	4	4.84	6	3.00	16
34.	Sagar	3.84	12	3.11	10	4.27	5
35.	Satna	6.54	6	4.09	7	3.13	14
36.	Sehore	2.37	25	1.34	27	3.97	6
37.	Seoni	5.63	7	3.38	8	2.85	17
38.	Shahdol	2.57	23	1.99	17	1.91	24
39.	Shajapur	0.43	40	0.29	38	0.50	36
40.	Shivpuri	2.51	24	1.50	24	1.74	28
41.	Sidhi	2.89	19	1.93	19	1.76	27
42.	Surguja	0.77	36	0.73	31	0.52	35
43.	Tikamgarh	0.64	37	0.26	40	0.28	39
44.	Ujjain	2.95	17	2.33	15	3.48	13
45.	Vidisha	2.36	26	1.87	21	3.87	8
	All M.P.	3.11	-	100.00	-	100.00	-

5.9 LINSEED (Linum Usitatissium)

5.9.1 Distribution

It is an important commercial crop of the state. It occupies nearly 3.33 per cent of the gross cropped area. It is a rabi crop and its cultivation is fairly widespread in all the districts. "Rank correlation calculated between the proportion of the cultivated area under this crop and the extent of irrigation and rainfall in the particular season in the different districts did not give any significant result, though their concentration, on the whole, is relatively more in districts with less of irrigation and rainfall than in other districts"[1].

5.9.2 Extent of Cultivation

The percentage of linseed area to gross cropped area in the district was highest in Rajnandgaon (11.68 per cent) followed by Balaghat (9.15 per cent). Other important linseed growing districts having more than 5 per cent of their gross cropped area under linseed were : Panna, Rewa, Satna, Damoh, Durg and Seoni. In Jhabua district average of linseed was nil and the other districts with very low acreage under this crop were Raigarh, Rajgarh, Khargone, Khandwa and Shajapur (Table 5.19).

5.9.3 Relative Share

i) Area

Rajnandgaon district shared the highest proportion (9.65 per cent) of linseed area in the state closely followed by Raipur (9.40 per cent). The other two districts having more than 5.0 per cent of total linseed area were Durg (7.82 per cent and Bilaspur (5.60 per cent). The districts sharing least, were

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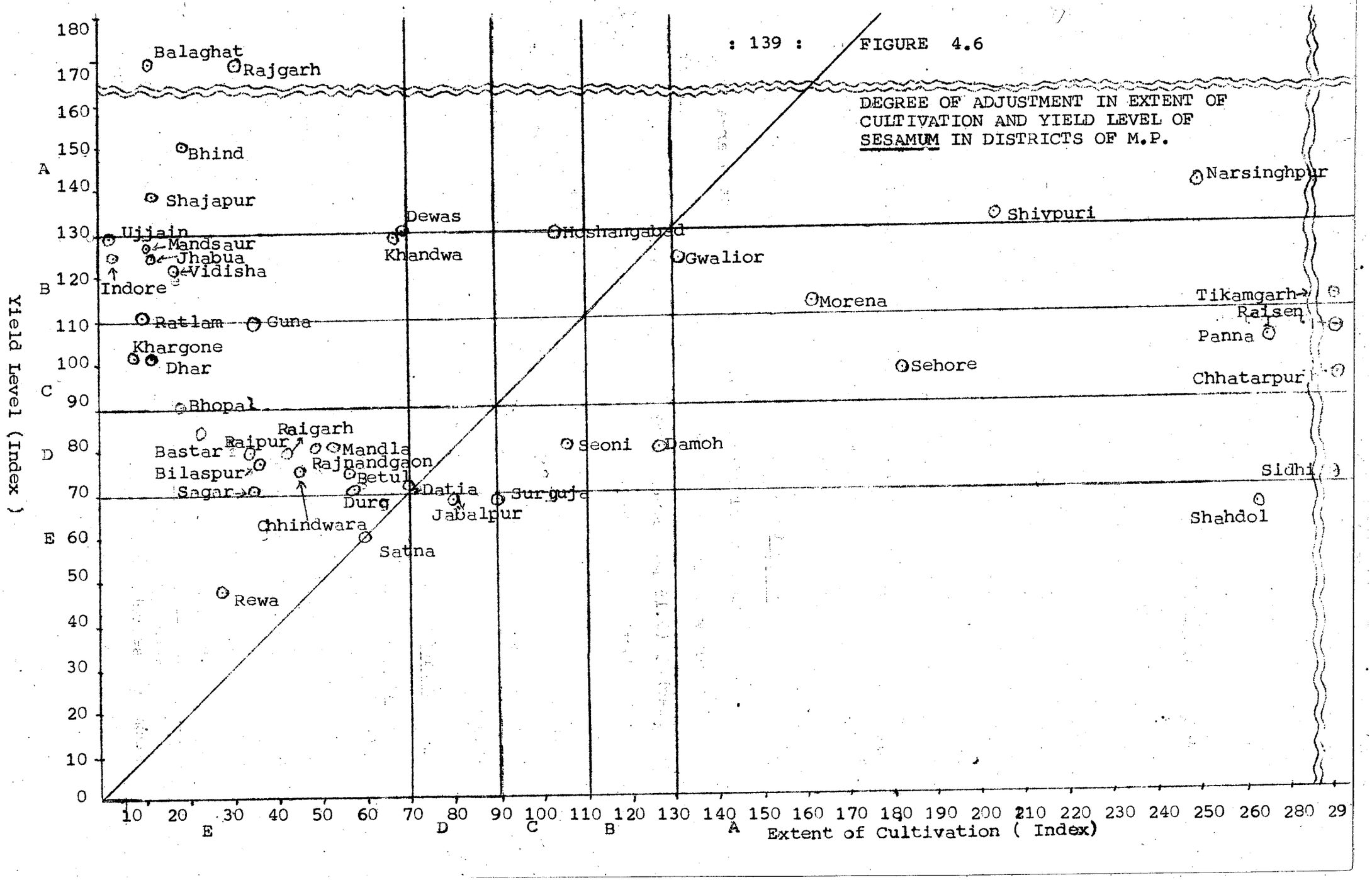
[1] "Cropping Pattern in Madhya Pradesh" National Council of Applied Economic Research, New Delhi.

FIGURE 4.6

DEGREE OF ADJUSTMENT IN EXTENT OF CULTIVATION AND YIELD LEVEL OF SESAMUM IN DISTRICTS OF M.P.



5.8.5 Crop Adjustment

The four top ranking high yielder districts for sesamum- Raigarh, Bhind, Shajapur and Balaghat were highly maladjusted districts. In these districts the proportion of sesamum area in their gross cropped area was very low. Against this Shahdol a low yielder district was also maladjusted since the area of the crop was propertionately high as compared to the low yield level. The division of sesamum area in the state under different adjustment categories showed-well adjusted area was 9.27 per cent, sufficiently adjusted 45.19 per cent, tolerably adjusted 24.29 per cent, mal maladjusted 13.59 per cent and highly maladjusted 7.66 per cent (Table 5.18 per cent Fig.5.6).

Table 5.18 Classification of Districts in different crop Adjustment categories for Sesamum

Category	Yield dominating	Area dominating	Sesamum Area	%
Well Adjusted	Rewa, Datia.	Narsinghpur, Shivpuri, Satna	22300	9.27
Sufficiently Adjusted	Hoshangabad, Durg, Betul, Mandla, Rajnandgaon, Bastar, Chhindwara, Bilaspur, Raigarh, Sagar, Raipur.	Morena, Gwalior, Seoni, Surguja, Jabalpur, Tikamgarh.	108700	45.19
Tolerably Adjusted	Guna, Bhopal, Dhar, Khargone	Chhatarpur, Raisen Panna, Sehore, Damoh	58433	24.29
Mal Adjusted	Dewas, Khandwa, Vidisha, Ratlam, Jhabua, Mandsaur, Ujjain, Indore.	Sidhi	32701	13.59
Highly Mal Adjusted	Rajgarh, Bhind, Shajapur, Balaghat	Shahdol	18433	7.66
Total	29 district	16 district	240567	100.00

Table 5.17 Districtwise yield of Sesamum in Madhya Pradesh (1977-78 to 1979-80 three years average)

Base : M.P.-100

District	Yield Kg/hect	Yield Index	Rank	District	Yield kg/hect	Yield Index	Rank
Balaghat	227	190.76	1	Morena	133	111.76	16
Bastar	101	84.87	27	Narsinghpur	165	138.65	5
Betul	89	74.79	36	Panna	123	103.36	21
Bhind	179	150.42	3	Raigarh	95	79.83	31
Bhopal	109	91.59	26	Raipur	95	79.83	32
Bilaspur	93	78.15	33	Raisen	127	106.72	20
Chhatarpur	115	96.64	25	Rajgarh	216	181.51	2
Chhindwara	90	75.63	35	Rajnandgaon	91	76.47	34
Damoh	95	79.83	30	Ratlam	132	110.92	18
Datia	86	72.27	37	Rewa	57	47.90	45
Dewas	155	130.25	7	Sagar	85	71.43	39
Dhar	122	102.52	22	Satna	71	59.66	44
Durg	85	71.43	38	Sehore	116	97.48	24
Guna	131	110.08	19	Seoni	97	81.51	29
Gwalior	147	123.53	14	Shahdol	77	64.71	43
Hoshangabad	155	130.25	8	Shajapur	165	138.65	4
Indore	149	125.21	13	Shivpuri	157	131.93	6
Jabalpur	83	69.75	41	Sidhi	85	71.43	40
Jhabua	150	126.05	12	Surguja	82	69.18	42
Khandwa	154	129.41	9	Tikamgarh	133	111.76	17
Khargone	122	102.52	23	Ujjain	154	129.41	10
Mandla	97	81.51	28	Vidisha	145	121.85	15
Mandsaur	151	126.89	11	All M.P.	119	100.00	-

5.8.3.2 Output

About 68.0 per cent of total sesamum production in the state was contributed by only eight districts which were : Hoshangabad, Gwalior, Chhatarpur, Sidhi, Raisen, Shivpuri, Tikamgarh and Shahdol (Table 5.16)

5.8.4 Yield Level

Yield of sesamum was highest in Balaghat district (227. kg/Hect) followed by Rajgarh (216 kg/Hect), Bhind (179 kg/Hect) Shajapur and Narsinghpur both 165 kg/Hect). In all twenty three districts had higher yield rate than the state average of 119 kg/hect). The districts exhibiting lowest yield were Rewa, Satna, Shahdol, Surguja, Jabalpur and Sidhi (Table 5.17).

Table 5.16 Districtwise percentage of Sesamum area to gross Cropped Area and relative share of district in area and output of Sesamum in Madhya Pradesh.

S.No.	District	Percentage to gross cropped area		Relative share in M.P.			
				Area		Output	
		Percent	Rank	Percent	Rank	Percent	Rank
1.	Balaghat	0.12	40	0.17	41	0.45	33
2.	Bastar	0.24	33	0.78	30	0.59	31
3.	Betul	0.65	23	1.18	24	1.04	23
4.	Bhind	0.22	34	0.33	36	0.35	37
5.	Bhopal	0.21	35	0.13	43	-	-
6.	Bilaspur	0.41	27	1.69	18	1.38	19
7.	Chhatarpur	8.55	1	8.87	3	8.99	3
8.	Chhindwara	0.51	25	1.11	26	0.80	27
9.	Damoh	1.44	14	1.81	17	1.15	21
10.	Datia	0.79	18	0.42	33	-	-
11.	Dewas	0.78	19	1.24	22	1.73	15
12.	Dhar	0.13	37	0.30	37	0.35	36
13.	Durg	0.66	22	2.02	15	1.38	18
14.	Guna	0.39	29	0.95	28	1.04	22
15.	Gwalior	1.49	13	1.67	19	11.76	2
16.	Hoshangabad	7.96	2	14.83	1	18.92	1
17.	Indore	0.03	44	0.04	45	-	-
18.	Jabalpur	0.90	17	2.19	14	1.49	17
19.	Jhabua	0.12	41	0.19	40	-	-
20.	Khandwa	0.76	20	1.47	20	2.08	12
21.	Khargone	0.10	43	0.27	38	0.35	38
22.	Mandla	0.60	24	1.19	23	0.93	25
23.	Mandsaur	0.13	38	0.38	35	0.59	30
24.	Morena	1.84	12	3.18	9	3.35	10
25.	Narsinghpur	2.82	9	3.32	8	4.38	9
26.	Panna	3.01	7	2.90	11	2.76	11
27.	Raigarh	0.44	26	0.99	27	0.69	28
28.	Raipur	0.38	30	2.42	13	1.97	13
29.	Raisen	3.42	6	5.78	5	5.99	5
30.	Rajgarh	0.35	31	0.63	31	1.28	20
31.	Rajnandgaon	6.55	3	1.36	21	1.03	24
32.	Ratlam	0.11	42	0.16	42	-	-
33.	Rewa	0.31	32	0.57	32	-	-
34.	Sagar	0.40	28	0.88	29	0.59	32
35.	Satna	0.68	21	1.14	25	0.69	29
36.	Sehore	2.07	11	3.15	10	0.92	26
37.	Seoni	1.20	15	1.94	16	1.50	16
38.	Shahdol	2.98	8	6.23	4	4.38	8
39.	Shajapur	0.13	39	0.24	39	0.45	35
40.	Shivpuri	2.31	10	3.75	7	5.54	6
41.	Sidhi	5.32	4	9.58	2	7.27	4
42.	Surguja	1.02	16	2.65	12	1.84	14
43.	Tikamgarh	4.24	5	4.80	6	5.10	7
44.	Ujjain	0.02	45	0.05	44	-	-
45.	Vidisha	0.19	36	0.40	34	0.45	34

5.8 SESAMUM (sesamum indicum)

5.8.1 Distribution

Sesamum grows well in the tropical and sub-tropical regions, in the plains as well as up to an elevation of 1200 meters. It is generally cultivated as Kharif crop but in South India it is cultivated both in Kharif and Rabi seasons. In Madhya Pradesh it is grown as a rainfed crop and its cultivation is spread in all most in all the districts.

5.8.2 Extent of Cultivation

Percentage of sesamum area to gross cropped area in the district was highest in Chhatarpur (8.55 per cent) followed by Hoshangabad (7.96 per cent), Rajnandgaon (6.55 per cent), Sidhi (5.32 per cent) and Tikamgarh (4.24 per cent). The districts ranking at the bottom in this respect were Ujjain, Indore, Khargone, Ratlam and Jhabua (Table 5.16).

5.8.3 Relative Share

5.8.3.1 Area

Percentage of sesamum area in the district to total sesamum area in the state was highest in Hoshangabad (14.83 per cent) followed by Sidhi (9.58 per cent) and Chhatarpur (8.87 per cent). About 33.0 per cent of total sesamum area of the state was shared by these three district. Other important districts sharing sesamum area were : Shahdol, Raisen, Tikamgarh, Shivpuri, Narsinghpur, Morena, Sehore and Panna. These eight districts along with the three districts mentioned earlier contributed more than 66.00 per cent of total sesamum area in the state (Table 5.16).

