# Dynamics of Lentil Production in Major Producing Districts of Madhya Pradesh

**THESIS**

***Submitted to the***

**Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur**
**in Partial Fulfillment of the Requirements for the Degree of**

## MASTER OF SCIENCE

***In***

## AGRICULTURE

**(AGRICULTURAL ECONOMICS AND FARM MANAGEMENT)**

***By***


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**2013**

# CERTIFICATE – I

This is to certify that the thesis entitled ***"Dynamics of Lentil Production in Major Producing Districts of Madhya Pradesh"*** submitted in partial fulfillment of the requirement for the degree of **MASTER OF SCIENCE** in Agriculture of Jawaharlal Nehru Krishi Vishwa Vidhyalaya, Jabalpur is a record of the confide research work carried out by **Ms. SWATI YADAV** under my guidance and supervision. The subject of the thesis has been approved by the students Advisory Committee and the Director of Instruction.

No part of the thesis has been submitted for any other degree or diploma (Certificate awarded etc.) or has been published / published part has been fully acknowledged. All the assistance and help received during the course of the investigation has been acknowledged by her.

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**(Dr. S.K. Gupta)**
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# CERTIFICATE – II

This is to certify that the thesis entitled ***"Dynamics of Lentil Production in Major Producing Districts of Madhya Pradesh"*** submitted by **MS. SWATI YADAV** to the Jawaharlal Nehru Krishi Vishwa Vidhyalaya, Jabalpur in partial of the requirements for the degree of **"MASTER OF SCIENCE IN AGRICULTURE"** in the Department of Agricultural Economics and Farm Management has been approved by the students Advisory Committee and the External Examiner(s) after an oral Examination of the same.

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**Place : Jabalpur**

**Date :** **(Swati Yadav)**

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## CHAPTER-I

# INTRODUCTION

### 1.1 Introduction

Pulse crop is one of the most important groups of crops in our country. This group comprises of chickpea, pigeon pea, lentil, green gram, black gram, which are widely cultivated major pulse in the state of M.P., Maharashtra, Rajasthan, U.P. and Andhra Pradesh. Pulses production in India is characterized by a very high degree of diversity as indicated by the number of crops, and their spatial distribution into varied agro-climatic conditions.

Lentil (*Lens culinaris medik*) is self pollinating diploid (2N = 14 chromosomes) annual winter crop belonging to the family leguminosae. It orginated in the Central Asian Region in the prehistoric times. Botanically Lentil Plants are slender, semi erect annuals with compound leaves 4 to 7 pairs with atendril at the tips. Plants height normally ranges from 12 to 20 inches. It is adopted to high humidity, cool season and good fertility its favours vegetative growth.

Lentil seed content 24 to 27% protein and 0.26 to 0.31 mg phosphorus. Lentil is used as a dal and also used as a green manure crop. It is a use as a cover crop to check the soil erosion in problem areas.

The major Lentil consuming countries are India, China, Turkey, Japan, Syria, Spain around 26% of the total Masur produced in the world are traded in the international market. Masur production in Indian has been producing Lentil since 1$^{st}$ century, India was the largest producer of the Masur crop in the world until recently Canada took over the lead leaving India at the second place. Indian production of this crop covers around 10 lakh metric tons per year about 14 lakh hectares of land.

Lentil crop is grown in India following states Uttar Pradesh, Madhya Pradesh, Bihar, West Bengal, Rajasthan, Haryana, Punjab, Assam, Maharashtra around 90% of the production comes from the top four states. The area under this crop is mainly concentrated in the Madhya Pradesh in the districts of Vidisha, Sagar, Raisen, Jabalpur and Damoh.

The area under this crop has increased in Vindhyan Plateau, Kymore Plateau, Satpura and gird region of the state where Lentil is sown. The cultivated area of Lentil in India has been estimated 1500 thousand ha. and productivity of seeds has been reported as 633.33 kg / ha. and production was recorded as 950 thousand tonnes. The data obtained from the Commissioner Land records M.P. Gwalior, Indicates the area, production and productivity of Lentil in M.P. was found as 520.4 thousand / ha 272.6 th./ha, 524 kg/ha respectively.

Uses of Lentil – Lentil is used as a dal. The grain is just converted into split pulse by the removal of skin and separation of the fleshy cotyledons. It is a rich source of calcium, Iron, niacin, etc. It is a good source of protein in the indian diets as majority of population is vegetarian. It is grown as mixed crop and thus compensates the failure of the companion crop. It is used as a cover crop to check the soil erosion in problem areas. The dry leaves, stems, branches, empty pods, and broken bits are used as cattle feed.

**Specific Objectives**

1. To examine the absolute and relative changes in area, production and productivity of Lentil crop in major producing districts of Madhya Pradesh.
2. To study the trend and growth rate in area, production and productivity of Lentil crop.
3. To analyse the contribution of various components like area, yield and their interaction on the total production of lentil crop.
4. To suggest the ways and policy implication for sustainable growth of lentil production.

**Limitations of the study**

This study doesn't claim to free from limitations. Major limitations of the present study are given below:

The results of this study will be situation specific

The empirical estimation is based on date collected from different published records and reports and therefore validity of data cannot be questioned.

## CHAPTER - II

# REVIEW OF LITERATURE

To analysis any problem, it is necessary to understand the research work done in past related to different parameters and their interrelationship. This chapter deals with review of research work already done related to problem of study in hand to provide support to the finding of the present study.

Jain *et al.* (1988) analyzed the growth rate of area, production and productivity of gram for the period of 1974 to 1984 in Madhya Pradesh and observed that in most of the division, there was positive growth rate of area, production and productivity of the crop they further pointed out the Major factors influencing the productivity of gram in M.P. were the irrigated area under the crop and form harvest prices.

Sodhiya, H.C. (1989) in his paper estimates linear trends in the area, production and productivity of 10 major crops in sagar division, M.P. for the period 1956-57 to1982-83.the crops covered are wheat, rice, sorghum, millet, barly (in the cereal group), chickpeas and lentils (in the pulse group) and linseed, seasame and soyabeans (in the oilseeds group). The comparative signs and levels of significance of the regression coefficients suggest preference for cereals over pulses and oilseed. It is concluded that the decrease in production importance of sorghum and millet, the inferior cereal groups, is acceptable, but in there case of sesame it is a matter of concern.

Jain, K.K. (1991) examined the growth rate of different pulse crops in the Indian Punjab with an attempt to explain the differences in output in terms of risk and other factors affecting production. Data were collected from all the district in the state for the period 1950 / 51 to 1983/84. It is found that the decline in mean area accounts for most of the fall in pulse supply. Hence, there is a need direct policy at stabilizing yields.

Moorti *et al.* (1991) reviewed the trends in pulse production and the supply of oilseeds in Himachal Pradesh, India using secondary data from official sources and primary data on mixed cropping between 1970/71 and 1987/88, the acreage, yields and production of both crops are monitored and

analyzed. The observed decline in productivity, for both crops, is a result of a shift away from the use of fertile soils to marginal lands. Moreover, this trend is a consequence of the Green Revolution which as encouraged farmers to grow high – yielding varieties of wheat and other real on more fertile soil. Nevertheless, pulses and oilseeds can perform reasonably well on available soils, provided essential complementary services like marketing infrastructure and technology transfer are looked into.

Shrivastava and Awasthi (1992) examined the growth of pulses production in M.P. in the case of chickpea per annum rate of growth of area 2.1 percent which was statistically significant a though it was larger that other pulses crops in relative terms. The whole chickpea production grew at the rate of 2.66 per cent and yield growth was found to be 0.49 per cent.

Rahane and joshi (1993) examined the area, production and productivity of some important and pulses crop in Maharashtra during the period from 1966-67 to 1989-90 and revealed that the area, production and yield of sesamum, safflower, gram and tur has increased significantly but in groundnut there was as increase in production and yield only.

Shrivastava, A. (1993) the findings of a temporal analysis of growth rates of pulses. In vindhya plateau, india reveal that during the period 1966-67 to 1989-85 area and production have increased significantly. Conversely productivity has decreased during the same period. The teora crop is shown to be losing important in the area.

