Trend and growth rate analysis of maize crop in different agro climatic regions of Madhya Pradesh

THESIS

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In

AGRICULTURE
(AGRICULTURAL ECONOMICS & FARM MANAGEMENT)

By

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CERTIFICATE - I

This is to certify that the thesis entitled **" Trend and growth rate Analysis of maize crop in different agro climatic regions of Madhya Pradesh"** submitted in partial fulfilment of the requirement for the degree of **MASTER OF SCIENCE IN AGRICULTURE (Agricultural Economics and Farm Management)** of the Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur is a record of the bonafide research work carried out by **Ms. NEHA SHRIVASTAVA** under my guidance and supervision. The subject of the thesis has been approved by the Student's 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 him.

(Dr. A. M. Mishra)
Chairman of the Advisory Committee

THESIS APPROVED BY THE STUDENT'S ADVISORY COMMITTEE

Chairman	**Dr. A. M. Mishra**	.....
Member	**Dr. A. Shrivastava**	.....
Member	**Dr. S. K. Agrawal**	.....

CERTIFICATE - II

This is to certify that the thesis entitled **" Trend and growth rate Analysis of maize crop in different agro climatic regions of Madhya Pradesh"** submitted by **Ms. NEHA SHRIVASTAVA** to the J.N. Krishi Vishwa Vidyalaya, Jabalpur, in partial fulfilment of the requirements for the degree of **Master of Science in Agriculture** in the **Department of Agricultural Economics and Farm Management** has been, after evaluation, approved by the External Examiner and by the Student's Advisory Committee after an oral examination of the same.

Place:Jabalpur
Date

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V ITA

The author of this thesis Neha Shrivastava was born on 20 March 1987 at Jabalpur District (Madhya Pradesh). She passed her High School (10^{th}) in year 2003 from MHSS (Seoni) with 79.2% marks. She passed her Higher Secondary in the year 2005 from MHSS, (SEONI) with 72% marks.

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* * *

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Place: Jabalpur ***(NEHA SHRIVASTAVA)***

Date:

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INTRODUCTION

Maize (Zea – Mays L.) is one of the most important cereal crop of the world. Maize is highly yielding, easy to process, readily digestible and cost less than any other cereal. It is also a versatile crop allowing it to grow across a range of agro ecological zones. Every part of maize plant has economic value the grain stalk, tassel, and cob can also be use to produce a large variety of food and non food products.

Maize provides nutrients for human and animals and serves as a basic raw material for the production of starch, oil, protein, alcoholic beverages food sweetness and more recently fuel. In India maize is mainly used in poultry fed manufacturing.

In India maize is grown in all the seasons Kharif, Rabi, summer season, of these three seasons nearly 90% of the production is from Kharif season, 7 – 8% during Rabi and remaining in summer season. Since the maize is rain dependent it is mainly grown during kharif season, maize like any other cereal is grown across all the state in India.

India is the fifth largest producer of maize in the world contributing 3% of the global production. India had produced 16.68 million tonnes of maize in 2009-10, down from 19.73 million tonnes in 2008-09.The dip in production last year was mainly because of poor monsoon. Greater availability of hybrid seeds would also help boost maize production. In the last few years, the trend has moved towards hybrid seeds. The maize acreage is around 8.17 million hectares.

Madhya Pradesh contribute 12% production in India, maize is grown in the states of Andhra Pradesh, Rajasthan, Madhya Pradesh, Bihar U.P. Karnataka, Gujarat which contribute 17, 14, 12, 10, 09, 08, & 5.8 percentage respectively. Madhya Pradesh

has large percentage of cropped area under maize. Madhya Pradesh has 8.58lakh hectare of area under maize.

Maize is a new traditional oil seed crop and the oil contain in general varies from 2.5 to 5.5 percentage. It contains 80 – 87% unsaturated fatty acids. Maize oil is widely used as a cooking medium and for manufacturing of hydrogenated oil. The oil has the quality of reducing cholesterol in human blood like sun flower oil. The fat contain of oil is about 80%.

The next important field where maize finds extensive use for live stock feeds viz, cattle poultry and piggery both in the form of seeds and fodder. The green fodder can be fed to milch cattle to boost the milk production of a considerable extent. The most of the developing countries maize is consumed directly as a food. In India over 85% of maize production is used as food.

Most commonly used forms are as chapattis, porridges of various form, boiled or roasted green ears, pop corns, breakfast food like corn flakes.

Maize acts as a source in the manufacture of starch syrup, dextrose, Oil, gelatin, lactic acid etc. Corn flour is used as a thickening agent in the preparation of many edibles like soups, sauces and custard powder. Corn syrup is used as an agent in confectionery units. Corn sugar (dextrose) is used in pharmaceutical formulations is a sweetening agent in soft drinks etc. corn gel an account of its moisture retention character is used as a bonding agent for ice cream cones and as dry dusting agent for baking products.

The maize cob the central rachis to which the grains are attached remains as an agricultural waste after thrashing. It finds many important agricultural an industrial uses.

The industrial uses based on the physical properties of the cob when ground to powder are as fillers for explosive in the manufacture of plastics glues adhesive rayon resin, vinegar and

artificial lather and as diluents and carrier in the formulation of insecticides and pesticides based on the chemical properties. The processed cob find their use in the manufacture of furfural, fermentable sugar, solvents, liquid, fuel charcoal gas and other chemicals by destructive distillation in also in the manufacture of pulp, paper and hard boards. The water, in which the maize grains are socked for the manufacture of glucose, is used for growing penicillin molds.