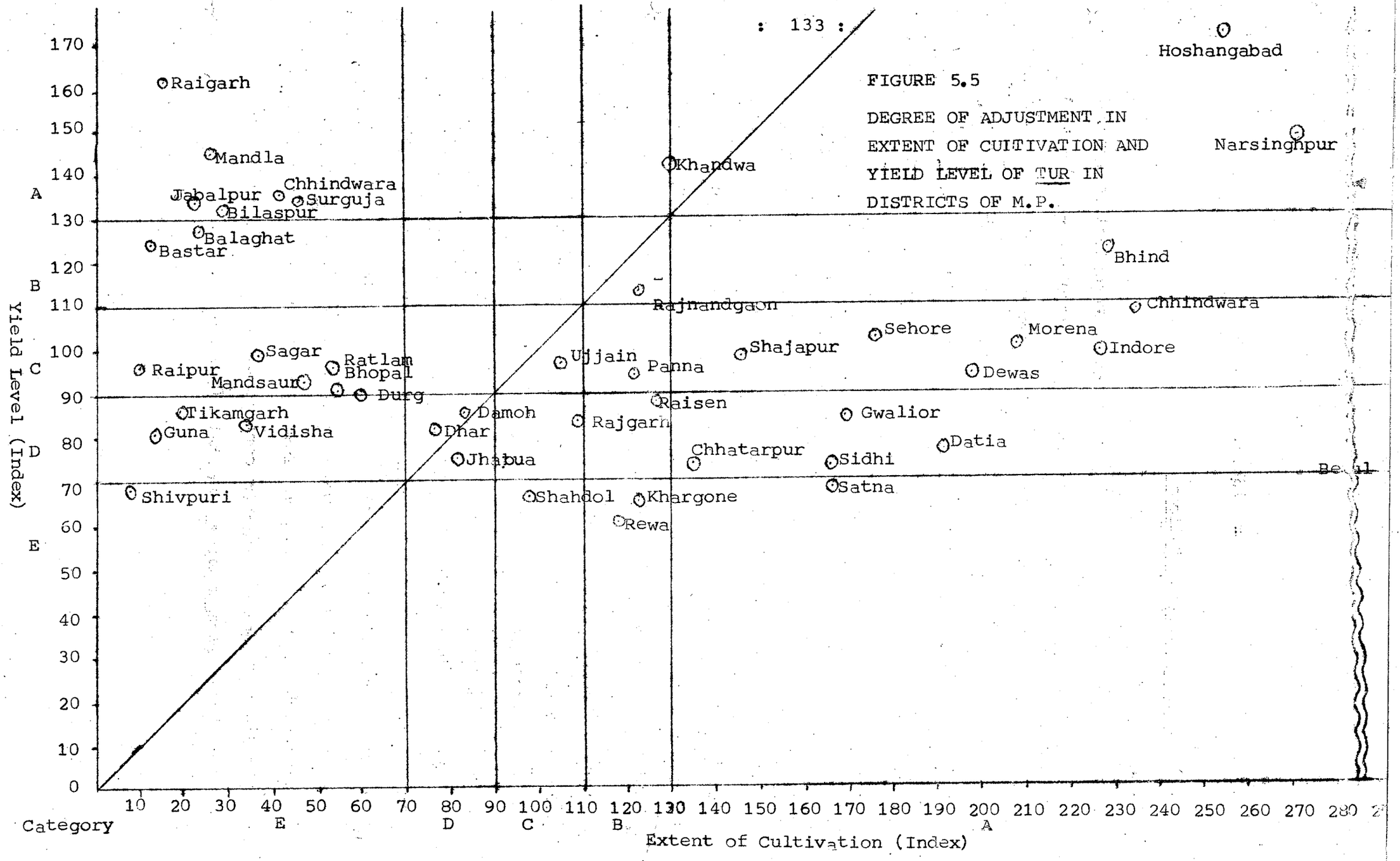


FIGURE 5.5

DEGREE OF ADJUSTMENT IN EXTENT OF CUITIVATION AND YIELD LEVEL OF TUR IN DISTRICTS OF M.P.

7.2.4 Composite Index of Agricultural Efficiency

Combining the weighted indices of all the selected indicators the composite indices of agricultural efficiency were obtained for all the districts. Gwalior with the index value of 130.03 ranked first. Other districts showing fairly good level of agricultural efficiency were Morena (124.29) Bilaspur (122.18), Balaghat (120.91), and Raipur (118.07). The composite index of 21 district was above 100 while the rest 24 district ranged between 75-100. The districts lying at the bottom were Betul (77.44), Shahdol (77.93) Damoh(80.41), Jhabua (81.57) and Sidhi (84.36) Table 7.5

Categorisation of Districts on the basis of composite Index of Agricultural Efficiency.

Base M.P.= 100

Category	Index Range	No.of Distt.	Name of Districts
Good	More than 130	1	Gwalior
Fair	110-130	5	Morena, Bilaspur, Balaghat, Raipur, Indore.
Moderate	90-110	28	Mandsaur, Tikamgarh, Chhatarpur, Narsinghpur, Raisen, Khandwa, Bhind, Khargone, Surguja, Shivpuri, Jabalpur, Dewas, Bhopal, Vidisha, Sagar, Raigarh, Seoni, Shajapur, Datia, Dhar, Sehore, Ratlam, Durg, Bastar, Raigarh, Rajnandgaon, Hoshangabad, Ujjain.
Poor	70-90	11	Panna, Mandla, Rewa, Guna, Chhindwara, Satna, Sidhi, Jhabua, Damoh, Shahdol, Betul.
Very Poor	Below 70	Nil	---

Table 7.4 Districtwise Index of Crcp Productivity in Madhya Pradesh.

Base: M.P.=100; Weight = 3.0

District	Index of Product*	Weighted Index	RANK	District	Index of product*	Weighted Index	RANK
Balaghat	112.08	336.24	10	Morena	148.59	445.77	1
Bastar	101.73	305.19	16	Narsingpur	125.51	376.53	6
Betul	74.65	223.95	44	Panna	83.27	249.81	40
Bhind	136.23	408.69	3	Raigarh	99.04	297.12	19
Bhopal	108.02	324.06	13	Raipur	105.92	317.76	14
Bilaspur	109.74	329.22	12	Raisen	116.35	349.05	8
Chhatarpur	138.43	415.29	2	Rajgarh	77.27	231.81	43
Chhindwara	77.33	231.99	42	Rajnandgaon	87.46	262.38	36
Damoh	90.59	271.77	32	Ratlam	83.98	251.94	38
Datia	94.02	282.06	29	Rewa	83.72	251.16	39
Dewas	110.43	331.29	11	Sagar	100.02	300.06	17
Dhar	98.59	295.77	22	Satna	82.06	246.18	41
Durg	92.87	278.61	31	Sehore	89.37	268.11	33
Guna	85.02	255.06	37	Seoni	129.37	388.11	5
Gwalior	118.81	356.43	7	Shahdol	63.72	191.16	45
Hoshangabad	97.93	293.79	26	Shajapur	88.82	266.46	34
Indore	99.85	299.55	20	Shivpuri	98.70	296.10	25
Jabalpur	98.06	294.18	24	Sidhi	88.82	266.46	35
Jhabua	93.08	279.24	30	Surguja	99.22	297.66	18
Khandwa	97.35	292.05	27	Tikamgarh	115.60	346.80	9
Khargone	129.42	388.26	4	Ujjain	94.11	282.33	28
Mandla	98.72	296.16	23	Vidisha	99.43	298.29	21
Mandsaur	104.41	313.23	15	All M.P.	100.00	300.00	-

* Results of own analysis based on 5 years average data of area and yields of 22 crcps.

Source of data- Agricultural Statistics of M.P.

7.2.3 Agricultural Productivity

Productivity is a measure of efficiency. It is used in measuring the contribution of the various factors of production, through a variety of productivity ratios. Agricultural Productivity can be measured in terms of output per unit of individual inputs or through the entire production function. However, one of the chief difficulties is the lack of knowledge of the production functions involved, therefore, it is found convenient and operationally meaningful to compare the productivity of different regions on the basis of per unit of area. In the present study agricultural productivity of different districts has been compared by constructing composite indices of yields per hectare of different crops in each district. Weight assigned to this indicator was 3.00.

For the purpose of constructing composite crop yield index the following 22 crop were selected. These crops together accounted for 89.00 per cent of the total gross cropped area of the state.

1. Rice	7. Kodon-Kutki	13. Sesamum	19. Sugarcane
2. Wheat	8. Gram	14. Linseed	20. Chillies
3. Jowar	9. Tur	15. Rape & Mustard	21. Potato
4. Maize	10. Teora	16. Niger	22. Tobaco
5. Bajra	11. Massor	17. Cotton	
6. Barley	12. Groundnut	18. Sunhemp	

Composite Index of crop yields was constructed by the following method: Composite Index = $\frac{\sum \frac{Yi}{Yio} \cdot Ai}{\sum Ai}$

Where:

i = Crops (1 to)
Yi = Average yield (kg.per hectare) of the crop in the District (5 years average)
Ai = Average area of the crop in the district
Yio = Average yield of the crop in the state.

Composite crop yield indices so constructed for different districts of the state are given in Table 7.4.

Table 7.3 Districtwise Linear Growth Rate of Gross Value of Agricultural Output per hectare in Madhya Pradesh (1960-61 to 1977-78)

Base: M.P.=100, Weight= 2.0

District	Growth Rate*	Weighted Index	RANK	District	Growth Rate*	Weighted Index	RANK
Balaghat	71.85	239.86	6	Morena	72.69	242.66	5
Bastar	57.50	191.95	25	Narsinghpur	68.98	230.28	9
Betul	43.81	146.25	38	Panna	48.86	163.11	32
Bhind	70.09	233.98	7	Raigarh	63.40	211.65	15
Bhopal	46.23+	154.23	37	Raipur	67.25	224.50	10
Bilaspur	83.26	277.95	2	Raisen	64.17	214.22	13
Chhatarpur	52.69	175.89	29	Rajgarh	58.27	194.52	23
Chhindwara	53.50	178.60	27	Rajnandgaon	41.14**	137.34	41
Damoh	39.29	131.16	45	Ratlam	60.21	201.00	22
Datia	63.37	211.55	16	Rewa	48.52	161.97	33
Dewas	60.98	203.57	19	Sagar	60.96	203.50	20
Dhar	53.33	178.03	28	Satna	40.88	136.47	43
Durg	41.14	137.34	40	Sehore	46.23	154.33	36
Guna	52.64	175.73	30	Seoni	50.86	169.79	31
Gwalior	84.00	280.42	1	Shahdol	46.89	156.53	34
Hoshangabad	43.08	143.81	39	Shajapur	66.90	223.33	11
Indore	74.98	250.31	4	Shivpuri	69.04	230.48	8
Jabalpur	60.45	201.80	21	Sidhi	41.09	137.17	42
Jhabua	40.58	135.47	44	Surguja	62.87	209.88	17
Khandwa	76.05	253.88	3	Tikamgarh	63.41	211.68	14
Khargone	56.12	187.35	26	Ujjain	57.91	193.32	24
Mandla	46.45	155.06	35	Vidisha	61.31	204.67	18
Mandsaur	66.19	220.96	12	All M.P.	59.91	200.00	-

Note: * Growth Rates calculated from Gross Value of Agricultural Output per hectare from 1960-61 to 1977-78 (Results of own analysis).

Source of Data : 1. Directorate of Economics & Statistics, M.P.
2. Commissioner of Land Records, M.P.

+ As for Sehore District.

** As for Durg District.

Categorisation of Districts on the basis of indices for Gross Value of Agricultural Output per Hectare (on Gross Cropped Area)

Base M.P.= 100

Category	Index Range	No.of Distt.	Name of Districts
Good	More than 130	4	Gwalior, Raipur, Balaghat, Bilaspur.
Fair	110-130	6	Bhind, Indore, Morena, Sehore, Bhopal, Mandsaur.
Moderate	90-110	21	Surguja, Vidisha, Sagar, Khandwa, Jabalpur, Raisen, Tikamgarh, Shivpuri, Raigarh, Shajapur, Hoshangabad, Ratlam, Chhatarpur, Datia, Dhar, Durg, Dewas, Rajgarh, Khargone, Ujjain, Panna.
Poor	70-90	11	Narsinghpur, Bastar, Guna, Satna, Chhindwara, Seoni, Rewa, Shahdol, Rajnandgaon, Mandla, Sidhi.
Very Poor	Below 70	3	Damoh, Betul, Jhabua.

7.2.2 (b) Growth Rate

Linear growth rates of gross value of agricultural output per hectare for the period 1960-61 to 1977-78 were calculated. Weight assigned to this indicator was 2.0.

Categorisation of Districts on the basis of Indices for Linear Growth Rate of Gross Value of Agricultural Output per hectare.

Base M.P.=100

Category	Index Range	No.of Distt.	Name of Districts
Good	More than 130	2	Gwalior, Bilaspur
Fair	110-130	4	Khandwa, Indore, Morena, Balaghat.
Moderate	90-110	22	Bhind, Shivpuri, Narsinghpur, Raipur, Shajapur, Mandsaur, Raisen, Tikamgarh, Raigarh, Datia, Surguja, Vidisha, Dewas, Sagar, Jabalpur, Ratlam, Rajgarh, Ujjain, Bastar, Khargone, Chhindwara, Dhar.
Poor	70-90	14	Chhatarpur, Guna, Seoni, Panna, Rewa, Shahdol, Mandla, Sehore, Bhopal, Hoshangabad, Durg, Rajnandgaon, Sidhi.
Very Poor	Below 70	3	Satna, Jhabua, Damoh.

Table 7.2 Districtwise Gross Value of Agricultural Output Per Hectare (on Gross Cropped Area) in Madhya Pradesh.

Base: M.P.=100, Weight= 3.0

District	Value Per Hect.	Weighted Index	RANK	District	Value Per Hect.	Weighted Index	RANK
Balaghat	1796	396.47	3	Morena	1651	364.40	7
Bastar	1186	261.81	33	Narsinghpur	1212	267.55	32
Betul	941	207.73	44	Panna	1229	271.30	31
Bhind	1735	383.00	5	Raigarh	1371	302.65	19
Bhopal	1532	339.67	9	Raipur	1833	404.63	2
Bilaspur	1781	393.16	4	Raisen	1415	312.36	16
Chhatarpur	1335	294.70	23	Rajgarh	1235	272.63	28
Chhindwara	1124	248.12	36	Rajnandgaon	1044	228.96	40
Damoh	943	208.67	43	Ratlam	1335	294.70	22
Datia	1334	294.48	24	Rewa	1053	232.45	38
Dewas	1304	287.86	27	Sagar	1432	316.11	13
Dhar	1333	294.26	25	Satna	1139	251.43	35
Durg	1309	288.96	26	Sehore	1584	349.67	8
Guna	1142	252.10	34	Seoni	1081	238.63	37
Gwalior	2163	477.48	1	Shahdol	1049	231.57	39
Hoshangabad	1357	299.56	21	Shajapur	1365	301.32	20
Indore	1660	366.44	6	Shivpuri	1373	303.09	18
Jabalpur	1423	314.13	15	Sidhi	954	210.59	42
Jhabua	935	206.40	45	Surguja	1479	326.49	11
Khandwa	1430	315.67	14	Tikamgarh	1408	310.82	17
Khargone	1232	271.96	29	Ujjain	1232	271.96	30
Mandla	954	210.59	41	Vidisha	1454	320.97	12
Mandsaur	1497	330.46	10	All M.P.	1359	300.00	-

Note: Value of output calculated from secondary data- 'Gross Value' of Agricultural output (1977-78)
Source: Directorate of Economics and Statistics, M.P.