Bhatnagar (1995) analyzed trend in production, area and yield of rice in Haryana state for the period 1966-67 to 1991-92. The compound growth rates are found to be high significant interaction between area and yield was played a significant role in increasing production, production has increased to a large, extent due to the adoption of high yielding varieties, irrigation and fertilizer use.

Kumar, D. (1995) studied the problems, prospects and management strategies of pulse production over the past three decades, and found that the area under cultivation, production and yields of pulses have remained almost static in India. The possible reasons for this are examined in relation to the

cropping systems of pigeonpea, chickpea, mung bean, urdbean and cowpea in both intercropping and double cropping systems. Further, stated that the need for a dramatic increase in the production of pulses in India is highlighted as the population continues to grow at a rate of 2.2% per year.

Pant *et al.* (1995) presented an investigation on the dimensions and magnitude of the problems inhibiting production and productivity of pulses in the chief pulse producing state of Madhya Pradesh, India. The paper reviews several issues surrounding the production of pulses, including the technological aspects and market incentives. It is concluded that there is a need for strengthening pulse research with specific objectives of high yield under adverse agro-ecological conditions at lower real costs of production. Marketing, processing supports and prices incentives should also be ensured to make the crop as remunerative as its principal competitors.

Jain *et al.* (1995) analyzed the instability of grain legume in the area and yield in five districts of Bundelkhand zone of Madhya Pradesh state, India, is carried out for three kharif season crops (black gram, green gram and pigeon peas) for the period 1970/71 – 1991/92. In general, there was stagnation in area expansion of pigeon peas and green gram, but black gram witnessed acceleration in area expansion over the period. Yield levels of all three crops experienced stagnation and mean yields were very poor. In all but one district, yield instability was higher than that of area instability.

Rajan *et al.* (1996) analyzed the growth in area, production and yield of pulses along with the production stability of major pulses crops in north Bihar, India, during the post-Green Revolution period. The analysis is conducted for two periods, early period of Green Revolution (1974-84) and later period of Green Revolution (1984-94). The major findings are that the compound growth rates of area under total pulses were positive in both agro climatic zones studied despite negative growth rates in area under major pulse crops. No relationship was found between growth and instability in pulse production, Rather, the instability in area, production and yields of pulse crops are attributed to changes in the agro-physical environment.

Dhindsa and Anju Sharma (1997) studied the regional analysis of growth and supply responses of pulses in Punjab state in India from 1966-67 to 1991-92. The study revealed that the non price variables rather than price variables were significant in determining the area response of various pulse crops in the state and its various sub-regions.

Shete *et al.* (1997) estimated the compound growth rate of area. production and productivity of total cereals, pulses, oilseed ,sugarcane, and cotton crops during different time period viz.(1)-(1956-57) to (1966-67),period (2)-(1967-68)to(1977-78) and period (3)-(1978-79) to (1989-90).the increase in the production of cereals during period (1) noted the productivity of positive decline in period (1)Maharashtra contributed to be the deficit state in oilseed production during the sixties and seventies but experienced some dramatic change in production during the eighties.

Asthana, A.N. (1998) observed that the area under pulses in India has changed little overall between 1965/65 and 1994/95 (23-24 million ha), but production increased from 12.42 to 14.12 million tonnes due to a yield increase from 520 to 609 kg/ha. Production trends and research achievements for this period are described, including discussion of cultivar improvement, cropping systems, crop protection, changing research priorities, and plant genetic resources.

Dingar *et al.* (1998) study the production performance of pulses in Uttar Pradesh which has been declining due to lower area of these crops, and their production on marginal and sub-marginal land. Production of pulses as a group in the state declined during 1969-78 at the rate of –3.21%, but increased at the rate of 0.18% during 1980-93. Production of chickpea and pea decreased at the rate of –3.81% and –9.47%, respectively, whereas pigeonpea and lentil increased, respectively at the rate of 0.94% and 2.45% during 1969-78. Lentil production grew at a compound growth rate of 7.06% in 1980-93, and pea production by 5.95%, whereas chickpea production found continued to decline.

Gupta, H.S. (1998) studied the major and minor grain legumes grown in the North – eastern Hill Region of India and being there is genetic diversity of grain legumes in the region, various constraints regarding the production and strategies for increasing production, are discussed. The area and yield of total grain legume production in each state of the region are tabulated.

Mazumdar *et al.* (1999) study an analysis of production performance of pulses in Assam based on secondary data to access the compound growth rates and the existence of acceleration or declaration of growth in area, production and yield of different pulse crops in Assam which was done with the help of exponential and quadratic trend function. The period of study from 1967-68 to 1994-95 was divided into three periods. The exponential trend analysis indicated slow growth or negative growth rates in area, production and yield of the different pulse crops separately and of the total pulse crop as a whole in the state during the periods of study. The estimates of the quadratic trend function support the evidence of deceleration in the growth of pulse crops. The study indicated that production / yield needs to be enhanced through adoption of improved technolog, increase in irrigated area, incentives to farmers etc. There is also a need to bring changes to the cropping pattern in favour of pulse crops.

Rangi *et al.* (2002) examines the trend in the area, production, export and import of pulse in India both at national and international level and the result suggested that the pulse import are expected to rise significantly by 2005 and 2010. More efforts to increase the area and production of pulses in the country are suggested.

Swain, and Bhakar (2006) examined trends and variability of some cereals, pulses and commercial crop in Rajasthan, during time period of 20 years from 1980-81 to 1999-2000.to analyse the trends in the area, production and yield of some common commercial crops, cereals and pulse crops grown in rajasthan and focus on the degree of fluctuation in the growth of area, production and yield of said crop.

Srivastava, S.K. (2010) study the diagnosis of pulse performance in India to explored the dynamics of production and consumption of major pulses in different states of India and made a comparative evaluation of key economic factor affecting their production. Moreover, a structural shift in production of pulse in major producing states not only validates the lack of spatial and temporal stability in their production. But also throw light on the hidden potential of minor state in pulses producing for long term sustainability of pulses production.

**CHAPTER - III**

# PROFILE OF STUDY AREA

The garnered characteristics of the area under studey i.e. major producing district Sagar and Vidisha is presented in this chapter for understanding its different feature, Which will facilitate in the discussion to similarity and variations in different components, viz. location and topography, sails, drainage, irrigation, cropping pattern, rainfall and climate, geomorphology and soil types, cropping Patten ect.

**Table 3.1 : General information of Sagar district**

| S.N. | ITEMS | STATISTIC |
|---|---|---|
| **1** | **1General Information : (As per 2001 census)** | |
| | (i) Geological Area<br>(ii) Administrative Division : (As on 2006)<br>Number of Tehsils<br>Number of Blocks<br>Number of Panchayat<br>(iii) Population<br>(iv) Average Annual Rainfall (mm) | 10,252 Sq. Kms.<br>09<br>11<br>760<br>1868<br>20,21,987 (2001)<br>1234.8 mm |
| 2 | **Geomorphology** | |
| | **Major Physiographic Units :** The District extends over two physiographic divisions. They are : | (i) Bundelkhand in the north.<br>(ii) Malwa plateau in the south. |
| | **Major Drainages** | Two drainage basin are there |
| | (i) Ganga basin | 986 Sq. Km. |
| | a) Ken sub basin | 4507 Sq. Km. |
| | b) Betwa sub basin | 5562 Sq. Km. |
| | (iii) Narmada basin | 342 Sq. Km. |
| **3** | **Land Use** | |
| | (a) Forest Area | 2978.02 Sq. Km. |
| | (b) Net area sown | 7106.90 Sq. Km. |
| | (c) Cultivable area | 88.14 Sq. Km. |

| S.N. | ITEMS | | |
|---|---|---|---|
| **4** | **Major Soil Types** | | |
| | (a) Clay loam<br>(b) Sandy clay loam<br>(c) Sandy loam | | |
| **5** | **Area Under Principal Crops (As on 20004-05)** | | |
| | Wheat, Rice, Jowar, Maize & other | 1829.44 hectare | |
| | Gram, Tur, Urad & others | 3094.38 hectare | |
| | Sugar cane | 7.20 Sq. Km | |
| **6** | **Irrigation by Different Sources** | **Nos.** | **Areas Sq km** |
| | Tube well/Bore wells | 6558 | 398.52 |
| | Dug wells | 52910 | 11.69 |
| | Canal | 43 | 48.25 |
| | Tanks/Ponds | 34 | 25.64 |
| | Other Sources | - | 724.35 |
| | Net Irrigated Area | - | 2,366.35 |
| **7** | **Number of Ground Water Monitoring Wells of CGWB. (As on 31.3.2007)** | | |
| | No. of Dug Wells | 19 | |
| | No. of Piezometers | 09 | |

Sources: ministry of water resources, North central region Bhopal August 2009.