7.2.2 Gross Value of Agricultural Output per Hectare

Output per unit of area is considered a relevant indicator to compare the efficiency of two different units or situations. Here, output per unit of area in the form of gross value of agricultural output per hectare (on gross cropped area) has been used to compare the agricultural efficiency of different districts of the state. Districtwise gross value of agriculture from 1960-61 to 1977-78 on current prices was taken from the publications of Directorate of Economics and Statistics, Madhya Pradesh. It was converted into-output value per hectare by dividing it with the gross cropped area of the districts in the respective years. It has been used in two ways :

(a) To compare and rank the districts on the basis of gross value of agricultural output per hectare in the terminal year of its time series data i.e. 1977-78.

(b) To compare and rank the district on the basis of linear growth rates of gross value of agricultural output per hectare in time series data from 1960-61 to 1977-78.

7.2.2 (a) Output Level (1977-78)

Over all average gross value of agricultural output per hectare for the state was Rs.1359/- and twenty district had higher values than the state average Gwalior having Rs.2163/- per hectare, gross value ranked first Raipur, (Rs.1833) Balaghat (Rs.1796) and Bilaspur (Rs.1781) district (all belonging to the Rice zone) stood second, third and fourth respectively. The district trailing at the bottom were Jhabua (Rs.935), Betul (Rs.941), Damoh (Rs.943), Sidhi and Mandla both Rs.954/-. The remaining 36 districts ranged between Rs.1049/-(Shahdol) to Rs.1735 (Bhind). Table 7.2. Weight assigned to this indicator was 3.0.

Table 7.1 Districtwise Intensity of Cropping in Madhya Pradesh (1977-78 to 1979-80, 3 years average)

Base : M.P.=100, Weight= 2.0

District	Intensity of cropping	Weighted Index	RANK	District	Intensity of cropping	Weighted Index	RANK
Balaghat	135.31	236.53	2	Morena	108.75	190.10	29
Bastar	104.28	182.29	37	Narsinghpur	103.69	181.26	40
Betul	112.42	196.52	20	Panna	113.48	198.37	18
Bhind	104.60	182.85	36	Raigarh	107.29	187.55	32
Bhopal	102.86	183.58	41	Raipur	133.79	233.88	4
Bilaspur	126.71	221.50	8	Raisen	101.17	176.85	45
Chhatarpur	112.26	196.24	21	Rajgarh	135.07	236.11	3
Chhindwara	110.22	192.67	26	Rajnandgaon	125.28	244.10	10
Damoh	110.14	192.53	27	Ratlam	118.35	206.88	15
Datia	101.95	178.22	44	Rewa	126.51	221.15	9
Dewas	109.40	191.24	28	Sagar	103.85	181.54	39
Dhar	113.11	197.73	19	Satna	120.66	210.92	13
Durg	139.64	244.10	1	Sehore	105.02	183.58	35
Guna	104.14	182.05	38	Seoni	107.55	188.01	31
Gwalior	106.86	186.00	33	Shahdol	114.46	200.09	17
Hoshangabad	102.00	178.31	43	Shajapur	110.39	192.97	25
Indore	116.94	204.42	16	Shivpuri	111.14	194.28	23
Jabalpur	118.99	208.00	14	Sidhi	131.25	229.44	6
Jhabua	111.34	194.63	22	Surguja	133.34	198.13	5
Khandwa	106.30	185.82	34	Tikamgarh	122.77	214.61	11
Khargone	108.50	189.67	30	Ujjain	110.43	193.04	24
Mandla	122.00	213.27	12	Vidisha	102.53	179.23	42
Mandsaur	128.67	224.93	7	All M.P.	114.41	200.00	-

Note: Intensity of cropping calculated on three years average data i.e. for 1977-78 to 1979-80.

Districtwise indices of the above four indicators were pooled and composite indices of agricultural efficiency were derived for each district by the method explained earlier.

7.2.1 Intensity of Cropping

It has been used here as an indicator of agricultural efficiency, since it indicates the level of intensification with which the land (net cropped area) is being cultivated. The weight assigned to this indicator is 2.0.

Intensity of cropping was highest in Durg (1939.64 per cent) followed by Balaghat (135.31 per cent) Rajgarh (135.07 per cent) and Raipur (133.79 per cent). Lowest cropping density was in Raisen (101.17 per cent). In all seventeen district had higher cropping density than the state average of 114.41 per cent (Table 7.1).

Categorisation of Districts on the basis of Indices for Intensity of Cropping

Base M.P.= 100

Category	Index Range	No.of Distt.	Name of Districts
Good	More than 130	Nil	-
Fair	110-130	10	Durg, Balaghat, Rajgarh, Raipur, Surguja, Sidhi, Mandsaur, Bilaspur, Rewa, Rajnandgaon.
Moderate	90-110	33	Tikamgarh, Mandla, Satna, Jabalpur, Ratlam, Indore, Shahdol, Panna, Dhar, Betul, Chhatarpur, Jhabua, Shivpuri, Ujjain, Shajapur, Chhindwara, Damoh, Dewas, Morena, Khargone, Seoni, Raigarh, Gwalior, Khandwa, Sehore, Bhind, Bastar, Guna, Sagar, Narsinghpur, Bhopal, Vidisha, Hoshangabad,
Poor	70-90	2	Datia, Raisen
Very Poor	Below 70	Nil	--

Thus, after obtaining the composite indices, the district were ranked in the descending order of their composit indices for agricultural efficiency and development separately. The chapter, onward has been divided into three parts :

I Agricultural Efficiency

II Agricultural Development

III Rank Correlation

Part I AGRICULTURAL EFFICIENCY

7.2 Indicators of Agricultural Efficiency

It is generally measured in one of the four ways i.e.

(i) Output per unit of area

(ii) Output per unit of labour

(iii) Input-Output ratio, and

(iv) Output in terms of grain equivalent per head of population.

Since, districtwise data on item two, three and four (as mentioned above) were not available output per unit of area in the form of gross value of agricultural output per hectare was used as one of the indicators of agricultural efficiency. Further, in order to assess properly the combined effect of different factors in the form of increased productivity efficiency due to temporal and spatial changes two more indicators i.e. intensity of cropping and the growth rate of gross value of agricultural output per hectare were included.

Thus, the districtwise agricultural efficiency was measured through the composite indices of following four indicators:

1. Intensity of cropping
2. Gross value of agricultural output per hectare
3. Growth rate of gross value of agricultural output per hectare and
4. Composite index of agricultural productivity

to study the agricultural development. The selection of indicators was done on following three considerations.

1. The indicator was representative of some basic factor which had direct bearing on the problem under study.
2. The indicator was measureable
3. Relevant data with regard to the indicator was available.

7.1.3 Assignment of Weight

In order to arrive at a meaningful and compareable composite index of agricultural efficiency and agricultural development it was desireable to assign some weights to the indicators. A serious problem one encounters, while constructing a composite index based on various physical indicators pertains to assigning of weights to the indicators which differ considerably in their relative importance. Any attempt at assigning weights based on value judgement is bound to result in arbitrariness and subjectivity which becomes an important limitation of this approach.

7.1.4 Composite Index

For working out composite index of agricultural efficiency or agricultural development of each district, first the districtwise data for each indicator was converted into index number, taking the state data as the base. In order to arrive at a meaningful and compareable composite index, the index values of each indicator were multiplied by the weight assigned to the respective indicator. Further, the weighted indices of all the indicators were added districtwise (separately for agricultural efficiency and development) and divided by the total value of weights given in each exercise.

CHAPTER- VII

AGRICULTURAL EFFICIENCY AND DEVELOPMENT

7.1 Method of Study

Any specific agricultural situation is an outcome of combination of some basic and emergent factors. It is realised that development involves much more than mere growth, therefore assessment of the development of this situation should not be done only on the trends in the agricultural production and productivity. Though, the differences in total output and productivity (which reflect the essence of various agricultural development measures) are often used as measure of development, however a big limitation of any of these criteria when taken individually, is that they do not consider various factors which influence the level of activities in different areas under study. Any of the above mentioned criteria is at best a partial indicator of development.

7.1.1 Indicators Approach

In this chapter the selected indicators approach with weighted indices method has been adopted to measure and compare districtwise agricultural efficiency and agricultural development.

Since the process of development is multidimensional any exercise for measuring it should be based on a fairly comprehensive list of indicators which should cover the various aspect. Further, the selected indicators should be sensitive enough so as to explain quite a sizeable proportion of the total variation in the efficiency and development level of different units under study.

7.1.2 Selected Indicators

Two different sets of indicators were selected one to assess the agricultural efficiency of the district and the other

Table 6.5 : Districtwise Linear Growth Rates of Gross Value of Agricultural Output per Hectare from 1960-61 to 1977-78.

(Base : Agricultural year 1960-61=100

District	Growth Rate(%)	Rank	District	Growth Rate(%)	Rank
Balaghat	16.59	26	Morena	17.86	20
Bastar	15.46	33	Narsinghpur	20.97	4
Betul	16.05	29	Panna	14.54	38
Bhind	18.02	17	Raigarh	16.09	28
Bhopal	-	-	Raipur	18.63	16
Bilaspur	21.40	2	Raisen	20.12	9
Chhatarpur	15.27	35	Rajgarh	21.42	1
Chhindwara	18.01	18	Rajnandgaon	-	-
Damoh	6.61	43	Ratlam	17.92	19
Datia	19.68	11	Rewa	20.13	8
Dewas	17.68	22	Sagar	16.66	24
Dhar	15.32	34	Satna	14.97	37
Durg	12.74	41	Sehore	11.41	42
Guna	16.00	30	Seoni	19.64	12
Gwalior	15.19	36	Shahdol	17.43	23
Hoshangabad	14.22	39	Shajapur	20.27	7
Indore	20.54	6	Shivpuri	19.90	10
Jabalpur	19.44	14	Sidhi	14.17	40
Jhabua	16.57	27	Surguja	19.46	13
Khandwa	21.07	3	Tikamgarh	16.64	25
Khargone	15.81	32	Ujjain	17.82	21
Mandla	19.27	15	Vidisha	15.92	31
Mandsaur	20.68	5	All M.P.	17.57	-

Highest increase of 408 per cent was observed in Raipur followed by Mandsaur (368 per cent) and Bilaspur, Jabalpur and Surguja (all 358 per cent). Lowest increase was observed in Damoh which was only 59 per cent. In eighteen districts the increase in gross value of agricultural output per hectare was more than the over all increase of 298 per cent in the state (Table 6.4).

6.4.3 Linear Growth Rate

The gross value of agricultural output per hectare on gross cropped area for the period 1960-61 to 1977-78 in each district was converted to indices with the 1960-61 data equal to hundred as base. Linear growth rate of these indices in time series was calculated for each district and compared ((Table 6.5).

Highest growth rate was obtained by Rajgarh district (21.42 per cent) followed by Bilaspur (21.40 per cent) and Khandwa (21.07 per cent). In all twenty two districts had higher growth rate than the state level of 17.57 per cent. The districts exhibiting low growth rates were Damoh (lowest with 6.61 per cent), Sehore, Durg, Sidhi, Hoshangabad Panna, and Satna (Table 6.5).

Table 6.4 Districtwise Change in Gross Value of Agricultural Output per Hectare (gross cropped area) in 1977-78 over 1960-61.

District	1960-61 (Rs.)	1977-78 (Rs.)	Per-cent Increase.	District	1960-61 (Rs.)	1977-78 (Rs.)	Per-cent Increase
Balaghat	433	1796	315	Morena	407	1651	305
Bastar	372	1186	219	Narsinghpur	329	1212	268
Betul	273	941	245	Panna	336	1229	266
Bhind	389	1735	346	Raigarh	394	1371	248
Bhopal	-	1532	-	Raipur	361	1833	408
Bilaspur	389	1781	358	Raisen	319	1415	344
Chhatarpur	345	1335	287	Rajgarh	272	1235	354
Chhindwara	297	1124	278	Rajnandgaon	-	1044	-
Damoh	594	943	59	Ratlam	336	1335	297
Datia	322	1334	314	Rewa	241	1053	337
Dewas	345	1304	278	Sagar	366	1432	291
Dhar	348	1333	283	Satna	273	1139	317
Durg	323	1309	305	Sehore	405	1584	291
Guna	329	1142	247	Seoni	259	1081	317
Gwalior	553	2163	291	Shahdol	269	1049	290
Hoshangabad	303	1357	348	Shajapur	330	1365	314
Indore	365	1660	355	Shivpuri	347	1373	296
Jabalpur	311	1423	358	Sidhi	290	954	229
Jhabua	251	935	272	Surguja	323	1479	358
Khandwa	361	1430	296	Tikamgarh	381	1408	270
Khargone	355	1232	247	Ujjain	325	1232	279
Mandla	241	954	296	Vidisha	385	1454	278
Mandsaur	320	1497	368	All M.P.	341	1359	298

Districts exhibiting growth rate in between 1 to 2 per cent were Sagar, Bhind, Shajapur, Guna, Rajgarh, Dewas, Sidhi, Datia, Bastar, Dhar, Panna and Satna. Another ten districts having positive growth rate were below 1.0 per cent and ranged between 0.12 per cent to 0.89 per cent.

The districts exhibiting negative growth rate were ten in number and ranged between -0.06 to -0.80 per cent. Lowest growth rate was found in Jhabua (-0.80 per cent) preceded by Khargone, Betul, Chhindwara, Bilaspur, Seoni, Surguja, Shivpuri, Gwalior and Durg. (Table 6.3).

6.4 Output Per Hectare

6.4.1 Source and Coverage

Districtwise estimates of gross value of output for agriculture (proper) i.e. crops and their by-products, prepared by the Directorate of Economics and Statistics, Madhya Pradesh (available in time series for the period 1960-61 to 1977-78) was utilised to calculate gross value of agricultural output per hectare. For this purpose the total output value of a district was divided by the gross cropped area of the same district in the corresponding years.

The time series data of gross value of agricultural output (crops only) per hectare (gross cropped area) has been analysed in two ways :

6.4.2 Percentage increase

The percentage increase in gross value of output per hectare in the terminal year (1977-78) over the base year (1960-61) has been calculated (table 6.4).

Table 6.3 Districtwise Linear Growth Rate of Composite Crop Output in Madhya Pradesh.