**Introduction of Sagar district**

Sagar district is located in the north central part of the state of Madhya Pradesh and occupies as area of 10252 sq km. The district extends between the latitude of $23^0$10' and $24^0$ 27' north, longitude of $78^0$ 04' and $79^0$ 21'east. The district is bound in the north by state of Uttar Pradesh, in the north east by Chhatarpur district in south and west by Raisen, in the south east by Narsimhapur district, in the northwest by Guna district and in the east by Damoh district. The National highway No. 26 passes through Sagar town. The district falls in survey of India toposheet No. 55M, 54L and 54P.

**The district has seven Tehsil and eleven development blocks :**

**Table 3.2. Administrative Division District Sagar, M.P.**

| S. No. | Blocks | Area (Sq. Km) | No. of village | No. of Town |
|---|---|---|---|---|
| 1 | Sagar | 874.64 | 152 | 1 |
| 2 | Jaisinagar | 731.96 | 145 | 1 |
| 3 | Rahatgarh | 816.12 | 198 | 1 |
| 4 | Rahali | 502.61 | 116 | 1 |
| 5 | Garhakota | 373.38 | 100 | 1 |
| 6 | Devri | 812.47 | 223 | 1 |
| 7 | Kesli | 696.39 | 164 | 1 |
| 8 | Bina | 687.17 | 156 | 1 |
| 9 | Khurai | 751.17 | 343 | 1 |
| 10 | Malthone | 680.79 | 173 | 1 |
| 11 | Banda | 807.22 | 164 | 1 |
| 12 | Shahgarh | 488.65 | 107 | 1 |

Sources: ministry of water resources, North central region Bhopal August 2009.

**Soil**

The major part of Sagar district is covered by black cotton soil . However, clay loam soils occurs in the northern parts of Banda blocks, north of Malthone, west of Sagar town, Kesli and Deori blocks. Sands clay loam covers the areas falling in the southern parts Deori and Kesli blocks, east of Rehli and northern parts of Shahgarh block. Rehli block is by and large, covered by sandy loam soils.

**Drainage**

The southern most tip of the district is drained by the Narmada river. However the major part of the area fall in the Ganga basin. The drainage of the district is towards north and north east. The five rivers, from west to east are the Bina, the Dhasan, the Bewas, the Sonar and the Bamner. The Bina takes its course upto several Kilometer to the south of the district and enters it near village Mahura. After flowing through Rahatgarh, the rivers takes a north easterly course and at places forms the boundary with Vidisha district.

The height of water fall at is about 15m and joins the Betwa at about 16 km west of Bina town.

The Dhasan emerges from just south of the district and flows initially in the south and then to the north. It also forms the boundary with Jhansi district of Uttar Pradesh. The Kopra and Bewas are tributaries of the Sonar. The Sonar joins Bamber and then both river joins Ken river. The Ken is a tributary of the Yamuna river.

The drainage pattern is of dendritic type. At a few place especially around Sagar town and near Khamlasa and Jaisinagar radial drainage pattern is also observed.

**Irrigation**

Irrigation in the district is mainly from dug wells (11.69 sq km.) tube wells (398.52 sq km). Canal (48.25 sq km). Ponds (25.64 sq km.) and from other source (724.35 sq. km). There are 52190 dug wells, 6558 tube wells, 34 tanks/ponds, 43 canal. So, net irrigated area is 2366.35 sq. km.

**Rainfall & Climate**

There are six rain gange stations in Sagar district. A heavier amount of rainfall occurs along the south western boundary of the district and decreases towards the north and slightly towards the east. In the southwestern parts of the district, Rehli gets a marked amount of low rainfall mainly due to its location in the valley on the side of the hill range.

The normal annual rainfall of the district is 1234.8 m.m. About 90% of the annual rainfall takes place during the southwest monsoon period i.e. June to September only 5.5% of annual rainfall takes place during winter and about 4.5% of rainfall occurs during the summer months.

The month wise normal rainfall at six stations show that the maximum rainfall occurs during the month of July followed by August.

The climate of Sagar district can be classified mainly into three season. Winter season starts from middle of November to end of February. March to May constitute summer season and the monsoon season starts from second week of June to end of September.

During winter season the January is the coldest months with the temperature falling as low as $11.6^0$g C and max up to $24.5^0$ C. During the month of May, temperature goes up to $40.7^0$ C (max.).

**Geomorphology & Soil Types**

Sagar district lies at the north eastern edge of the Malwa plateau, which widens in the south and south west. It lies just north of the Narmada river and is separated from tis valley by a steep escarpment towards the south. The area is by and large cropped by the deccan trap lava flows whereas at places vindhayan sandstone also crops out. The average elevation of the district is about 452 to 533 mamsl with elevation as low as 353 mamsl in the Dhasan river bed in the north to as high as 683 mamsl at Naharmau peak in the southwest.

The physical divisions of the district are represented by the basins of several rivers. Cropping the district in an almost south-north direction. The area in the north west falling under Khurai tehsil is almost a level tract with an elevation of about 411 to 427 mamsl and is drained towards north-west by Thimpa, Parasasi and Bina rivers. These rivers are tributaries of the Betwa river. The Khurrai plan is separated from the rest of the district by a series of steeply rising hills. These hills attain an elevation of up to 533 mamsl and also act as a water divide.

To the east of and south-east of the above discussed hills are the five parallel valley of Dhasan, Bewas, Sonar, Kopra and Bamner rivers. These basins are separated by hills rising 91 to 153 meters above the general ground surface. The highest hill range of Tendu Dabar attains a height of 665 mamsl.

There is a very prominent lake in Sagar town around which the town has developed. As per Dr. W.D. west, the lake come into existence due to the erosion of the deccan traps and exposing the underlying Vindhyans.

**Table 3.3 : General information of Vidisha District**

| S. No. | ITEMS | STATISTICS |
|---|---|---|
| **1.** | **General Information** | |
| | i) Geographical area | 7371 Km2 |
| | ii) Administrative Divisions (As on 2006 )<br>Number of Tehsil/Blocks<br>No of Janpad Panchayats Panchayats /Villages | 7/7<br>Vidisha, Gyarspur, Basoda, Nateran, Kurwai, Sironj, Lateri)<br>07/2113 |
| | iii) Population (Census 2001) | 12,14,857 |
| | iv) Average Annual Rainfall (mm) | 1159.7 |
| **2.** | **Geomorphology** | |
| | 1. Major Physiographic Units:<br>2. Major Drainage: | Malwa Plateau, Vindhyan Hill Range and Betwa Alluvium<br>Betwa River, Bah Nadi, Nion River, Keother Nadi, Bina River, Kethan nadi and Sindh River |
| **3.** | **Land Use (Km2)** | |
| | i) Forest area: | 1084.71 |
| | ii) Net area sown: | 5310.71 |
| | iii) Cultivable area: | 5847.32 |
| **4.** | **Major Soil Types** | Black Cotton |
| **5.** | **Area Under Principal Crops ( June'2006)** | 2478.92 Km2 |

| | | | |
|---|---|---|---|
| **6.** | **Irrigation by Different Sources** | Nos. | Irrigated area km2 |
| | Dugwells | 11822 | 393.05 |
| | Tube wells/Bore wells | 12193 | 1002.95 |
| | Tanks/Ponds | 23 | 42.56 |
| | Canals | 11 | 386.56 |
| | Other Sources | - | 606.38 |
| | Gross Irrigated Area | 2431.50 | |
| **7.** | **Number of Ground Water Monitoring Wells of CGWB (As on 31.3.2007)** | | |
| | No. of Dug Wells | 20 | |
| | No. of Piezometers | 6 | |

Sources: ministry of water resources, North central region Bhopal June 2009.