District	No.of Crops	Percent of Area	Growth Rate	District	No.of Crops	Percent of Area	Growth Rate
Balaghat	9	80.61	0.61	Morena	10	92.66	3.89
Bastar	9	84.33	1.25	Narsinghpur	10	82.64	0.31
Betul	12	87.80	-0.34	Panna	11	96.40	1.03
Bhind	10	87.00	1.76	Raigarh	9	79.20	0.12
Bhopal	-	-	-	Raipur	10	74.56	0.40
Bilaspur	9	75.36	-0.23	Raisen	7	81.61	2.36
Chhatarpur	10	88.13	2.08	Rajgarh	9	93.63	1.52
Chhindwara	12	81.79	-0.24	Rajnandgaon	-	-	-
Damoh	9	88.13	0.67	Ratlam	11	82.99	0.89
Datia	10	90.52	1.38	Rewa	9	91.08	2.10
Dewas	11	90.39	1.52	Sagar	13	86.22	1.97
Dhar	11	88.95	1.19	Satna	9	94.40	1.02
Durg	8	74.12	-0.06	Sehore	10	95.34	2.36
Guna	9	91.94	1.64	Seoni	10	72.74	-0.14
Gwalior	9	89.12	-0.07	Shahdol	10	84.79	0.77
Hoshangabad	9	92.55	2.08	Shajapur	8	92.99	1.70
Indore	10	91.42	3.06	Shivpuri	11	85.20	-0.07
Jabalpur	11	90.12	0.55	Sidhi	11	89.67	1.45
Jhabua	11	71.70	-0.80	Surguja	11	74.31	-0.07
Khandwa	8	83.11	0.28	Tikamgarh	11	84.53	2.32
Khargone	10	83.15	-0.41	Ujjain	10	93.63	0.82
Mandla	10	80.86	3.19	Vidisha	9	93.89	3.47
Mandsaur	10	88.17	3.15	All M.P.	-	-	-

The composite crop output growth for each district was calculated from the composite crop output indices for the period 1960-61 to 1979-80 with 1960-61 as the base year. Linear growth rate determined for each district is presented in table 6.3. The table also gives the number of crops studied for each district and the percentage of gross cropped area shared by the crops in the district.

6.3.3 Composite Crop output Growth in Districts

Highest growth rate of crop output was obtained by Morena (3.89 per cent) followed by Vidisha (3.47 per cent), Mandla (3.19 per cent), Mandsaur (3.15 per cent) and Indore (3.06 per cent). Other districts exhibiting growth rate of more than 2.0 per cent were Sehore, Raisen, Tikamgarh, Rewa, Chhatarpur and Hoshangabad (Table 6.3).

The weights given to individual crops, represented their value shares in each district. These weights were determined by taking percentage of the Crop output value of each selected crop from the total output value of all crops in each district. The total output value was obtained by summing up the three years average production of each crop evaluated at the farm harvest prices of 1960-61. The procedure may be summed up as:

Index of crop output (value) i.e. $O = \frac{Q_1 P}{Q_o P} X\ 100$

Q_1 = Physical quantity of crop output in the current year

Q_o = Physical quantity of the crop output in the base year

P = Farm harvest price of the commodity in 1960-61

Weight i.e. $W = \frac{Q_{\ldots\ldots n} \ldots P_{1\ldots\ldots n}}{Q_1 P_1 + Q_2 P_2 + Q_3 P_{3\ldots n}} X\ 100$

Weighted Index i.e. $Ow = O x W$

Composite Index i.e. $OC = \frac{E\ Ow_1}{E\ Owo} X\ 100$

Ow_1 = Weighted index of individual crop in the current year

Ow_2 = Weighted index of individual crops in the base year.

6.3 Composite Crop Output Growth

6.3.1 Coverage

Output (Physical quantity of production) growth rate of individual crops was calculated for the period 1950-51 to 1979-80. Here, the composite growth rate of crop output (value of crop production) has been studied for the period 1960-61 to 1979-80. The initial period has been changed in these series as the number of crops covered in the composite crop output growth analysis is more and the availability of their data for the earlier period was difficult.

6.3.2 Methodology

All important crops together sharing more than 80 per cent of the gross cropped area, were selected for each district. The production data of all selected crops in each district were collected in continuous time series from 1960-61 to 1979-80.

The production of each crop in a district was evaluated at its farm harvest price in the state during the base year of 1960-61. By adopting the state price of a crop for all the district the spatial price variation have been eliminated and through the adoption of base year prices for the entire series the temporal price fluctuations were avoided.

For converting the time series data of output, into indices the base year (1960-61) data was considered equal to 100.

For constructing composite index of crop output for each district the indices of selected individual crops multiplied by their weights were summed up and again converted into indices by taking the base year (1960-61) total equal to 100.

Table 6.2 Districtwise Linear Rates of Growth of Crop Output of Important (Individual) Crops in Madhya Pradesh 1950-51 to 1979-80.

S.No.	Districts	Gram	Sesamum	Linseed	Cotton
1.	Balaghat	-0.56	-	2.06	-
2.	Bastar (Jagdalpur)	- 2.32	- 0.38	2.64	-
3.	Betul	- 0.12	- 1.47	5.89	- 2.67
4.	Bhind	0.61	- 2.36	0.23	-
5.	Bhopal	-	-	-	-
6.	Bilaspur	2.57	0.71	1.08	-
7.	Chhatarpur	3.51	- 3.40	10.16	-
8.	Chhindwara	- 1.49	- 2.39	3.04	- 0.77
9.	Damoh	2.41	-9.00	11.96	-
10.	Datia	0.88	-	4.44	-
11.	Dewas	9.38	- 2.22	2.87	- 0.36
12.	Dhar	6.65	- 7.12	5.24	0.59
13.	Durg	0.84	14.77	0.10	-
14.	Guna	3.82	- 3.15	6.01	-
15.	Gwalior	- 0.15	-	9.94	-
16.	Hoshangabad	1.07	2.10	7.05	6.45
17.	Indore	3.49	-	3.75	- 2.99
18.	Jabalpur	- 0.36	- 1.50	3.13	-
19.	Jhabua	6.20	- 4.71	-	2.54
20.	Khandwa	3.94	- 3.03	2.09	1.03
21.	Khargone	- 4.40	-13.61	-18.32	- 0.58
22.	Mandla	- 0.56	- 1.98	17.25	-
23.	Mandsaur	27.40	- 3.16	0.21	- 3.50
24.	Morena	2.48	- 2.68	- 2.13	-
25.	Narsinghpur	0.97	3.05	- 1.44	-
26.	Panna	1.17	- 3.48	5.25	-
27.	Raigarh	1.03	- 3.21	-	-
28.	Raipur	- 2.56	- 1.21	- 2.33	-
29.	Raisen	2.39	0.81	11.76	-
30.	Rajgarh	11.14	- 2.58	0.80	- 2.85
31.	Rajnandgaon	-	-	-	-
32.	Ratlam	8.19	-	0.18	- 0.77
33.	Rewa	1.48	-	- 0.92	-
34.	Sagar	6.74	- 3.82	17.11	-
35.	Satna	0.69	-	0.55	-
36.	Sehore	4.68	- 1.82	9.70	- 1.47
37.	Seoni	- 0.56	- 0.56	6.69	-
38.	Shahdol	-	-	8.35	-
39.	Shajapur	14.44	- 2.36	0.44	- 2.19
40.	Shivpuri	1.12	- 3.72	5.49	-
41.	Sidhi	3.34	-	3.44	-
42.	Surguja (Ambikapur)	- 0.51	1.69	10.35	-
43.	Tikamgarh	4.68	-	7.69	-
44.	Ujjain	10.71	-	1.11	- 1.31
45.	Vidisha	3.19	- 1.64	4.84	-

6.2.6 Linseed

Linseed had high output growth rate of more than 5 per cent in atleast 17 districts. Important among them were Mandla, Surguja, Sagar, Damoh, Sehore, Shahdol. Betul, Hoshangabad and Sehore. Some of the districts where output growth rate of linseed was negative were : Khargone, Raipur, Narsinghpur and Rewa.

6.2.7 Cotton

In Madhya Pradesh the output growth rate of cotton was on a downward trend. Its area and output both had gone down. Out of the 15 cotton growing districts (11 district of Cotton-Jowar zone and Sehore, Hoshangabad, Betul and Chhindwara) 11 had negative output growth rate. Highest growth rate was exhibited by Hoshangabad (6.45 per cent) fcllowed by Jhabua (2.54 per cent), Khandwa (1.03 per cent) and Dhar (0.59 per cent) Table 6.2.

Table 6.1 Districtwise Linear Rates of Growth of Crop output of Important (Individual) Crops in Madhya Pradesh, 1950-51 to 1979-80.

S.No.	Districts	Rice	Wheat	Jowar
1.	Balaghat	1.77	4.96	7.92
2.	Bastar(Jagdalpur)	1.07	13.66	5.89
3.	Betul	5.16	- 0.10	- 0.57
4.	Bhind	10.83	10.51	- 0.12
5.	Bhopal	-	-	-
6.	Bilaspur	1.23	1.72	6.95
7.	Chhatarpur	1.75	9.54	0.14
8.	Chhindwara	5.17	1.87	- 2.12
9.	Damoh	2.26	1.30	- 0.65
10.	Datia	0.34	4.81	0.63
11.	Dewas	- 0.72	11.71	8.40
12.	Dhar	7.98	5.66	1.89
13.	Durg	1.00	- 0.09	-
14.	Guna	2.13	21.45	5.06
15.	Gwalior	3.67	6.84	3.65
16.	Hoshangabad	1.52	0.68	2.39
17.	Indore	- 1.22	6.34	5.49
18.	Jabalpur	2.09	0.10	2.36
19.	Jhabua	6.59	42.26	16.42
20.	Khandwa	3.41	8.13	4.23
21.	Khargone	12.79	46.07	13.20
22.	Mandla	3.03	4.32	16.58
23.	Mandsaur	- 1.08	13.08	3.22
24.	Morena	10.56	29.42	- 0.77
25.	Narsinghpur	0.76	1.28	- 2.55
26.	Panna	0.20	5.21	1.10
27.	Raigarh	0.48	48.35	-
28.	Raipur	1.34	9.89	5.21
29.	Raisen	0.24	5.36	1.32
30.	Rajgarh	9.53	14.70	6.99
31.	Rajnandgaon	-	-	-
32.	Ratlam	1.53	6.73	2.35
33.	Rewa	1.44	4.14	0.18
34.	Sagar	0.77	2.06	- 2.43
35.	Satna	- 1.36	5.09	- 1.54
36.	Sehore	3.58	5.15	0.98
37.	Seoni	1.91	- 0.10	0.09
38.	Shahdol	2.42	2.82	4.66
39.	Shajapur	0.83	16.36	5.04
40.	Shivpuri	1.59	8.15	- 1.27
41.	Sidhi	- 0.28	11.52	1.95
42.	Surguja(Ambikapur)	0.17	23.43	7.73
43.	Tikamgarh	- 0.68	21.74	0.40
44.	Ujjain	- 1.27	6.80	3.33
45.	Vidisha	0.04	17.17	0.01

6.2.2 Wheat

Highest growth rate of wheat output was exhibited by Raigarh (48.35 per cent) followed by Khargone (46.07)percent) and Jhabua (42.26 per cent). Other districts having growth rate higher than 20 per cent were: Morena, Tikamgarh, Guna and Surguja. The districts having negative growth rate of wheat output were Betul, Durg and Seoni (Table 6.1).

6.2.3 Jowar

Only three districts Jhabua, Mandla and Khargone had output growth rate of Jowar exceeding 10 per cent. Others having growth rates in between 5 to 10 per cent were : Balaghat, Bastar,Bilaspur, Dewas, Guna, Indore, Raipur, Rajgarh, Shajapur and Surguja. The districts having negative growth rate of Jowar output were Betul, Bhind, Chhindwara, Damoh, Morena, Narsinghpur, Sagar, Satna and Shivpuri (Table 6.1).

6.2.4 Gram

Highest growth rate in output of gram was acquired by Mandsaur (27.43 per cent). Other districts where the growth rate exceded 10 per cent were Ujjain, Shajapur and Rajgarh. (Table 6.2)

6.2.5 Sesamum

In case of sesamum, since acreage and production both have gone down in Madhya Pradesh, the output growth rate in at least 26 district was negative ranging from-0.38 per cent in Bastar to -13.61 per cent in Khargone. Districts exhibiting positive growth rate were Durg (14.77 per cent), Hoshangabad (2.10 per cent) Narsinghpur (3.05 per cent) Surguja, Raisen and Bilaspur (Table 6.2).

CHAPTER- VI

CROP OUTPUT GROWTH

6.1 Approach

Studying the growth rates of agriculture, particularly in a planned economy is important and useful in several ways. It enables to assess the progress of agricultural development and helps in locating the weaknesses in the existing programmes. There are several ways of measuring growth, however looking to the purpose of our study, availability of data and the analytical facilities we have confined our efforts to the following steps:

1. Crop output growth of individual crops between 1950-51 to 1979-80.
2. Composite crop output growth between 1960-61 to 1979-80.
3. Gross value of agricultural output per hectage :
   a) Percentage increase in 1977-78 over 1960-61.
   b) Linear growth rate between 1960-61 to 1977-78.

6.2 Crop Output Growth-Individual Crops

The main trends in the growth rates of principal individual crops between 1950-51 to 1979-80 may be summed up as follows :

6.2.1 Rice

Rice had high rates of growth in output, exceeding 10 per cent in Khargone, Bhind and Morena. Some other districts having more than 5 per cent growth rate were: Rajgarh, Jhabua, Dhar, Chhindwara and Betul (Table 6.1). Seven districts: Dewas, Indore, Mandsaur, Satna, Sidhi, Tikamgarh and Ujjain had negative growth rates of rice output.

Table 5.32 Categorization of Districts of Different Crop Zones in Madhya Pradesh on the basis of Crop Adjustment Coefficient.

Category (Crop Adjustment Coefficient)	Crop Zones of Madhya Pradesh					Total No. of Distt. and percent
	Rice Zone	Rice-Wheat Zone	Jowar-Wheat Zone	Wheat Zone	Jowar-Cotton Zone	
	District	District	District	District	District	
Good More than 80			Morena, Bhind		Dewas, Dhar, Shajapur, Ujjain.	6 (13.33)
Fair 70-80	Bilaspur, Bastar, Raipur, Balaghat, Sidhi		Chhindwara, Chhatarpur	Hoshangabad Sehore, Bhopal, Vidisha, Narsinghpur	Jhabua, Indore Rajgarh.	15 (33.34)
Moderate 60- 70	Durg, Rajnandgaon Raigarh, Shahdol	Panna	Gwalior Shivpuri	Raisen	Khargone, Ratlam	10 (22.22)
Poor 50- 60	Surguja	Rewa, Jabalpur, Satna.	Betul, Datia.	Damoh	Khandwa, Mandsaur.	9 (20.00)
Very Poor Below 50	Mandla	Seoni	Tikamgarh, Guna.	Sagar	-	5 (11.11)

District Morena ranked first with the crop adjustment coefficient of 91.72. The other important districts ranking behind Morena were: Bhind (90.09), Dewas (88.18), Dhar (83.55), Shajapur (82.47), Ujjain (80.72), Bilaspur (79.98) and Chhindwara (79.81). The district ranking at the bottom was Guna (39.81) preceded by Seoni (62.89), Sagar (44.33) and Mandla (44.87),

Cropzone wise categorization of districts on the basis of crop adjustment coefficients presented in table 5.32 reveals that:

Six district categorised as good had their crop adjustment coefficient more than 80. Out of these six district two-Morena and Bhind belonged to Jowar-Wheat zone and the rest four-Dewas, Dhar, Shajapur and Ujjain were from Jowar-Cotton zone.

In the second category i.e. fair crop adjustment coefficient ranged between 70-80. Fifteen districts came under this category-5 from ricezone, 2from Jowar-Wheat zone, 5 from Wheat zone and 3 from Jowar-Cotton zone.

In the rice-wheat zone only one i.e. Panna stood as moderate, Rewa, Jabalpur and Satna as Poor and Seoni as very poor.

Five districts categorized as 'very poor' were mandla (rice zone) Seoni (rice-wheat zone), Tikamgarh and Guna (Jowar-Wheat zone) and Sagar (Wheat-zone) Table 5.32.

Table 5.31 Districtwise, Percentage of Crop area covered and crop Adjustment Coefficient.

District	Percentage of crop Area	Crop Adjustment Coefficient	RANK	District	Percentage of crop Area	Crop Adjustment Coefficiet	RANK
Balaghat	81.69	77.39	13	Morena	72.81	91.72	1
Bastar	65.76	78.85	9	Narsinghpur	66.73	71.33	21
Betul	53.99	59.84	33	Panna	86.69	61.48	31
Bhind	72.17	90.09	2	Raigarh	69.64	65.18	27
Bhopal	45.65	72.97	17	Raipur	58.59	77.50	12
Bilaspur	77.77	79.98	7	Raisen	72.29	65.56	26
Chhatarpur	92.72	71.43	20	Rajgarh	70.69	71.53	19
Chhindwara	52.01	79.81	8	Rajnandgaon	65.30	66.91	25
Damoh	81.37	59.71	34	Ratlam	53.94	62.07	29
Datia	83.98	57.48	35	Rewa	77.63	54.29	37
Dewas	71.55	88.18	3	Sagar	71.95	44.33	43
Dhar	63.16	83.55	4	Satna	82.46	52.59	40
Durg	59.48	67.23	24	Sehore	71.28	75.39	15
Guna	62.74	39.81	45	Seoni	62.89	42.17	44
Gwalior	80.97	68.12	23	Shahdol	64.56	61.63	30
Hoshangabad	70.67	78.23	10	Shajapur	73.27	82.47	5
Indore	66.85	73.94	16	Shivpuri	61.02	62.88	28
Jabalpur	79.01	53.93	38	Sidhi	52.45	75.84	14
Jhabua	42.69	78.21	11	Surguja	60.41	53.20	39
Khandwa	78.61	59.95	32	Tikamgarh	57.88	48.72	41
Khargone	69.32	68.57	22	Ujjain	73.70	80.72	6
Mandla	53.31	44.87	42	Vidisha	82.03	71.69	18
Mandsaur	55.82	56.90	36	All M.P.	-	-	-

5.6 G R A M (Cicer arietinum)

5.6.1 Distribution

Another important crop among grains is gram. It coveres as much as 8.84 per-cent of the gross cropped area in the state. The districts growing this crop mainly are: Mandsaur, Vidisha, Bhind, Narsinghpur, Guna, Raisen, Morena and Ujjain. Thus the concentration of this crop is in the central and north-western districts of the state.

5.6.2 Extent of Cultivation

The percentage of gram area to the gross cropped area in the district was highest in Narsinghpur (31.84 per cent) followed by Datia (25.78 per cent), Bhind (22.62 per cent) Chhatarpur (19.92 per cent), Raisen (19.87 per cent), Vidisha (18.99 per cent), Gwalior (16.83 per cent), Indore (16.52 per cent) Bhopal (16.44 per cent), Morena (15.84 per cent) and Mandsaur (15.81 per cent). (Table 5.10)

5.6.3 Relative Share

i) Area

Percentage of gram area in the district to total gram area in the state was highest in Mandsaur (5.84 per cent) followed by Vidisha (5.15 per cent) Guna, (4.85 per cent) Narsinghpur (4.77 per cent) and Jabalpur (4.33 per cent). These five districts shared one fourth of total gram area in the state (Table 5.10)

ii) Output

Relative share in output of gram was highest for Bhind (6.45 per cent) followed by Mandsaur (6.19 per cent) Vidisha (6.11 per cent) and Raisen (5.28 per cent). These four districts together shared 24.03 per cent of the total output of gram (Table 5.10)

5.6.4 Yield Level

Yield of gram was highest in Bhind (774 kg per hectare). Tikamgarh stood second with 713 kg. per hectare followed by Morena (699 kg. per hectare) and Chhatarpur (668 kg. per hect). Betul recorded lowest yield of gram with 291 kg. per hect) preceded by Shahdol, Surguja, Chhindwara and Seoni (Table 5.11)

Table 5.10 Districtwise percentage of Gram area to gross cropped area and relative share of district in area and output of Gram in Madhya Pradesh

S.No.	District	Percentage to gross cropped area		Relative share in M.P.			
				Area		Output	
		Percent	Rank	Percent	Rank	Percent	Rank
1.	Balaghat	1.60	40	0.29	41	0.23	39
2.	Bastar	0.23	45	0.09	45	0.07	42
3.	Betul	2.20	38	0.51	39	0.97	32
4.	Bhind	22.62	3	4.21	7	6.45	1
5.	Bhopal	16.44	9	1.35	33	1.73	24
6.	Bilaspur	3.84	35	2.0	24	1.63	26
7.	Chhatarpur	19.92	4	2.63	14	3.52	8
8.	Chhindwara	6.65	31	1.86	26	1.16	30
9.	Damoh	14.30	15	2.28	19	1.57	27
10.	Datia	25.78	2	1.78	27	1.90	22
11.	Dewas	8.24	28	1.67	28	1.94	21
12.	Dhar	9.92	24	2.97	11	2.84	14
13.	Durg	4.11	34	1.61	29	1.11	31
14.	Guna	15.59	13	4.85	3	3.85	7
15.	Gwalior	16.63	7	2.37	18	1.99	19
16.	Hoshangabad	10.20	22	2.41	17	2.47	17
17.	Indore	16.52	8	2.64	13	2.91	13
18.	Jabalpur	15.69	12	4.33	5	3.51	9
19.	Jhabua	6.91	29	1.38	32	1.39	29
20.	Khandwa	0.57	43	0.38	40	0.43	38
21.	Khargone	1.69	39	0.60	38	0.57	36
22.	Mandla	3.77	36	0.96	35	0.81	35
23.	Mandsaur	15.81	11	5.84	1	6.19	2
24.	Morena	15.84	10	3.51	9	4.79	6
25.	Narsinghpur	31.84	1	4.77	4	4.84	5
26.	Panna	11.95	17	1.46	30	1.46	28
27.	Raigarh	0.60	42	0.17	44	0.14	41
28.	Raipur	0.24	44	0.18	43	0.15	40
29.	Raisen	19.87	5	4.26	6	5.28	4
30.	Rajgarh	9.13	25	2.10	21	1.85	23
31.	Rajnandgaon	4.23	33	1.33	34	-	-
32.	Ratlam	14.66	14	2.83	12	2.71	15
33.	Rewa	10.61	20	2.53	15	1.96	20
34.	Sagar	11.48	19	3.19	10	3.37	11
35.	Satna	0.90	27	1.91	25	-	-
36.	Sehore	11.68	18	2.27	20	2.65	16
37.	Seoni	7.00	30	1.44	31	0.90	34
38.	Shahdol	2.76	37	0.73	37	0.48	37
39.	Shajapur	10.29	21	2.50	16	3.14	12
40.	Shivpuri	9.93	23	2.04	23	2.06	18
41.	Sidhi	9.01	26	2.06	22	1.71	25
42.	Surguja	0.88	41	0.28	42	0.91	33
43.	Tikamgarh	5.85	32	0.84	36	-	-
44.	Ujjain	13.72	16	3.72	8	3.41	10
45.	Vidisha	18.99	6	5.15	2	6.11	3
	All M.P.	9.06	-	100.00	-	100.00	-

5.6.5 Crop Adjustment

The tendency of localization was not very powerful in case of gram. Cultivation of this crop is wide spread and excluding the rice zone districts it was grown in almost every district. The concentration of this crop was visible slightly in the Central and north western districts of this state.

In twelve districts sharing 23.74 per cent of total gram area, the crop of gram was well adjusted and in another sixteen districts sharing 28.66 per cent of area the crop was sufficiently adjusted. Another 32.88 per cent area spread in twelve districts was tolerably adjusted (Table 5.12)

In case of gram crop maladjustment was very little. Only 13.88 per cent area shared by four districts- Gwalior, Guna, Jabalpur and Damoh was maladjusted. All these districts were area dominating maladjusted districts. Only one district i.e. Tikamgarh was highly maladjusted (Table 5.12 and Figure 5.4).

Table 5.11 Districtwise yield of Gram in Madhya Pradesh (three years average, 1977-78 to 1979-80)

Base : M.P.= 100

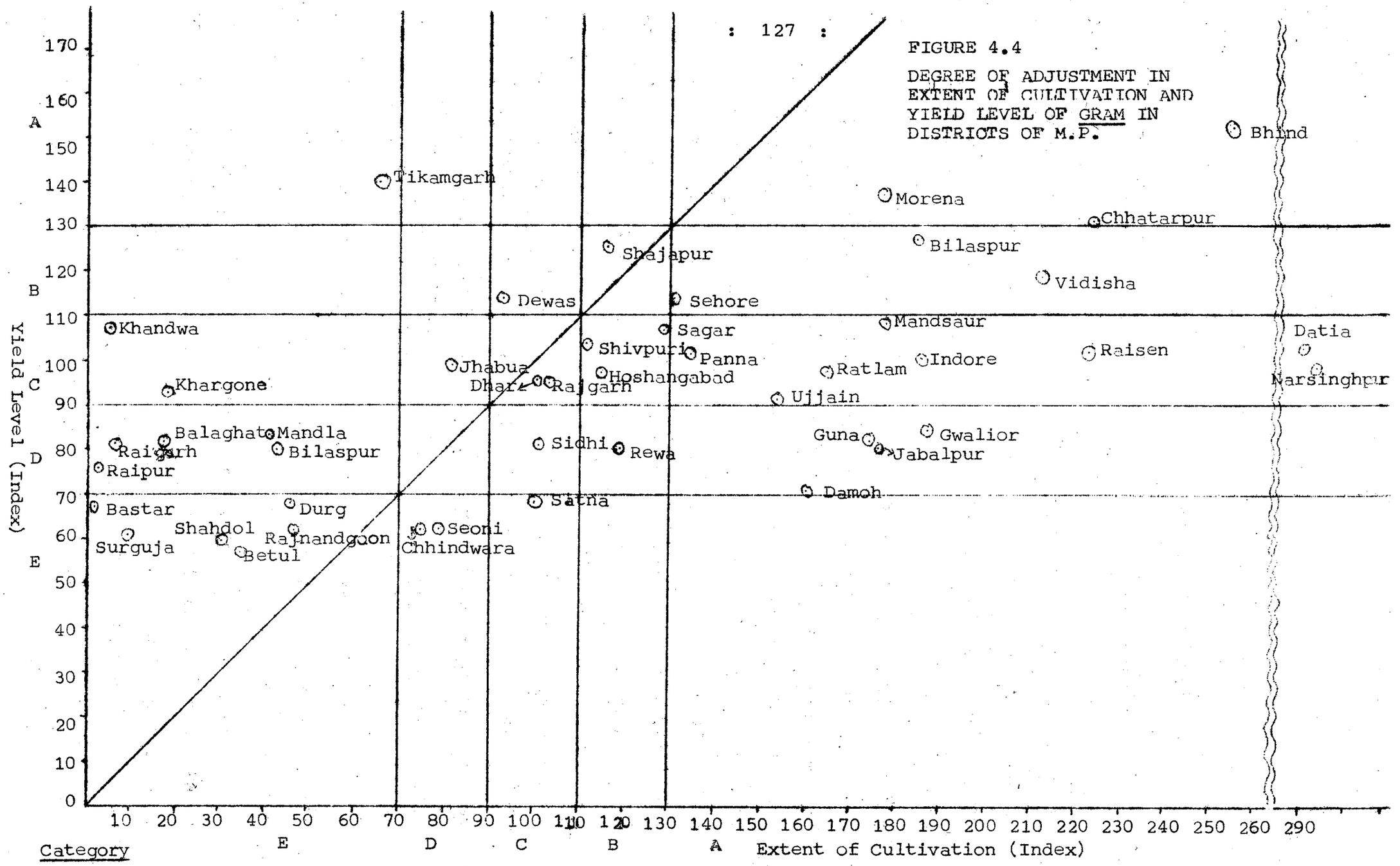
District	Yield kg/Hect	Yield Index	Rank	District	Yield kg/Hect	Yield Index	Rank
Balaghat	417	81.92	30	Morena	699	137.32	3
Bastar	340	66.80	40	Narsinghpur	509	100.00	18
Betul	291	57.17	45	Panna	520	102.15	16
Bhind	774	152.06	1	Raigharh	410	80.75	32
Bhopal	650	127.70	5	Raipur	385	75.64	36
Bilaspur	409	80.35	33	Raisen	571	112.19	10
Chhatarpur	668	131.23	4	Rajgarh	485	95.28	23
Chhindwara	314	61.69	42	Rajnandgaon	315	61.89	38
Damoh	359	70.72	37	Ratlam	495	97.25	22
Datia	520	102.15	17	Rewa	408	80.15	35
Dewas	582	114.34	9	Sagar	549	107.85	13
Dhar	484	95.28	24	Satna	349	68.76	38
Durg	346	67.98	39	Sehore	585	114.93	8
Guna	425	83.49	28	Seoni	315	61.89	41
Gwalior	428	84.08	27	Shahdol	308	60.51	44
Hoshangabad	495	97.25	21	Shajapur	638	125.34	6
Indore	559	109.82	11	Shivpuri	526	103.34	15
Jabalpur	409	80.35	33	Sidhi	415	81.53	31
Jhabua	506	99.41	19	Surguja	312	61.30	43
Khandwa	549	107.86	13	Tikamgarh	713	140.08	2
Khargone	476	93.52	25	Ujjain	465	91.35	26
Mandla	422	82.90	29	Vidisha	603	118.46	7
Mandsaur	552	108.44	12	All M.P.	509	100.00	-

Table 5.12 Classification of Districts in different crop Adjustment categories for Gram.