**Introduction of Vidisha district**

Vidisha district is lying in the central part of Madhya Pradesh. It is in Bhopal commissioners division and is well connected by roads and railway. National Highway 67, connecting Bhopal and Dewas passes through the district. There are 7 tehsils and 7 blocks in the district. The block headquarters are Vidisha, Gyarspur, Basoda, Nateran, Kurwai, Sironj, Lateri. Vidisha district with an area of 7371 km2 lying between the North Latitudes 220 20' and 240 22' and East Longitudes 770 16' and 780 18'" and falls under the Survey of India toposheet No. 54H, 54L, 55E and 55 I. The district is encircled by Guna district in the North, Sagar and Raisen in the east, Raisen in the South and Bhopal in the west (figure 1).

**Administrative Division**

The district is sub divided into seven administrative blocks and seven tehsils. The administrative divisions are shown in figure-1 and details are given in table–1.

**Table 3.4 : Administrative Division, District Vidisha, M.P.**

| District/ Block | Area Sq.km | Population 2001 | Density of Population per km2 |
|---|---|---|---|
| 1. Vidisha | 1066 | 268199 | 252 |
| 2. Gyarspur | 872 | 106939 | 123 |
| 3. Basoda | 1223 | 24205 | 198 |
| 4. Nateran | 1069 | 155241 | 145 |
| 5. Kurwai | 831 | 136862 | 165 |
| 6. Sironj | 1255 | 193397 | 154 |
| 7. Lateri | 986 | 112135 | 114 |
| **District Vidisha** | **7302** | **1214857** | **165** |

Sources: ministry of water resources, North central region Bhopal June 2009.

Vidisha district forms the part of Malwa plateau and Vindhyan hill range with an undulating topography. Vidisha district is primarily an agricultural district occupying the Betwa basin valley, having predominantly an agricultural economy. Agriculture is the main occupation of the people in the district. Wheat, Jawar, Maize and Soyabean are the major crops sown in the district. Ground water has an important role to play for irrigation.

Out of total 243150 hectares irrigated land, 139600 hectares was irrigated from ground water sources. There were 12193 tube wells and 11822 dug wells up to the year 2006 for irrigation purpose.

The statistical data of land use and Irrigation pattern of Vidisha district has been extracted from the district statistical booklet, Vidisha district 2006. The land use for the district is given in Table – 3.4. The irrigation details for the district are given in table – 3.5.

**Table 3.5: Land Use, District Vidisha (M.P.)**

| District/Block | Total Geographical Area (In ha) | Forest area (In ha) | Agricultural area (In ha) | Non Agricultural area (In ha) | Fallow land (In ha) | Total | Total % |
|---|---|---|---|---|---|---|---|
| 1. Vidisha | 106552 (14.59) | 5568 (5.13) | 1911 (8.04) | 8741 (18.44) | 1843 (9.47) | 124615 | 13.40 |
| 2. Gyarspur | 87191 (11.94) | 18171 (16.74) | 1371 (5.77) | 4218 (8.90) | 823 (4.23) | 111774 | 12.02 |
| 3. Basoda | 122324 (16.75) | 10946 (10.08) | 4921 (20.71) | 8044 (16.97) | 3835 (19.72) | 150070 | 16.14 |
| 4. Nateran | 106899 (14.69) | 14379 (13.24) | 4624 (19.46) | 7350 (15.51) | 5042 (25.92) | 138294 | 14.88 |
| 5. Kurwai | 83144 (11.38) | 108 (0.09) | 2178 (9.16) | 7091 (14.96) | 2639 (13.57) | 95160 | 10.23 |
| 6. Sironj | 125454 (17.18) | 20817 (19.18) | 5612 (23.62) | 7042 (14.86) | 3410 (17.53) | 162335 | 17.46 |
| 7. Lateri | 98633 (13.50) | 38541 (35.51) | 3135 (13.19) | 4898 (10.33) | 1853 (9.52) | 147060 | 15.82 |
| **Total** | **730197** | **108530** | **23752** | **47384** | **19445** | **929308** | |
| **Total %** | **78.57** | **11.678** | **2.55** | **5.098** | **2.092** | **100%** | |

Sources: ministry of water resources, North central region Bhopal June 2009.

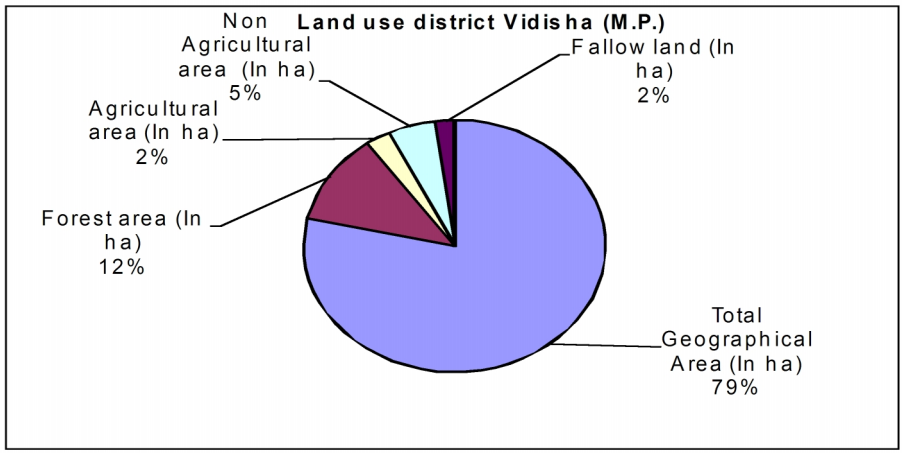


**Fig. 1. Land Use, District Vidisha (M.P.)**

**Table 3.6 : Irrigation, District, Vidisha (M.P.)**

| Block | Canals | Irrigated area (In ha) | Tube wells | | Dug wells | | Tanks | |
|---|---|---|---|---|---|---|---|---|
| | | | No. | Irrigated area (in ha) | No. | Irrigated area (in ha) | No. | Irrigated area (in ha) |
| 1. Vidisha | 3 | 29813 | 3035 | 16696 | 696 | 1460 | 6 | 96 |
| 2 Gyarspur | - | - | 1861 | 9998 | 2366 | 7007 | 3 | 693 |
| 3. Basoda | 1 | 2733 | 1440 | 12841 | 2212 | 7691 | 6 | 1016 |
| 4. Nateran | 1 | 766 | 1726 | 7299 | 2631 | 14411 | 2 | 1141 |
| 5. Kurwai | - | - | 1999 | 31662 | 814 | 1052 | 3 | 324 |
| 6. Sironj | 4 | 5344 | 1302 | 15969 | 1508 | 2922 | 2 | 390 |
| 7. Lateri | - | - | 830 | 5830 | 1595 | 4762 | 1 | 596 |
| **District Vidisha** | **9** | **38656** | **12193** | **100295** | **11822** | **39305** | **23** | **4256** |

Sources: ministry of water resources, North central region Bhopal June 2009.

**Rainfall and Climate**

The climate of Vidisha district characterized by a hot summer and general dryness except during the southwest monsoon season. The year may be divided into four seasons. The cold season, December to February is followed by the hot season from March to middle of June. The period from the middle of June to September is monsoon season. October and November form the post monsoon or transition period.

The normal rainfall of Vidisha district is 1159.7 mm. It receives maximum rainfall during southwest monsoon period. About 91.4% of the annual rainfall received during monsoon seasons. Only 8.6 % of the annual rainfalls take place during October to May period. The surplus water for groundwater recharge is available only during the southwest monsoon period. The maximum rainfall received in district at Kurwai i.e. 1191.0 mm and minimum at Bareli i.e. 1150.3 mm.

The normal maximum temperature received during the month of May is 41.7$^{o}$C and minimum during the month of December is 8.9$^{o}$C. The normal annual means maximum and minimum temperature of Vidisha district is 32.0$^{o}$C and 17.9$^{o}$C respectively. During the southwest monsoon season the relative humidity generally exceeds 94% (August month). In rest of the year is drier.

The driest part of the year is the summer season, when relative humidity is less than 39%. April is the driest month of the year. The wind velocity is higher during the pre-monsoon period as compared to post monsoon period. The maximum wind velocity 11.2 km/hr observed during the month of June and is minimum 1.5 km/hr during the month of December. The average normal annual wind velocity of Vidisha district is 5.3 km/hr.

**Geomorphology & Soil types**

Physiographically the district has been divided into three major units i.e. Malwa Plateau, Vindhyan Hill range and Alluvium plain. The district is formed by the valleys of major rivers like Betwa basin and Sindh River.

Most part of the district, measuring about more than 80% is located in the Betwa river basin, which is drained by its tributary like Bah nadi, Nion river, Keother nadi, Bina river and Kethan nadi. The presence of elevated ground on all the subbasin marks the surface water divides. The interior area of the basin is marked by undulating topography with elevated plains with very few low altitude isolated hills. The ground elevations in the area vary between about 383 m (Kurwai Block) in the northeast and about 550 m (Lateri Block) in the northwest part of district.

The district is generally covered with black cotton soils covering almost three fourths of the area. This part is occupied by Deccan Basalts. The rest part has red-yellow mixed soils derived from sandstone, shale. The alluvial soils are found along the river courses. The higher elevations i.e. the hilly re0gions have a cover of murum, which is made up of small rounded pieces of weathered trap. The Vindhyans and Bijawars have a thin cover of sandy

loams. The alluvium is derived from hill slopes by numerous streams and watercourses.

**Cropping Pattern**

The principal crop is wheat grown in Vidisha and Sagar districts of Madhya Pradesh in an area about 198.1 and 173.0 thousand per hectare respectively. The another major crop is Chana (gram) which is cultivated in an area of 202.1 and 186.3 thousand hectare in Vidisha & Sagar districts respectively. Lentil comes under other pulse crop which covered the area of 70.8 & 54.5 thousand per ha. in Vidisha and Sagar districts respectively.

(Source : www.mpkrishi.org)

**Table 3.7: Cropping pattern of selected districts and Madhya Pradesh 2006-07 (in ha.)**

| Crops | Districts | | M.P. total |
|---|---|---|---|
| | Sagar | Vidisha | |
| **Food Crop Cereals** | | | |
| Padd | 8601 (0.50%) | 619 (0.30%) | 1700446 |
| Jowar | 3869 (0.68%) | 4556 (0.80%) | 566180 |
| Bajra | 41 (0.02%) | 0 | 182506 |
| Maize | 3737 (0.43%) | 5774 (0.67%) | 852591 |
| Ragi / Madua | 91321 (99.11%) | 99106 (107.56%) | 92136 |
| Wheat | 163778 (4.34%) | 206566 (5.47%) | 3772615 |
| Barley | 1394 (0.41%) | 175 (0.05%) | 339398 |
| Other cereals & millets | 1926 (0.56%) | 328 ( 0.09%) | 340536 |

| | | | |
|---|---|---|---|
| **Total cereals** | **182944** (2.44%) | **218236** ( 2.91%) | **7497084** |
| **Pulses** | | | |
| Gram | 201587 (7.95%) | 194560 (7.67%) | 2534571 |
| Tur | 17406 (2.93%) | 20079 (3.39%) | 592064 |
| Other pulses ( Black gram, green gram, Lentil) | 104886 (7.18%) | 105739 (7.24%) | 1460437 |
| **Total pulses** | **309438** (7.17%) | **301215** (6.98%) | **4314481** |
| **Total food grain** | **492382** (4.16%) | **519451** (4.39%) | **11811565** |
| **Non food grains** | | | |
| Sugarcane / new ratoon | 720 (0.82%) | 274 (0.31%) | 87018 |
| Spices | 1799 (0.86%) | 4532 (2.18%) | 207218 |
| Fruits veg. | 9222 (3.80%) | 2079 (0.85%) | 242466 |
| **Total food crops** | **504123** (4.08%) | **526237** (4.26%) | **12348290** |
| **Non Food crops Oilseeds** | | | |
| Groundnut | 1353 (0.66%) | 684 (90.33%) | 204793 |
| Sesamum | 1710 (0.92%) | 213 (0.11%) | 184090 |
| Soybean | 168772 (3.68%) | 124862 (2.72%) | 4576216 |
| Sunflower | 8 (0.82%) | 188 (17.15%) | 1096 |
| Rape mustard | 975 (0.11%) | 923 (0.11%) | 829550 |

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| | | | |
|---|---|---|---|
| Linseed | 6336 (4.79%) | 329 (0.24%) | 132260 |
| Other oilseeds | 0 | 0 | 12483 |
| **Total oilseeds** | **179702** (2.97%) | **127223** (2.10%) | **6048162** |
| **Fibers** | | | |
| Cotton | 0 | 7 (0.01%) | 596392 |
| Fodder crop | 26685 (4.53%) | 9603 (1.63%) | 588497 |
| Phulwan | 8 (0.21%) | 5 (0.13%) | 3667 |
| Total non food crops | 206567 (0.84%) | 136693 (1.88%) | 7259302 |
| Net area sown | 539003 (3.60%) | 531071 (3.54%) | 14970966 |
| Double cropped area | 171687 (3.70%) | 131859 (2.84%) | 4636626 |
| **Gross area sown** | **710690** ( 3.60%) | **662930** (3.38%) | **19607592** |
| **Cropping intensity (%)** | **132** | **125** | **131** |

(Source : Commissioner land records & settlement Madhya Pradesh Gwalior M.P.)

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## CHAPTER – IV

# RESEARCH METHODOLOGY

This section discusses the nature of the problem under study, sources of data, limitations of the data and specification issues.

### 4.1 The study area

The study is confined to major lentil producing districts of Madhya Pradesh. Vindhyan Plateau covering maximum area and production under Lentil Sagar and Vidisha districts having maximum acreage under Lentil were selected to fulfill the stated objective.

**The data**

Area, production and yield of lentil for the selected districts (Sagar, Vidisha) were conducted for various issues of Agricultural statistics published by Directorate of Agriculture Bhopal covering period for the year 2000-01 to 2010-11.

| Agro-climatic zones | Divisions | Districts |
|---|---|---|
| Vindhyan Plateau | Sagar division | Sagar |
| | Bhopal division | Vidisha |

**Period of study:**

The secondary data would pertain for the period of 10 years i.e. from 2000-01 to 2010-11.

## 4.2 Method of analysis

Analytical tools used and hypothesis under testing

**Absolute and relative change**

Absolute change = Current year – Base year

$$\text{Relative change} = \frac{\text{Current year} - \text{Base year}}{\text{Base year}} \times 100$$

Where,

Base year (Po) = Triennium average ending (2003-04) of area, production and yield of selected lentil crop.

Current year (Pn) = Triennium average (ending 2010-11) of area production and yield of selected lentil crop.

**Linear trend**

To study the growth rates of lentil crop in selected districts the trend analysis was carried out using linear trend method

Linear trend, $Y = a + b\,x$

Where,

Y = Dependent variables (Area, Production and Yield)

a = Intercept

b = Regression co-efficient

x = Period

**iii. Compound growth rate (CGR)**

$$\text{CGR}\,(\%) = (\text{Antilog } b - 1) \times 100$$

**iv. Simple Growth Rate (SGR)**

$$\text{SRG}(\%) = \frac{b}{\bar{y}} \times 100$$

**Decomposition of Analysis**

For estimation of contribution of area and yield towards change in production (Positive / negative) for two sub periods the following Model (Sharma, 1977) was used.