Category	Yield dominating	Area dominating	Gram Area (Hect.)	%
I Well Adjusted	Shajapur, Rajnand-gaon, Durg, Betul Shahdol, Surguja, Bastar.	Bhind, Chhatarpur Morena, Rajgarh, Dhar	449599	23.74
II Sufficient Adjusted	Dewas, Jhabua, Bilaspur, Mandla, Balaghat, Raigarh, Raipur.	Sagar, Vidisha, Bhopal, Sehore, Hoshangabad, Shivpuri, Sidhi, Seoni, Chhindwara.	542898	28.66
III Tolerably Adjusted	Khargone, Khandwa	Narsinghpur, Datia, Raisen, Indore, Mandsaur, Ratlam, Ujjain, Panna, Rewa, Satna.	622599	32.88
IV Mal Adjusted		Gwalior, Guna, Jabalpur, Damoh	262867	13.88
V Highly Mal Adjusted	Tikamgarh		16000	0.84
Total	17 districts	28 districts	1893963	100.00

FIGURE 4.4

DEGREE OF ADJUSTMENT IN EXTENT OF CULTIVATION AND YIELD LEVEL OF GRAM IN DISTRICTS OF M.P.



5.7 A R H A R (Cajanus cajan)

5.7.1 Distribution

Arhar is grown throughout the tropical area. It is one of the most widely cultivated pulse crops, next in importance to gram. It is mostly grown as a mixed crop in the Jowar and wheat growing tracts. In rice zone this crop is generally grown on binds of the fields.

5.7.2 Extent of Cultivation

The top ranking ten districts where the area of Arhar crop was more than 4.0 per cent of their gross cropped area were- Betul (7.44 per cent), Narsinghpur (6.27 per cent), Hoshangabad (5.87 per cent), Chhindwara (5.41 per cent), Indore (5.24 per cent) Bhind (5.16 per cent), Morena (4.79 per cent), Dewas (4.56 per cent), Datia (4.39 per cent) and Sehore (4.05 per cent). Other six districts where the percentage of Arhar area was inbetween 3.0 to 4.0 per cent were :Gwalior, Satna, Sidhi, Shajapur, Chhatarpur and Khandwa. Shivpuri having lowest percentage of area under Arhar ranked at the bottom, other districts preceding it were Raipur, Bastar, Guna, Raigarh and Tikamgarh (Table 5.13)

5.7.3 Relative Share

i) Area

The five Arhar producing, topmost districts which together shared 25.0 per cent of total Arhar area in the state were Betul (6.66 per cent) Chhindwara (5.83 per cent), Hoshangabad (5.37 per cent), Morena (4.09 per cent) and Khargone (3.52 per cent). Again Shivpuri district ranked lowest, sharing only 0.19 per cent of total Arhar area in the state preceded by Tikamgarh with 0.25 per cent area (Table 5.13)

Table 5.13 Districtwise percentage of Arhar area to gross Cropped area and relative share of district in area and output of Arhar in Madhya Pradesh

S.No.	District	Percentage to gross cropped area		Relative share in M.P.			
				Area		Output	
		Percent	Rank	Percent	Rank	Percent	Rank
1.	Balaghat	0.57	38	0.40	42	0.52	40
2.	Bastar	0.30	43	0.49	40	0.66	38
3.	Betul	7.44	1	6.66	1	4.87	3
4.	Bhind	5.16	6	3.17	12	4.56	5
5.	Bhopal	1.26	29	0.40	4	0.37	42
6.	Bilaspur	0.66	36	1.32	29	1.75	22
7.	Chhatarpur	3.11	15	1.16	31	1.21	29
8.	Chhindwara	5.41	4	5.83	2	4.86	4
9.	Damoh	1.50	27	0.92	34	0.78	36
10.	Datia	4.39	9	1.17	30	0.81	35
11.	Dewas	4.56	8	3.57	7	3.39	10
12.	Dhar	1.78	26	2.03	24	1.69	24
13.	Durg	1.37	28	2.07	23	1.75	23
14.	Guna	0.33	42	0.40	43	0.32	43
15.	Gwalior	3.91	11	2.15	22	1.86	19
16.	Hoshangabad	5.87	3	5.37	3	9.20	1
17.	Indore	5.24	5	3.24	10	3.24	11
18.	Jabalpur	0.53	39	0.56	39	2.14	18
19.	Jhabua	1.89	25	1.34	26	1.03	31
20.	Khandwa	3.00	16	2.84	15	4.09	6
21.	Khargone	2.84	19	3.92	5	2.99	14
22.	Mandla	0.64	37	0.63	38	0.96	32
23.	Mandsaur	1.08	31	1.53	25	1.44	27
24.	Morena	4.79	7	4.09	4	4.04	8
25.	Narsinghpur	6.27	2	3.63	6	5.41	2
26.	Panna	2.80	20	1.32	28	1.26	28
27.	Raigarh	0.38	41	2.23	20	0.69	37
28.	Raipur	0.23	44	0.72	37	0.49	41
29.	Raisen	2.94	17	2.43	18	2.26	16
30.	Rajgarh	2.51	23	2.23	21	1.84	21
31.	Rajnandgaon	2.85	18	3.48	8	4.08	7
32.	Ratlam	1.26	30	0.94	32	0.93	33
33.	Rewa	2.72	21	2.50	17	1.48	26
34.	Sagar	0.85	34	0.92	33	0.91	34
35.	Satna	3.82	12	3.17	11	2.19	17
36.	Sehore	4.05	10	3.02	14	3.07	12
37.	Seoni	1.05	33	0.83	35	1.17	30
38.	Shahdol	2.26	24	2.25	19	1.58	25
39.	Shajapur	3.36	14	3.15	13	3.02	13
40.	Shivpuri	0.19	45	0.15	45	0.12	45
41.	Sidhi	3.82	13	3.36	9	3.74	9
42.	Surguja	1.06	32	1.34	27	1.85	20
43.	Tikamgarh	0.45	40	0.25	44	0.22	44
44.	Ujjain	2.65	22	2.78	16	2.62	15
45.	Vidisha	0.78	35	0.81	36	0.64	39
	All M.P.	7.05	-	100.00	-	100.00	-

ii) Output

Relative share in output of Arhar was highest in Hoshangabad (9.20 per cent) followed by Narsinghpur (5.41 per cent) output share was lowest 0.12 per cent in Shivpuri district preceded by Tikamgarh with 0.22 per cent (Table 5.13).

5.7.4 Yield Level

Average yield of Arhar was highest in Hoshangabad (1049 Kg/Hect) followed by Raigarh (992 Kg/Hect) and Narsinghpur (908 Kg/hect). Fifteen districts exhibited higher yield level than the state. The districts ranking at the bottom in respect of yield of Arhar were : Rewa, Shahdol, Khargone, Satna and Shivpuri (Table 5.14).

5.7.5 Crop Adjustment

Cultivation of Arhar is wide spread with little tendency of localization in some particular region or cropzone.

Eight districts sharing 1985 per cent of total Arhar area in the state were well adjusted in respect to the extent of cultivation and the yield level. These districts were : Damoh, Dhar and Shivpuri (Yield dominating) Narsinghpur, Hoshangabad, Ujjain, Rajnandgaon and Jhabua (area dominating). Nearly fourteen per cent of Arhar area spread in eight districts was sufficiently adjusted. Thirteen districts sharing nearly 33.0 per cent of Arhar area were tolerably adjusted (Table 5.15 and Figure 5.5)

The maladjusted area formed nearly 34.0 per cent. It included 24.73 per cent area spread in 9 districts as maladjusted and 9.32 per cent area spread in in 7 districts as highly maladjusted. These districts were Surguja, Seoni, Bilaspur, Mandla, Jabalpur, Raigarh and Satna (Table 5.15).

Table 5.14 Districtwise Yield of Arhar in Madhya Pradesh
(3 yrs.average 1977-78 to 1979-80)

Base : M.P. 100

District	Yield kg/Hect.	Yield Index	Rank	District	Yield kg/Hect	Yield Index	Rank
Balaghat	784	127.48	10	Morena	606	98.54	19
Bastar	765	124.55	11	Narsinghpur	908	147.80	3
Betul	443	72.03	40	Panna	577	93.82	25
Bhind	753	122.44	12	Raigarh	992	161.30	2
Bhopal	559	91.05	27	Raipur	592	96.26	22
Bilaspur	815	132.52	9	Raisen	599	97.56	20
Chhatarpur	458	74.47	38	Rajgarh	510	82.93	32
Chhindwara	669	108.78	14	Rajnandgaon	696	113.17	13
Damoh	519	84.55	30	Ratlam	588	95.61	23
Datia	471	76.58	36	Rewa	366	59.51	45
Dewas	579	94.15	24	Sagar	612	99.51	16
Dhar	503	81.79	34	Satna	421	68.45	42
Durg	556	90.41	28	Sehore	630	102.44	15
Guna	500	81.30	35	Seoni	831	135.12	6
Gwalior	520	84.55	31	Shahdol	408	66.34	44
Hoshangabad	1049	170.57	1	Shajapur	609	99.02	18
Indore	610	99.19	17	Shivpuri	422	68.62	41
Jabalpur	826	134.47	7	Sidhi	455	73.98	39
Jhabua	464	75.45	37	Surguja	825	134.15	8
Khandwa	876	142.44	5	Tikamgarh	527	85.69	29
Khargone	399	64.93	43	Ujjain	597	97.07	21
Mandla	895	145.69	4	Vidisha	510	82.93	33
Mandsaur	575	93.49	26	All M.P.	615	100.00	-

Table 5.15 Classification of Districts in different Crop Adjustment Categories for Arhar.

Category	Yield dominating	Area dominating	Area (Hect)	%
I Well Adjusted Above 130	Damoh, Dhar, Shivpuri	Narsinghpur, Hoshangabad, Ujjain Rajnandgaon, Jhabua	97033	19.85
II Sufficiently Adjusted 110-130	Khandwa, Durg, Vidisha, Tikamgarh, Guna	Bhind, Panna, Rajgarh	67134	13.73
III Tolebrably Adjusted 90-110	Bhopal, Ratlam, Mandsaur, Sagar, Raipur.	Chhindwara, Indore, Morena, Dewas, Sehore, Shajapur, Raisen, Shahdol	158201	32.37
IV Mal Adjusted 70-90	Balaghat, Bastar	Betul, Datia, Sidhi, Gwalior, Chhatarpur, Khargone, Rewa.	120866	24.73
V Highly Mal Adjusted Below 70	Surguja, Seoni, Bilaspur, Mandla, Jabalpur, Raigarh.	Satna	45534	9.32
Total	21 districts	24 districts	488768	100.00

Table 7.5 Districtwise composite Index of Agricultural Efficiency in Madhya Pradesh.

Base : M.P.=100

District	Composit Index	Rank	District	Composit Index	Rank
Balaghat	120.91	4	Morena	124.29	2
Bastar	94.12	30	Narsinghpur	105.56	10
Betul	77.44	45	Panna	88.25	35
Bhind	104.45	13	Raigarh	99.89	22
Bhopal	101.16	19	Raipur	118.07	5
Bilaspur	122.18	3	Raisen	105.24	11
Chhatarpur	108.21	9	Rajgarh	93.50	31
Chhindwara	85.13	39	Rajnandgaon	93.27	32
Damoh	80.41	43	Ratlam	95.45	28
Datia	96.63	25	Rewa	86.67	37
Dewas	101.39	18	Sagar	100.12	21
Dhar	96.57	26	Satna	84.50	40
Durg	94.90	29	Sehore	95.56	27
Guna	86.49	38	Seoni	98.45	23
Gwalior	130.03	1	Shahdol	77.93	44
Hoshangabad	91.54	33	Shajapur	98.40	24
Indore	112.07	6	Shivpuri	102.39	16
Jabalpur	101.81	17	Sidhi	84.36	41
Jhabua	81.57	42	Surguja	103.21	15
Khandwa	104.74	12	Tikamgarh	108.39	8
Khargone	103.72	14	Ujjain	91.06	34
Mandla	87.50	36	Vidisha	100.31	20
Mandsaur	108.95	7	All M.P.	100.00	-

II. Agricultural Development

7.3 Indicators of Agricultural Development

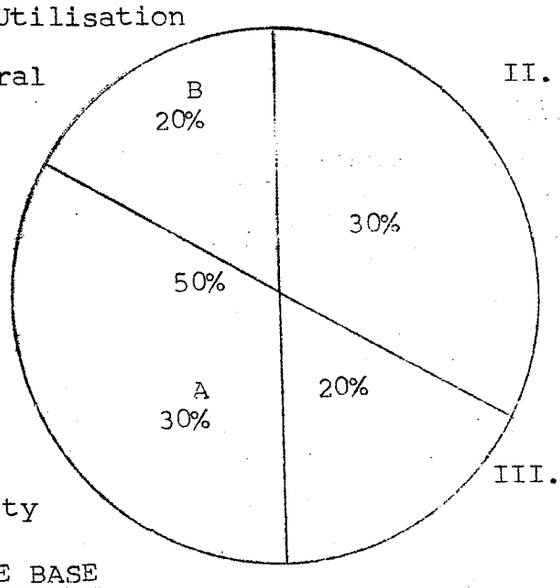
'Development' is a relative concept and there is neither a clear and agreed definition nor a single measure acceptable to all. In order to develop a quantitive measure of development one has to rely on some approximations and indirect measures. Here, the scope of this study has been confined to agricultural development only and therefore where ever the word development has been used it implies material improvement in agriculture which can be identified with the increase in the availability and utilisation of resources, modernisation of input and techniques and increase in the infrastructural facilities. Any change for betterment in these parameters indicates development.

In order to study and compare the agricultural development of the districts of Madhya Pradesh an attempt has been made to construct a composite index of development for each district. The selected indicators used to assess the level of development have been divided into three categories viz.

1. Agricultural Resource Base- Its availability and utilisation
2. Adoption of New Technology in agriculture
3. Agricultural Infra-structure

It is assumed that better resource base greater use of new technology and good infra-structure facilities contribute to greater agricultural development of particular area. These three categories incorporate all the major factors which influence agriculture development. A number of indicators which were found measureable and relevant data on them was also available were selected under each category.

B. Resource Utilisation



I. RESOURCE BASE

1. Land

a) Percentage of total cultivable land to total geographical area.

b) Per capita (Rural Population) cultivable land(in hectares).

c) Per capita (Rural Population) net area sown (in hectares)

2. Size of Holdings

a) Percentage of the operational holdings of 2 hectares or more (5 acres or more) to total number of operational holdings.

b) Percentage of the area of land under holdings of 2 hectares of more (5 acres or more) to total area of all holdings.

3. Rainfall

a) Average annual rainfall in m.m.

b) Coefficient of Variation in Rainfall.

4. Soil Fertility

a) Fertility index of soils

b) Nutrient status of soils

5. Agricultural population

Percentage of cultivators to total agricultural workers.

6. Animal Power

Number of brought animal pairs per thousand hectares of net area sown.

7. (A) Irrigation

a) Percentage of net irrigated area to net area sown.

b) Percentage of gross irrigated area to gross cropped area.

(B) Resource Utilisation

1. Land Use

a) Percentage of cultivated area to total cultivable land

b) Percentage of net area sown to total cultivated area.

c) Percentage of double cropped area to net area sown.

2. Ground Water and Irrigation Potential

a) Percentage of existing wells to total number of wells possible on the basis of ground water potential.

b) Percentage of Irrigation potential utilised to total potential created under Plan and Pre-plan Schemes.

3. Cropping Pattern

a) Percentage of total cropped area under major crops to gross cropped area.

b) Percentage of area under cash crops to gross cropped area.

II. ADOPTION OF IMPROVED TECHNOLOGY

(A) Resource Development

1. Land Improvement

Percentage of area brought under soil conservation programme (up to V Five year plan) to total area requiring soil conservation measures.

2. Irrigation Potential Created

Percentage of area for which irrigation potential was created (under plan and Pre-Plan Schemes) to total cultivated area.

(B) Adoption of Improved Practices

1. Percentage of area under High yielding varieties to total area of the crops (Only HYV crops)

2. Average consumption of fertilizers per unit of croped area (Kg/hect.)

C. Mechanisation in Agriculture

1. Use of Electrical Power

a) Percentage of electricity consumption for irrigation to total rural consumption of electrical energy.

b) Percentage of electric consumers for irrigation to total number of rural electric consumers.

2. Use of Mechinery

a) Number of tractors per thousand hectares of total cultivated area

b) Number of Electric Pumps per thousand hectares of net area irrigated.

c) Number of oil engine pumps per thousand hectares of net area irrigated.

3. Use of Improved Implements and Equipment

a) Number of Iron ploughs per thousand hectares of total cultivated area

b) Number of bullock cart per thousand hectares of total cultivated area

III. INFRA-STRUCTURE

1. Communication

a) Road length per hundred square kilometres of Area.

b) Road length (in Kms.) per lakh of population (1971)

2. Rural Electrification

a) Percentage of villages electrified to total number of inhabited villages.

b) Percentage of rural electric consumers to total number of electric consumers.

c) Percentage of rural consumption of Electricity to total Electric consumption.

3. Rural Literacy

Percentage of literates to total rural population(1981)

4. Rural Credit

a) Average cooperative credit advanced per cultivator
b) Per capita outstanding credit of scheduled Commercial Banks.

5. Agricultural Marketing

Percentage of total arrivals of principal commodities to the total production.

6. Storage and Ware housing

Percentage of total godown capacity available to total food grains production.

7. Veterinary Services

Number of veterinary hospitals and dispensaries available per lakh of bovine population.

AGRICULTURAL RESOURCE BASE

7.3.1 Indicators of Resource Base

A resource is a highly relative concept changing with the ends-means scheme i.e., with the objective of its planning, with the state of technology and with the existing social institutions. It follows that resources, their scarcity, their depletion and their conservation are concepts of the social sciences. According to common usage, one may differentiate three broad classes of resources: natural cultural and human. In principle all the three categories of resources are of equal interest for economic analysis. Here attempt has been made to incorporate all possible indicators representing natural, cultural and human rescurces related with agriculture.

A Agricultural resource base is considered fundamental as it provides a base for further agricultural development. Fifty per cent of the agricultural development has been attributed to this category. It has been further divided into two subcategories i.e.

A. Resource Availability (30%)

B. Resource Utilisation (20%)

In all 20 indicators of resource base-13 under resource availability and 7 under resource utilisation were selected.

A.	Resource Availability	3.00
1.	Land	0.70
a)	Percentage of total cultivable land to total Geographical Area.	0.40
b)	Per capita (Rural population) cultivable land (in hectares).	0.15
c)	Per capita (Rural population) net area sown (in hectares)	0.15
2.	Size of Holdings	0.30
a)	Percentage of the operational holdings of 2 hectares of more (5 acres or more) to total number of operational holdings	0.15
b)	Percentage of the area of land under holdings of 2 hectares or more (5 acres or more) to total area of all holdings.	0.15
3.	Rainfall	0.55
a)	Average annual rainfall in m.m.	0.25
b)	Coefficient of Variation in Rainfall	0.30
4.	Soil Fertility	0.55
a)	Fertility index of soils	0.30
b)	Nutrient status of soils	0.25
5.	Agricultural population	0.20
	Percentage of cultivators to total agricultural of net area sown.	0.20
6.	Animal Power	
	Number of draught animal pairs per thousand hectares of net area sown.	0.20
7.	Irrigation	0.50
a)	Percentage of net irrigated area to net area sown.	0.25
b)	Percentage of gross irrigated area to gross cropped area.	0.25

1. Land

a) Percentage of cultivable land to total geographical area

Cultivable land includes net area sown fallow land and the culturable waste land. It is the availability of cultivable land which mainly determines the extent of agricultural activities in a particular area. It also limits the scope of further expansion in net area sown.

Here, the percentage of total cultivable land to total geographical area has been taken as an indicator of available agricultural resource base. Higher the percentage better the availability. Weight given to this indicator is 0.4.

Categorisation of Districts on the basis of indices for percentage of total cultivable land to total Geographical Area

Base M.P. = 100

Category	Index Range	No.of Distt.	Name of Districts
Good	More than 130	11	Ujjain, Bhind, Datia, Vidisha, Ratlam, Shajapur, Durg, Indore, Rajgarh, Rewa, Dhar.
Fair	110-130	11	Guna, Bhopal, Chhatarpur, Narsinghpur, Mandsaur, Sehore, Satna, Jabalpur, Tikamgarh, Gwalior, Sagar.
Moderate	90-110	14	Shivpuri, Seoni, Raisen, Dewas, Hoshangabad, Rajnandgaon, Chhindwara, Betul, Khargone, Raipur, Raigarh, Bilaspur, Damoh, Khandwa.
Poor	70-90	7	Mandla, Panna, Shahdol, Morena, Jhabua, Sidhi, Balaghat.
Very Poor	Below 70	2	Surguja, Bastar.

Table 7.6 Districtwise Percentage of total cultivable, Land to total Geographical Area in M.P.

(For Weighted Index) Base:M.P.=100; Weight= 0.4

District	Percentage	Weighted Index	RANK	District	Percentage	Weighted Index	RANK
Balaghat	36.34	28.81	43	Morena	43.04	34.12	40
Bastar	26.39	20.92	45	Narsinghpur	61.58	48.82	15
Betul	50.20	39.80	30	Panna	44.50	35.28	38
Bhind	79.28	62.85	2	Raigarh	47.31	37.51	33
Bhopal	62.05	49.19	13	Raipur	49.04	38.88	32
Bilaspur	46.75	37.07	34	Raisen	52.16	41.35	25
Chhatarpur	62.02	49.17	14	Rajgarh	69.25	54.90	9
Chhindwara	50.89	40.35	29	Rajnandgaon	51.08	40.50	28
Damoh	45.99	36.46	35	Ratlam	73.43	58.22	5
Datia	75.02	59.48	3	Rewa	67.80	53.75	10
Dewas	51.61	40.92	26	Sagar	55.66	44.13	22
Dhar	65.28	51.75	11	Satna	58.88	46.68	18
Durg	70.89	56.21	7	Sehore	59.79	47.40	17
Guna	64.65	51.26	12	Seoni	54.01	42.82	24
Gwalior	56.50	44.79	21	Shahdol	44.22	35.06	39
Hoshangabad	51.15	40.55	27	Shajapur	73.06	57.93	6
Indore	70.21	55.67	8	Shivpuri	54.67	43.34	23
Jabalpur	58.32	46.24	19	Sidhi	41.88	33.20	42
Jhabua	42.41	33.62	41	Surguja	31.86	25.26	44
Khandwa	45.93	36.41	36	Tikamgarh	58.03	46.01	20
Khargone	49.65	39.36	31	Ujjain	79.34	62.90	1
Mandla	44.90	35.60	37	Vidisha	73.66	58.40	4
Mandsaur	61.46	48.73	16	All M.P.	50.45	40.00	-

Note :- Cultivable land includes- Net Area Sown, Fallow and Culturable waste land.

Percentage derived on three years average data (1977-78 to 1979-80).

1. b) Percapita Cultivable land (on rural population)

Per capita cultivable land has been calculated on rural population of 1981. Weight assigned to this indicator is 0.15.

The availability of cultivable land per capita varied from 0.32 hectares in Balaghat district to 0.83 hectares in Guna district. Over all state average was 0.54 hectares. In thirty districtsthe per capita land was above the state average and in the remaining 15 districts it was less than 0.54 hectares (Table 7.7).

Categorisation of districts on the basis of Indices for cultivable land per capita (Rural Population)

Base M.P.= 100

Category	Index Range	No.of Distt.	Name of Districts
Good	More than 130	5	Guna, Vidisha, Bhopal, Shivpuri, Chhatarpur
Fair	110-130	16	Ujjain, Raisen, Sehore, Hoshangabad, Ratlam, Betul, Panna, Seoni, Shajapur, Raigarh, Datia, Mandla, Chhindwara, Sagar, Bastar, Gwalior.
Moderate	90-110	13	Mandsaur, Dhar, Narsinghpur, Indore, Dewas, Rajnandgaon, Shahdol, Khandwa, Damoh, Jhabua, Jabalpur, Durg, Khargone.
Poor	70-90	9	Surguja, Raigarh, Tikamgarh, Morena, Sidhi, Satna, Bhind, Raipur, Rewa.
Very poor	Below 70	2	Bilaspur, Balaghat

Table 7.7 Districtwise Per capita (Rural Population) Cultivable Land in M.P. (Area in Hectare)

(For weighted Index: Base M.P.=100, weight 0.15)

District	Land Per Capita Hect.	Weighted Index	RANK	District	Land Per Capita Hect.	Weighted Index	RANK
Balaghat	0.32	9.00	45	Morena	0.45	12.50	38
Bastar	0.60	16.66	20	Narsinghpur	0.56	15.55	24
Betul	0.65	18.05	11	Panna	0.63	17.49	12
Bhind	0.44	12.22	41	Raigarh	0.46	12.78	36
Bhopal	0.79	21.94	3	Raipur	0.41	11.39	42
Bilaspur	0.36	9.91	44	Raisen	0.69	19.17	7
Chhatarpur	0.71	19.72	5	Rajgarh	0.63	17.49	15
Chhindwara	0.61	16.94	18	Rajnandgaon	0.55	15.28	27
Damoh	0.54	15.00	30	Ratlam	0.66	18.33	10
Datia	0.61	16.94	16	Rewa	0.41	11.39	43
Dewas	0.56	15.55	26	Sagar	0.61	16.94	19
Dhar	0.58	16.11	23	Satna	0.45	12.50	40
Durg	0.48	13.33	33	Sehore	0.68	18.88	8
Guna	0.83	23.05	1	Seoni	0.63	17.49	13
Gwalior	0.59	16.38	21	Shahdol	0.55	15.28	28
Hoshangabad	0.68	18.88	9	Shajapur	0.63	17.49	14
Indore	0.56	15.55	25	Shivpuri	0.74	20.55	4
Jabalpur	0.50	13.89	32	Sidhi	0.45	12.50	39
Jhabua	0.51	14.17	31	Surguja	0.47	13.05	35
Khandwa	0.55	15.28	29	Tikamgarh	0.45	12.50	37
Khargone	0.48	13.33	34	Ujjain	0.69	19.17	6
Mandla	0.61	16.94	17	Vidisha	0.83	23.05	2
Mandsaur	0.58	16.11	22	All M.P.	0.54	15.00	-

Note : Land per capita calculated on Rural Population of 1981.

1. (c) Per capita net area sown (rural population)

Per capita net area sown has been calculated for each district on three years average (i.e. 1977-78 to 1979-80) data of net area sown divided by the total rural population of 1981. It ranged from 0.26 hectares in Balaghat to 0.77 hectares in Vidisha district. Weight assigned to this indicator is 0.15.

Per capita net area sown for rural population in the state was 0.45 hectares. In 25 districts it was more than the state average of 0.45 hectares and in the remaining 20 districts it was less. (Table 7.8).

Categorisation of Districts on the basis of Indices for Per Capita Net Area Sown (Rural Population)

Base M.P.= 100

Category	Index Range	No.of Distt.	Name of Districts
Good	More than 130	7	Vidisha, Bhopal, Guna, Ujjain, Raisen, Sehore, Hoshangabad,
Fair	110-130	14	Shajapur, Rajgarh, Ratlam, Dewas, Indore, Dhar, Sagar, Khandwa, Mandsaur, Gwalior, Betul, Datia, Seoni, Chhindwara.
Moderate	90-110	13	Narsinghpur, Rajnandgaon, Jhabua, Shivpuri, Bastar, Khargone, Chhatarpur, Durg, Damoh, Mandla, Bhind, Panna, Shahdol.
Poor	70-90	10	Raigarh, Surguja, Jabalpur, Raipur, Rewa, Satna, Sidhi, Tikamgarh, Morena, Bilaspur-
Very Poor	Below 70	1	Balaghat

Table 7.8 Districtwise Per Capita (Rural Population) Net Area Sown in M.P. (Area in Hectare)

(For Weighted Index: Base: M.P.=100, Weight= 0.15)

District	Percentage	Weighted Index	RANK	District	Percentage	Weighted Index	RANK
Balaghat	0.26	8.66	45	Morena	0.33	10.99	43
Bastar	0.44	14.66	26	Narsinghpur	0.48	15.99	22
Betul	0.50	16.66	18	Panna	0.41	13.66	33
Bhind	0.41	13.66	32	Raigarh	0.39	12.99	35
Bhopal	0.71	23.66	2	Raipur	0.36	11.99	38
Bilaspur	0.32	10.66	44	Raisen	0.63	21.00	5
Chhatarpur	0.44	14.66	28	Rajgarh	0.56	18.66	9
Chhindwara	0.49	16.33	21	Rajnandgaon	0.48	15.99	23
Damoh	0.43	14.33	30	Ratlam	0.55	18.33	10
Datia	0.50	16.66	19	Rewa	0.35	11.66	39
Dewas	0.54	17.99	11	Sagar	0.53	17.66	14
Dhar	0.53	17.66	13	Satna	0.35	11.66	40
Durg	0.43	14.33	29	Sehore	0.61	20.33	6
Guna	0.66	22.00	3	Seoni	0.49	16.33	20
Gwalior	0.50	16.66	17	Shahdol	0.40	13.33	34
Hoshangabad	0.58	19.33	7	Shajapur	0.57	18.99	8
Indore	0.54	17.99	12	Shivpuri	0.46	15.33	25
Jabalpur	0.37	12.33	37	Sidhi	0.34	11.33	41
Jhabua	0.46	15.33	24	Surguja	0.37	12.33	36
Khandwa	0.52	17.33	15	Tikamgarh	0.34	11.33	42
Khargone	0.44	14.66	27	Ujjain	0.65	21.66	4
Mandla	0.42	13.99	31	Vidisha	0.77	25.66	1
Mandsaur	0.51	16.99	16	All M.P.	0.45	15.00	-

Note :- Land per capita calculated on Rural Population of 1981.

2. Size of holdings

Variation among farms results from a vide range of physical economic and cultural factors, all of which affect resource use. These in turn affect the present level of productivity of resources as well as the acceptability and response to innovation. Such variability is both descriptively interesting and analytically important. The fact of variability conditions response to programmes, the nature of the planning process and the administrative procedures suitable to agricultural development.

Taking into consideration the classification given in the 'All India Report on Agricultural Census 1970-71' (i.e. marginal, (below 1 hectare), Small (1.0-2.0 hectare), Semi-medium(2.0-4.0), Medium (4.0-10.0) and Large holdings (10 hectares and above), it has been assumed that marginal and small holdings being uneconomic their abundance would affect the development process adversely.