1. Yield effect (%)= $\frac{(Y_n-Y_o)A_o}{(P_n-P_o)}$ X100

2. Area effect (%)= $\frac{(A_n-A_o)Y_o}{(P_n-P_o)}$ X100

3. Interaction effect = $\frac{(Y_n-Y_o)\ (A_n-A_o)}{(P_n-P_o)}$ X100

Where,

$P_n$ = Triennium average of current year for area, production and productivity.

$P_o$ = Triennium average of base year for area, production and productivity

Thus, the fatal change in production can be decomposed into three effects viz. yield effect, area effect and the interaction effect due to change in yield and area.

Coefficient of variation (cv) % = $\frac{\text{Standard deviation}}{\text{Mean}}$ x 100

Where,

Standard deviation was calculated by positive square root of arithmetic mean of the squares of deviation of the given values from their arithmetic mean.

## CHAPTER - V

# RESULTS & DISCUSSION

Keeping in view the specific objective of the study, the required data was collected analysed and the results were obtained. The present chapter describes the result obtained from analysis of secondary data within the limits of the objectives of study.

It may be recalled that the focus of the study to assess the trend in area, production and productivity of Lentil in major districts of Madhya Pradesh.

Present study is an endeavour to focus on the trend, growth rate, absolute and relative changes in area, production and yield in major districts of Madhya Pradesh.

The results are presented under different subheads as.

1. The absolute and relative change in area, production and yield.
2. Linear trend in area, production and yield.
3. Simple Growth Rate (SGR) and Compound Growth Rate and Coefficient of Variation (%).
4. Decomposition Analysis.

**Table 5.1: Absolute and relative change in area of lentil in major districts of Madhya Pradesh (2000-01 to 2010-11)**

**Area in ha.**

| District | Base Year | Current Year | Absolute Change | Relative Change (%) |
|---|---|---|---|---|
| Vidisha | 68.63 | 75.87 | 7.24 | 10.54 |
| Sagar | 62.57 | 58.70 | -3.87 | -6.18 |
| M.P. | 427.72 | 547.23 | 119.51 | 27.94 |

Table 5.1 shows absolute and relative change in area of lentil in major producing districts of Madhya Pradesh. Vidisha recorded maximum increase in area both in absolute (7.24ha.) and relative terms (10.54) and sagar district has negative absolute (-3.87 ha) and relative terms (-6.18) this is evident from the fact that the lentil crop in vidisha and has expanded from 68.63 ha. during the base year (triennium ending 2002-2003) to about 75.87 has during the current year (triennium ending 2010-2011) and sagar district from 62.57 ha during base year (triennium ending 2002-2003) and about 58.70 ha during the current year (triennium ending 2010-2011) expansion or reduction. At state level lentil are increased over 27.94 percent (119.51ha.) during the current year over the base year.

**Table 5.2: Absolute and relative change in yield of lentil in major districts of Madhya Pradesh (2000-01 to 2010-11)**

**(Yield kg. / ha)**

| District | Base Year | Current Year | Absolute Change | Relative Change (%) |
|---|---|---|---|---|
| Vidisha | 534.00 | 556.00 | 22.00 | 4.11 |
| Sagar | 231.73 | 408.00 | 176.27 | 76.06 |
| M.P. | 444.00 | 441.00 | -3.00 | -0.67 |

**Yield**

Table 5.2 shows absolute and relative change in yield of lentil in major producing districts of Madhya Pradesh. Vidisha and Sagar recorded increase in yield. The yield of lentil crop in Vidisha has expanded from 534 kg/ha. during the base year (triennium ending 2002-03) to about 556 kg/ha during the current year (triennium ending 2010-2011). The Increased in yield was recorded in Sagar, 76.06 percent or 176 kg/ha. During the study period. In the State, there was an overall decrease of yield by -0.67 per cent (-3 kg/ha.) between two points of time.

**Table 5.3: Absolute and relative change in production of lentil in major district of Madhya Pradesh (2000-01 to 2010-11)**

**Production in 000' tonnes**

| District | Base year | Current year | Absolute change | Relative change (%) |
|---|---|---|---|---|
| Vidisha | 36.63 | 42.10 | 5.47 | 14.93 |
| Sagar | 19.73 | 23.60 | 3.87 | 19.61 |
| M.P. | 177.67 | 236.23 | 58.56 | 32.96 |

**Production**

Table 5.3 shows relative and absolute changes in lentil production. The absolute change was recorded 5.47 thousand tones and relative change was 14.93 per cent in Vidisha district. The production of lentil in Vidisha has expanded from 36.63 thousand tones during the base year (triennium ending 2002-03) to a phenomenal 42.10 thousand tonnes during the current year (triennium ending 2010-11). The absolute change was recorded 3.87 thousand tonnes and relative change and 19.61 per cent in Sagar district.

The production of lentil in Sagar has expanded from 19.73 thousand tonnes during the base year (triennium ending 2002-03) 23.60 during the current year (2010-11).

**Table 5.4 Linear trend in area of lentil in the major districts of Madhya Pradesh (2000-01 to 2010-11)**

| Particulars | Area (ha.) | | Production (000 tonnes) | | Yield (kg/ha) | |
|---|---|---|---|---|---|---|
| | Constant (a) | Reg. Co-eff. (b) | Constant (a) | Reg. Co-eff. (b) | Constant (a) | Reg. Co-eff. (b) |
| Vidisha | 65.01 (3.66) | 1.15** (0.54) | 39.08 (4.05) | 0.52 (0.60) | 583.82 (50.48) | -1.68 (7.44) |
| Sagar | 63.99 (5.08) | 0.22 (0.75) | 22.10 (3.71) | 0.39 (0.55) | 279.51 (82.10) | 14.77 (12.10) |
| M.P. | 396.89 (25.76) | 16.19*** (3.80) | 185.26 (26.56) | 6.29 (3.92) | 456.56 (42.36) | 1.75 (6.25) |

Figures in paranthesis shows standard error of reg. coefficient
*** Significant at 1% probability level
** Significant at 5% probability level
* Significant at 10% probability level

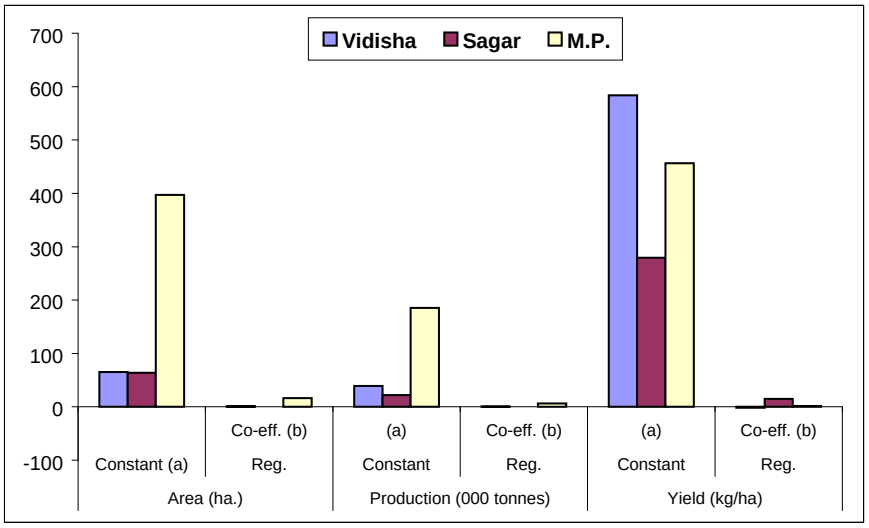


**Fig. 2. Linear trend in area of lentil in the major districts of Madhya Pradesh (2000-01 to 2010-11)**

Table 5.4 shows that linear trend of lentil area in selected districts of Madhya Pradesh for (2000-01 to 2010-11) confirming the results of absolute and relative changes of area (table 5.1). This table reveals significantly increasing trend (positively significant at 5% per cent level) in area in the district of Vidisha while it is non significant trend in area in the district of Sagar and Madhya Pradesh trend (positively significant at 1% per cent level). In area although the state showed positive trend (3.80 ha/yr).