2. (a) Percentage of operational holdings of 2 hectares or more

Considering that holdings of 2 hectares or more would be economicly viable, higher their percentage better possibility of development would be there. Weight given to this indicator is 0.15.

The percentage of such holdings which were of 2 hectares or more, varied from 26.7 per cent in Bilaspur to 76.7 per cent in Sehore. Twenty Seven districts had more than 50 per cent holdings were above the small farmers category of one to two hectares (Table 7.9).

The Economics of Agricultural Development' by John W. Mellor, p.133.

Table 7.9 Districtwise Percentage of the Operational Holdings of Two Hectares or More (5 Acres or more) to total Number of operational Holdings.

(For Weighted Index: Base: M.P.=100, Weight= 0.15

District	Percentage	Weighted Index	RANK	District	Percentage	Weighted Index	RANK
Balaghat	30.4	9.23	44	Morena	44.9	13.63	34
Bastar	62.4	18.95	12	Narsinghpur	53.5	16.24	24
Betul	59.6	18.09	18	Panna	48.9	14.85	28
Bhind	45.2	13.72	33	Raigarh	45.5	13.81	32
Bhopal	75.4	22.89	4	Raipur	35.9	10.90	43
Bilaspur	26.7	8.11	45	Raisen	75.8	23.02	2
Chhatarpur	50.3	15.27	26	Rajgarh	61.7	18.73	15
Chhindwara	60.0	18.22	17	Rajnandgaon	50.2	15.24	27
Damoh	44.5	13.51	35	Ratlam	59.0	17.91	19
Datia	56.9	17.28	21	Rewa	40.3	12.23	38
Dewas	71.0	21.56	7	Sagar	48.1	14.60	29
Dhar	68.8	20.89	9	Satna	39.3	11.93	39
Durg	37.1	11.26	41	Sehore	76.7	23.29	1
Guna	62.1	18.85	14	Seoni	56.2	17.06	23
Gwalior	47.7	14.48	31	Shahdol	42.1	12.78	36
Hoshangabad	66.6	20.22	11	Shajapur	61.0	18.52	16
Indore	69.4	21.07	8	Shivpuri	57.0	17.31	20
Jabalpur	36.3	11.02	42	Sidhi	41.6	12.63	37
Jhabua	62.4	18.95	13	Surguja	48.1	14.60	30
Khandwa	72.1	21.89	6	Tikamgarh	37.3	11.32	40
Khargone	75.8	23.01	3	Ujjain	68.3	20.74	10
Mandla	53.0	16.09	25	Vidisha	74.6	22.65	5
Mandsaur	56.6	17.19	22	All M.P.	49.4	15.00	-

Source: Agricultural Census 1976-77

Categorisation of Districts on the basis of Indices for Percentage of Operational Holdings of two hectares or more.

Base M.P.= 100

Category	Index Range	No of Distt.	Name of Districts
Good	More than 130	11	Sehore, Raisen, Khargone, Bhopal, Vidisha, Khandwa, Dewas, Indore, Dhar, Ujjain, Hoshangabad.
Fair	110-130	12	Bastar, Jhabua, Guna, Rajgarh, Shajapur, Chhindwara, Betul, Ratlam, Shivpuri, Datia, Mandsaur, Seoni.
Moderate	90-110	12	Narsinghpur, Mandla, Chhatarpur, Rajnandgaon, Panna, Sagar, Surguja, Gwalior, Raigarh, Bhind, Morena, Damoh.
Poor	70-90	8	Shahdol, Sidhi, Rewa, Satna, Tikamgarh, Durg, Jabalpur, Raipur.
Very Poor	Below 70	2	Balaghat, Bilaspur.

2 (b) Percentage of land area under holdings of 2 hectares or more

Here again it has been assumed that higher the percentage of area (under holdings of 2 hectares and more) greater the possibility of development. Weight assigned to this indicator is also 0.15.

Categorisation of Districts on the basis of Indices for Percentage of Area under Holdings of two hectares or more.

Base M.P.= 100

Category	Index Range	No.of Distt.	Name of Districts
Good	More than 130	Nil	--
Fair	110-130	1	Sehore
Moderate	90-110	41	Vidisha, Raisen, Bhopal, Dewas, Khargone, Indore, Hoshangabad, Khandwa, Ujjain, Dhar, Betul, Bastar, Shajapur, Seoni, Rajgarh, Guna, Chhindwara, Mandlad, Jhabua, Gwalior, Ratlam, Narsinghpur, Datia, Shivpuri, Mandsaur, Rewa, Sagar, Rajnandgaon, Damoh, Sidhi, Panna, Raigarh, Chhatarpur, Surguja, Shahdol, Satna, Bhind, Durg, Jabalpur, Morena, Raipur.
Poor	70-90	3	Balaghat, Tikamgarh, Bilaspur.
Very Poor	Below 70	Nil	--

Table 7.10 Districtwise Percentage of Area: under Holdings of Two Hectares or More (5 acres or more) to Total Area of All Holdings.

(For Weighted Index: Base: M.P.=100; Weight= 0.15)

District	Percentage	Weighted Index	RANK	District	Percentage	Weighted Index	RANK
Balaghat	75.7	12.82	43	Morena	80.1	13.56	41
Bastar	93.3	15.79	13	Narsinghpur	88.9	15.05	23
Betul	93.6	15.85	12	Panna	87.0	14.73	32
Bhind	82.4	13.95	38	Raigarh	86.7	14.68	33
Bhopal	96.6	16.35	4	Raipur	79.9	13.53	42
Bilaspur	73.6	12.46	45	Raisen	96.8	16.38	3
Chhatarpur	86.3	14.61	34	Rajgarh	92.3	15.62	16
Chhindwara	91.5	15.49	18	Rajnandgaon	87.4	14.80	29
Damoh	87.1	14.75	30	Ratlam	89.8	15.20	22
Datia	88.9	15.05	24	Rewa	88.1	14.91	27
Dewas	96.1	16.27	5	Sagar	87.7	14.85	28
Dhar	94.3	15.96	11	Satna	84.3	14.27	37
Durg	81.9	13.86	39	Sehore	97.2	16.45	1
Guna	92.0	15.57	17	Seoni	92.4	15.64	15
Gwalior	90.0	15.24	21	Shahdol	85.9	14.54	36
Hoshangabad	94.8	16.05	8	Shajapur	92.9	15.73	14
Indore	95.3	16.13	7	Shivpuri	88.7	15.02	25
Jabalpur	80.6	13.64	40	Sidhi	87.1	14.75	31
Jhabua	91.0	15.41	20	Surguja	86.0	14.56	35
Khandwa	94.7	16.03	9	Tikamgarh	75.6	12.80	44
Khargone	95.6	16.18	6	Ujjain	94.7	16.03	10
Mandla	91.1	15.42	19	Vidisha	96.8	16.38	2
Mandsaur	88.2	14.93	26	All M.P.	88.6	15.00	-

Source : Agricultural Census 1976-77.

3. Rainfall

Rainfall has been taken as an indicator under resource base. It has been divided into two sub-heads i.e. (a) total rainfall (b) Coefficient of variation in rainfall.

3 (a) Total annual rainfall

Twenty four years average of annual rainfall in the districts has been used here. Considering the range of 1000 mm.to 1500 mm. (i.e.40" to 60") annual rainfall as optimum-suitable for growing most of the crops in the state as many as 28 districts were with in this range. Only 17 districts were below the average of 1000 mm. rainfall in a year.

Weight assigned to this indicator is 0.25, however, different weight within the limit of 0.25, has been assigned for different levels of rainfall. The sliding scale used for this purpose is as given below :

Annual rainfall	Weight assigned
Below 1000 mm.	0.08
1000 mm. to 1225 mm.	0.17
1225 mm. to 1500 mm.	0.22
1500 mm. and above	0.25

The top ranking five districts according to the weighted index of rainfall were Balaghat, Raigarh, Bastar, Surguja and Mandla. The district ranking at the bottom was Khargone preceeded by Datia, Jhabua, Morena and Bhind. (Table 7.11).

Table 7.16 Districtwise Number of Draught Animal Pairs: per thousand hectares of Net Area Sown.

(For weighted Index, Base: M.P.=100, Weight = 0.20)

District	No.of pairs per'000 Hect.	Weighted Index	RANK	District	No.of pairs per'000 hect.	Weighted Index	RANK
Balaghat	455	31.82	3	Morena	309	21.61	19
Bastar	343	23.98	15	Narsinghpur	175	12.23	40
Betul	273	19.09	20	Panna	422	29.51	8
Bhind	176	12.31	39	Raigarh	407	28.46	10
Bhopal	180	12.58	37	Raipur	361	25.24	14
Bilaspur	381	26.64	12	Raisen	183	12.79	36
Chhatarpur	397	27.76	11	Rajgarh	179	12.52	38
Chhindwara	261	18.25	22	Rajnandgaon	337	23.57	16
Damoh	270	18.88	21	Ratlam	170	11.89	42
Datia	219	15.31	29	Rewa	424	29.65	7
Dewas	187	13.07	35	Sagar	226	15.80	28
Dhar	195	13.64	33	Satna	426	29.79	6
Durg	254	17.76	23	Sehore	232	16.22	26
Guna	233	16.29	25	Seoni	242	16.92	24
Gwalior	230	16.08	27	Shahdol	447	31.26	4
Hoshangabad	209	14.61	30	Shajapur	154	10.77	43
Indore	144	10.07	44	Shivpuri	364	25.45	13
Jabalpur	336	23.49	17	Sidhi	437	30.55	5
Jhabua	311	21.75	18	Surguja	469	32.80	1
Khandwa	189	13.21	34	Tikamgarh	464	32.44	2
Khargone	205	14.33	31	Ujjain	125	8.74	45
Mandla	408	28.53	9	Vidisha	198	13.84	32
Mandsaur	173	12.09	41	All M.P.	286	20.00	--

Source of Data used- Commissioner of Land Records, Madhya Pradesh.

7. Irrigation

Madhya Pradesh lags much behind the all India 26.56 per cent of net irrigated area to net area sown. Here only 12.28 per cent of net area sown is irrigated as against this Punjab has 78.09 per cent and Tamil Nadu 45.96 per cent Haryana 52.55 per cent Uttar Pradesh 50.86 per cent.

For the comparison of irrigational status of different districts, two indicators have been used here.

7. (a) Percentage of net irrigated area to net area sown

It varied from 1.3 per cent in Bastar district to 44.2 per cent in Morena district. Sixteen districts were above the state average of 11.6 per cent. Thirteen districts were having less than 5.0 per cent net irrigated area (Table 7.17).

Categorisation of Districts on the basis of Indices for Percentage of Net Irrigated Area to Net Area Sown.

Base M.P.= 100

Category	Index Range	No.of Distt.	Name of Districts
Good	More than 130	12	Morena, Balaghat, Tikamgarh, Raipur, Durg, Gwalior, Bhind, Datia, Chhatarpur, Shivpuri, Indore, Bilaspur.
Fair	110-130	3	Khargone, Mandsaur, Hoshangabad.
Moderate	90-110	4	Dhar, Betul, Dewas, Khandwa.
Poor	70-90	6	Chhindwara, Narsinghpur, Rajnandgaon, Ratlam, Ujjain, Shajapur.
Very Poor	Below 70	20	Sehore, Seoni, Bhopal, Jhabua, Panna, Jabalpur, Rajgarh, Rewa, Damoh, Raigarh, Satna, Sagar, Guna, Sidhi, Raisen, Surguja, Vidisha, Mandla, Shahdol, Bastar.

Table 7.11 Districtwise Average Annual Rainfall (in mm.) in M.P.

(Three years Average i.e. 1977-78 to 1979-80)

(For Weighted Index : Base: M.P.=100, Weight= 0.25)

District	Rain-fall (mm.)	Weighted Index	RANK	District	Rain-fall (mm.)	Weighted Index	RANK
Balaghat	1463	32.18	1	Morena	821	7.14	42
Bastar	1412	31.06	3	Narsinghpur	1259	27.70	11
Betul	1078	18.33	23	Panna	1145	25.19	19
Bhind	826	7.18	41	Raigarh	1438	31.64	2
Bhopal	1270	27.94	9	Raipur	1219	26.82	13
Bilaspur	1278	28.11	8	Raisen	1155	25.41	18
Chhatarpur	981	12.75	29	Rajgarh	949	12.34	34
Chhindwara	1047	17.80	26	Rajnandgaon	1185	26.07	17
Damoh	1231	27.08	12	Ratlam	932	12.12	37
Datia	764	6.65	44	Rewa	1062	18.05	25
Dewas	1100	18.70	22	Sagar	1285	28.27	6
Dhar	905	11.76	38	Satna	1015	17.25	28
Durg	1186	26.09	16	Sehore	1280	28.16	7
Guna	970	12.61	32	Seoni	1193	26.25	15
Gwalior	899	11.68	39	Shahdol	1109	18.85	21
Hoshangabad	1269	27.92	10	Shajapur	960	12.48	33
Indore	975	12.67	31	Shivpuri	829	7.21	40
Jabalpur	1205	26.51	14	Sidhi	1074	18.26	24
Jhabua	821	7.14	43	Surguja	1336	29.39	4
Khandwa	941	12.23	35	Tikamgarh	1017	17.29	27
Khargone	750	6.52	45	Ujjain	977	12.70	30
Mandla	1333	29.33	5	Vidisha	1139	25.06	20
Mandsaur	932	12.12	36	All M.P.	1135	25.00	-

3 (b) Coefficient of variation in rainfall

It is the second indicator included under the rainfall characteristics. It has been assigned a weight of 0.30. The weighted index has been calculated after substracting the coefficient of variation from 100 as it is inversely related with the agricultural development. Higher the coefficient of variation lower the consistency in annual rainfall and lower the coefficient greater the consistency.

The coefficient of variation in rainfall has been calculated on 24 years rainfall data (1956-57 to 1979-80). Coefficient of variation for the state as a whole was 19.50 per cent and it varied from 45.90 per cent in Bhind to 13.70 per cent in Bastar district (Table 7.12)

Categorisation of Districts on the basis of Indices for Coefficient of Variation in Rainfall

Base M.P.= 100

Category	Index Range	No.of Distt.	Name of Districts
Good	Below 70	Nil	-
Fair	70-90	2	Bastar, Shahdol
Moderate	90-110	3	Sehore, Bhopal, Balaghat.
Poor	110-130	9	Chhindwara, Durg, Rajnandgaon, Bilaspur, Tikamgarh, Chhatarpur, Mandla, Seoni, Surguja.
Very Poor	More than 130	31	Raipur, Damoh, Rajgarh, Mandsaur, Sagar, Raisen, Sidhi, Shivpuri, Gwalior, Datia, Rewa, Khandwa, Satna, Narsinghpur, Vidisha, Guna, Raigarh, Betul, Jabalpur, Dewas, Dhar, Panna, Shajapur, Ratlam, Ujjain, Khargone, Jhabua, Indore, Morena, Hoshangabad, Bhind.