Table 5.4 show the trend in yield (kg / ha) of Lentil in selected districts of Madhya Pradesh it shows regression coefficients of yield for the districts and the state are non significant in Vidisha, Sagar and the state the yield of lentil at the M.P. state level is 1.75 kg per ha. yield it is the positive effect of the trend, although it varies substantially across the selected districts for Vidisha (-1.68 kg per ha.) yield following by Sagar (14.77 kg per ha.) yield Sagar district has positive effect the linear trend of the yield.

The trends in production of lentil in selected districts and state during (2000-01 to 2010-11) showed non significantly results.

**Table 5.5 Districtwise simple growth rate (SGR) and compound growth rate (CGR) of lentil in selected district of Madhya Pradesh (2000-01 to 2010-11)**

| Particulars | Area (ha) | | Production (000 tonnes) | | Yield (kg/ha) | |
|---|---|---|---|---|---|---|
| | SGR | CGR | SGR | CGR | SGR | CGR |
| Sagar | 0.35 | 0.36 | 1.59 | 1.60 | 4.01 | 8.65 |
| Vidisha | 1.60 | 1.62 | 1.25 | 1.22 | 0.29 | 0.40 |
| M.P. | 3.28 | 3.37 | 2.82 | 2.91 | 0.39 | 0.76 |

**Simple growth rate**

The results for simple and compound growth rate (Table 5.5) is in conformation to our previous results on absolute & relative change and linear trend analysis (Table 51 to 5.4) Average growth in area for the period 2000-01 to 2010-11 reveals an accelerating (positive) trend in the major producing district (Vidisha, Sagar) as well as the state level.

The growth in yield was positive throughout during the study period. Overall area of lentil at state level has increased by 3.37 percent per annum during the study period while overall production Increased by 2.91 per cent per annum and overall yield increased by 0.76 per cent per annum. Maximum growth rate in area was observed in Vidisha. Vidisha shows a simple growth rate of 1.60 per cent in area, 1.25 per cent in production and 0.29% in yield. It shows a compound (annual) growth rate of 1.62 per cent in area, 1.22% in production and 0.40% in yield.

**Table 5.6: District wise coefficient of variation of lentil in Madhya Pradesh (2000-01 to 2010-11)**

| Particular | Area (cv%) | Production (cv%) | Yield (cv%) |
|---|---|---|---|
| Vidisha | 9.16 | 15.02 | 12.94 |
| Sagar | 11.96 | 22.91 | 35.32 |
| M.P. | 13.29 | 19.82 | 13.99 |

Table 5.6 shows the inferred the instability in area, production and yield of Lentil crop in Major producing districts of the M.P. during the period of 2000-01 to 2010-11.

It may be noted that the minimum acreage variability was found in the district of Vidisha (9.16%) with maximum of per cent in Sagar with (11.96%) variability state as a whole.

The variability in production was found to be highest in Sagar (22%) followed by Vidisha (15%), regarding productivity variability highest performance was observed in Sagar district (35%) followed by Vidisha (12%).

**Table 5.7 District wise decomposition of analysis of lentil in Madhya Pradesh (2000-01 to 2010-11)**

| Particular | Sagar | Vidisha | M.P. |
|---|---|---|---|
| Yield effect % | 140 | 27 | 14 |
| Area effect % | -32 | 70 | 82 |
| Interaction effect % | -8 | 3 | 4 |
| | 100 | 100 | 100 |

Table 5.7 shows the contribution of area, yield and interaction of change in production over the year (i.e. 2000-01 to 2010-11). In Sagar district the increase in production of Lentil was mainly due to increase in yield. The contribution of area was negative. But in the case of Vidisha district, the increase in production was mainly due to increase in the area of Lentil (70%) and the contribution of yield was 27% only in M.P. the contribution of area was 82% followed by yield effect (14%). Interaction effect of Sagar, Vidisha and Madhya Pradesh was found very low and Non significant.

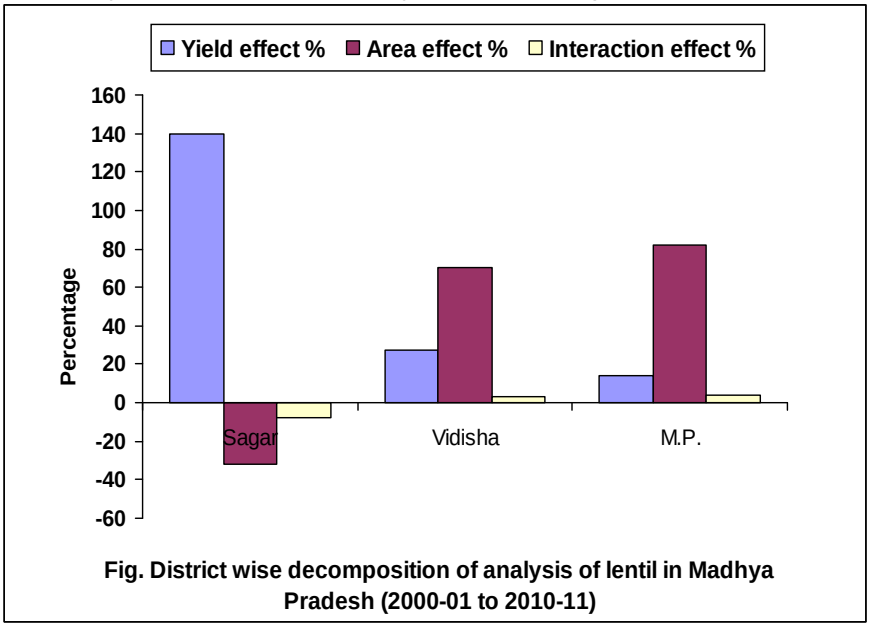


**Fig. District wise decomposition of analysis of lentil in Madhya Pradesh (2000-01 to 2010-11)**

**Fig. 3. District wise decomposition of analysis of lentil in Madhya Pradesh (2010-11).**

## CHAPTER – VI

# SUMMARY, CONCLUSIONS AND SUGGESTIONS FOR FUTURE WORK

**Summary**

To examine the growth of Lentil in major producing districts of M.P. and to suggest the ways and policy implication for sustainable growth in major producing districts of M.P.

The lentil is one of the most important pulse crop in northern Madhya Pradesh Lentil seeds contains 24 to 27 % protein and 0.26 to 0.31 mg phosphorous. Madhya Pradesh share 40.53% of area and 30.21% of production. The area under this crop is mainly concentrated in the districts of vidisha, Sagar, Raisen, Jabalpur and Damoh.

**Specific objective**

- To examine the absolute and relative changes in area, production and productivity of Lentil crop in major producing districts of Madhya Pradesh.
- To study the trend and growth rate in area, production and productivity of Lentil crop.
- To analyse the contribution of various components like area, yield and their interaction on the total production of Lentil crop.
- To suggest the ways and policy implication for sustainable growth of Lentil production.

The Present study is confined to potential Lentil Major Producing districts of Madhya Pradesh. namely Sagar and vidisha these districts together shared maximum area and production of lentil in Madhya Pradesh.The study is based on district wise secondary data.viz.area, production and yield of lentil crop covering a Period from 2000-01 to 2010-11.Absulute and relative change, Linear trend simple and compound growth rate, coefficient of variation. Used to analysed the collected data.

**CONCLUSIONS**

At state level, lentil area increased over 27.94 per cent (119.51 ha.) during the current year over the base year.

The Increased in yield was recorded in Sagar, 76.06 percent or 176 kg/ha. During the study period. In the State, there was an overall decrease of yield by -0.67 per cent (-3 kg/ha.) between two points of time. The absolute was recorded 3.87 thousand tonnes and relative change of 19.61 per cent in Sagar district.

The production of lentil in Sagar has expanded from 19.73 thousand tonnes during the base year (triennium ending 2002-03) 23.60 during the current year (2010-11).

In area in the districts of Vidisha while it is non significant trend in area in the district of Sagar and Madhya Pradesh trend (positively significant at 1% per cent level). In area although the state showed positive trend (3.80 ha/yr).

Are non significant in Vidisha and Sagar and the state. The yield of lentil at the state level is (1.75 kg/ha) although it varies substantially across the selected districts and for Vidisha (-1.68kg/ha) followed by Sagar (14.77 kg/ha).

The trends in production of Lentil in selected districts and state during (2000-01 to 2010) showed non significantly results.

Maximum growth rate in area was observed in Vidisha. Vidisha shows a simple growth rate of 1.60 per cent in area, 1.25 per cent in production and 0.29% in yield. It show a compound (annual) growth rate of 1.62 per cent in area, 1.22% in production and 0.40% in yield.

Regarding productivity variability highest performance was observed in Sagar district (35%) followed by Vidisha (12%).

In Sagar district the increase in production of Lentil was mainly due to increase in yield. The contribution of area was negative. But in the case of Vidisha district, the increase in production was mainly due to increase in the area of Lentil (70%) and the contribution of yield was 27% in M.P. the contribution of area was 82% followed by yield effect (14%).

**Policy implication**

On the basis of observation and consequent recommendations emerging from this study likely policy implications as follows.

1. Cultivation of lentil i.e. lentil as still in traditional mode of cultivation especially in the state. Productivity however, the potential productivity of available varieties is above 15 q/ha. Therefore, only though gradually replacement of traditional lentil varieties and increase the production by more than 75 per cent.
2. Area under whole major lentil has not yet become so popular despite of its higher productivity like Vindhyan Planteau region. The effects should be made for increase in its acreage through some incentives such as high bouns price crop insurance credit facilities.
3. More adaptive trials on the released varieties, newer practices and cropping systems evolved in Lentil need to be conducted in the farmers field to re-evaluate their relative advantage, profitability and effectiveness.

**Suggestions for further work**

Despite of the many efforts made so for increasing the production of the major lent and other important crops in the country there is still a wide gap between demands and supply of these commodities every year. Although our production levels are not in line with our requirement but whatever we are producing at our best level. It reaches to the consumer in a required quantity or not. Thus, there is a need of same empirical pulses, factors effecting supply and demand and extent of post harvest losses as pulses at various levels handling.

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## APPENDIX-I

**District - Sagar**

| Year | Area (ha) | Production (ooo' tonnes) | Yield (kg/ha) |
|---|---|---|---|
| 2000-01 | 67.1 | 20.2 | 301 |
| 2001-02 | 3.3 | 23.2 | 367 |
| 2002-03 | 56.8 | 15.5 | 272 |
| 2003-04 | 56.2 | 24.8 | 441 |
| 2004-05 | 55.8 | 22.5 | 404 |
| 2005-06 | 77.2 | 33.2 | 431 |
| 2006-07 | 74.0 | 32.4 | 439 |
| 2007-08 | 62.4 | 25.9 | 415 |
| 2008-09 | 59.8 | 28.1 | 477 |
| 2009-10 | 54.5 | 25.6 | 470 |
| 2010-11 | 61.8 | 17.1 | 277 |

## APPENDIX-II

**District - Vidisha**

| Year | Area (ha) | Production (ooo' tonnes) | Yield (kg/ha) |
|---|---|---|---|
| 2000-01 | 69.5 | 39.0 | 563 |
| 2001-02 | 68.5 | 40.2 | 587 |
| 2002-03 | 67.9 | 30.7 | 452 |
| 2003-04 | 59.7 | 37.2 | 623 |
| 2004-05 | 65.6 | 40.9 | 623 |
| 2005-06 | 78.8 | 49.8 | 632 |
| 2006-07 | 74.2 | 48.2 | 650 |
| 2007-08 | 79.2 | 40.6 | 513 |
| 2008-09 | 81.6 | 47.8 | 586 |
| 2009-10 | 70.8 | 45.4 | 641 |
| 2010-11 | 75.2 | 33.1 | 441 |

## APPENDIX - III

**Madhya Pradesh**

| Year | Area (ha) | Production (ooo' tonnes) | Yield (kg/ha) |
|---|---|---|---|
| 2000-01 | 424.2 | 172.4 | 456.00 |
| 2001-02 | 442.2 | 198.5 | 421.83 |
| 2002-03 | 418.77 | 162.1 | 354.00 |
| 2003-04 | 422.1 | 211.7 | 447.33 |
| 2004-05 | 444.2 | 218.0 | 384.46 |
| 2005-06 | 581.9 | 292.8 | 503.00 |
| 2006-07 | 539.8 | 261.6 | 485.00 |
| 2007-08 | 521.8 | 221.2 | 424.00 |
| 2008-09 | 264.4 | 498.0 | 520.40 |
| 2009-10 | 272.6 | 524.0 | 590.50 |
| 2010-11 | 590.5 | 177.9 | 301 |

# VITA

The author of this report Ms. Swati Yadav was born on 27 Nov. at district, Jabalpur. She passed her higher secondary examination in the year 2004 from Jabalpur, with first division. She then joined college of Agriculture, JNKVV and successfully completed her B.Sc. (Agriculture) in the year 2010 with first division.

Later joined the Department of Agricultural Economics & Farm Management, College of Agriculture, JNKVV, Jabalpur for M.Sc. (Ag.) in Agricultural Economics and for completion of the degree programme, this thesis work is submitted in partial fulfillment of the degree.

# APPENDIX-I

## District - Sagar

| Year | Area (ha) | Production (ooo' tonnes) | Yield (kg/ha) |
|---|---|---|---|
| 2000-01 | 67.1 | 20.2 | 301 |
| 2001-02 | 3.3 | 23.2 | 367 |
| 2002-03 | 56.8 | 15.5 | 272 |
| 2003-04 | 56.2 | 24.8 | 441 |
| 2004-05 | 55.8 | 22.5 | 404 |
| 2005-06 | 77.2 | 33.2 | 431 |
| 2006-07 | 74.0 | 32.4 | 439 |
| 2007-08 | 62.4 | 25.9 | 415 |
| 2008-09 | 59.8 | 28.1 | 477 |
| 2009-10 | 54.5 | 25.6 | 470 |
| 2010-11 | 61.8 | 17.1 | 277 |

# APPENDIX-II

## District - Vidisha

| Year | Area (ha) | Production (ooo' tonnes) | Yield (kg/ha) |
|---|---|---|---|
| 2000-01 | 69.5 | 39.0 | 563 |
| 2001-02 | 68.5 | 40.2 | 587 |
| 2002-03 | 67.9 | 30.7 | 452 |
| 2003-04 | 59.7 | 37.2 | 623 |
| 2004-05 | 65.6 | 40.9 | 623 |
| 2005-06 | 78.8 | 49.8 | 632 |
| 2006-07 | 74.2 | 48.2 | 650 |
| 2007-08 | 79.2 | 40.6 | 513 |
| 2008-09 | 81.6 | 47.8 | 586 |
| 2009-10 | 70.8 | 45.4 | 641 |
| 2010-11 | 75.2 | 33.1 | 441 |

# APPENDIX - III

## Madhya Pradesh

| Year | Area (ha) | Production (ooo' tonnes) | Yield (kg/ha) |
|---|---|---|---|
| 2000-01 | 424.2 | 172.4 | 456.00 |
| 2001-02 | 442.2 | 198.5 | 421.83 |
| 2002-03 | 418.77 | 162.1 | 354.00 |
| 2003-04 | 422.1 | 211.7 | 447.33 |
| 2004-05 | 444.2 | 218.0 | 384.46 |
| 2005-06 | 581.9 | 292.8 | 503.00 |
| 2006-07 | 539.8 | 261.6 | 485.00 |
| 2007-08 | 521.8 | 221.2 | 424.00 |
| 2008-09 | 264.4 | 498.0 | 520.40 |
| 2009-10 | 272.6 | 524.0 | 590.50 |
| 2010-11 | 590.5 | 177.9 | 301 |

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Later joined the Department of Agricultural Economics & Farm Management, College of Agriculture, JNKVV, Jabalpur for M.Sc. (Ag.) in Agricultural Economics and for completion of the degree programme, this thesis work is submitted in partial fulfillment of the degree.