Other industries (mainly starch, dextrose, corn syrup, corn oil etc) experts opine that there is a need to increase the production of maize in the country otherwise looking at the demand growth; India may well have to import maize in the coming years. Production of maize has been going up in eastern U.P. and Bihar however in many other parts of the country farmers are shifting from maize cultivation in search of more lucrative crop. It is also widely believed that in the very near future maize may become a staple food for human consumption if the demand for rice and wheat is not fulfilled throw increase production. According to expert a maize revolution is likely in sub – Sahara Africa, South Asia and East Asia. The maize crop is extremely productive in the U.S. the crop has high generic yield potential and is used both as animal feed and for human consumption and is also required by industries.

Objectives: -

1. To study absolute and relative changes in area, production & productivity of maize crop in different agro climatic regions of M.P.
2. To study the trend and growth rate in area, production, and productivity of maize crop in different agro climatic regions of M.P.
3. To project the expected area and production of maize crop.
4. To suggest policy implication based on the analysis.

Assumption: -

The present investigation is based on the major assumption of the agro climatic zones within the state are assumed to homogenous in agro climatic conditions.

Limitations of the study: -

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

1. The result of this study will be situation specific.
2. The empirical estimation is based on data collected from different published records and reports and therefore validity of data cannot be questioned.

REVIEW OF LITERATURE

Review of literature is an essential part of the thesis. The main objective of the review of literature is to determine what work (both theoretical and empirical) has been done before. It assists in the delineation of problem area provides a basis for conceptual framework, provides insight into the methods and procedures, suggests operational definitions of major concepts and provides basis for generalization of findings. Thus, it was thought appropriate to review the literature on area, production and productivity of crops in a chronological order. This is also having relevance of the present study.

Bhatia,-M-S (1991) presents the statistics for pulse production in the country, using data from 1950/51 to 1990/91. Growth rates in the supply of pulses are reviewed and compared to those for the supply of food grains like wheat and rice. The economic constraints to pulse production are the higher risks attached to the cultivation of the crop in rain fed areas, and the rate of innovation adoption. The relationship between the prices of pulses and those for other staples is also a significant determinant of the farmer's supply. Hence, there must be a breakthrough in cultivation techniques and farm management in rain fed areas before the supply of pulses can be increased.

Jain-KK (1991) examined the growth rate of different food grain 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 districts 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 food grain supply. Hence, there is a need to direct policy at stabilizing yields.

Moorti,-T-V 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 define in productivity, for both crops, is a result of a shift away from the use of fertile soils to marginal tends. Moreover, this brand is a consequence of the Green Revolution which has 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.

Lal *et al.* (1994) conducted a study on growth rate of area, production and productivity of rice, wheat and maize in Bihar state, over the period 1951-The growth rate of production was increased significantly for all crops due to growth in productivity. The contribution of area to production was not significantly for rice in study area.

Shukla-ND *et al.* (1994) studies the inter-regional variation in acreage, production and yields of major field crops over the period 1965-87 in seven agro-ecological regions in northern India is studied. The analysis covers five cereal crops (rice, wheat, sorghum, pearl millet, and maize), two pulse crops (chick peas pigeon peas), two oilseed crops (groundnuts, rapeseed and mustard) and one commercial crop (sugarcane).

Joshi and Sharma (1995) estimated the compound growth rate of area production and yield of rice for the period 1970-71 to 1988-89 for various coastal districts of India using the growth equation $y=ab^t$.

Vani Vyasulu (1996) studied the growth rates for three important cereals crops in Karnataka, namely rice, jowar and ragi in the three sub-periods 1955-56 to 1964-65, 1965-66 to 1979-80 and 1980-81 to 1989-90. The results indicated that in the case of rice there was a positive growth rate in the production and yield

over the entire period and a negative growth rate in area In case of ragi, the growth rate of production was higher than that of rice. A positive growth rate in area and production over the entire period with the highest growth in the second sub period was reported. In the case of jowar, there was a high growth rate in area and production in most of the districts. Productivity in most of the districts was high in the second period compared to the first and third sub periods.

Deepak-Shah (1997) study to evaluate the growth rate of area, production and yield of food grain crops In India over the period 1975/76-1990/91 and the magnitude of instability of these variables for each crop, and lastly examines the relative contribution of effects of basic components (area, yield and their interaction) to food grain production. The paper also throws light on the future prospects for food grain production and demand. The increase in food grain production over the period has been substantial but has brought in its wake uneven development across regions and crops

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 to1966-67],(2)- [1967-68 to 1977-78] and (3)-[1978-79 to 1989-90]. The increase in the production of cereals during period (1) noted the productivity positive decline in same 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.

Singh-RKP and Ranjan-KP (1998) performed an analysis on growth performance of principal food grain crops In North Bihar, India, over the period 1970/71-1994/95 and revealed that production recorded positive growth rates during the post-green revolution period. Wheat was the only crop which recorded positive growth rates in area, production and yield across the

zone over different sub-periods Moreover, a declining trend in rice area has been observed during the early 1990s. The study indicated that wheat, maize and pigeon peas witnessed a continuous decline in instability over the period under study. The decline has been due mainly to adoption of improved technology in crop production.

Bhatnagar (2000) estimated area, production of wheat in Haryana, growth performance of production of wheat is better than its growth in area and yield. Area and production have decreased in third decade but it has not affected the average yield of wheat. An estimate of area, production and yield of wheat in Haryana has been obtained for next years with 95 percent confidence limit.

Badal and Singh (2001) conducted study on technological change in maize production. Technological change was attributed for 30 per cent of total yield increase in HYVs technology in *kharif maize* production. This shows that if local variety maize growers just shift from local varieties of maize to cultivation of HYVs of maize, they cultivated in *kharif* and simultaneously use inputs levels being used on HYVs farms they could earn an additional of 39 per cent of their existing Income from maize. Similarly the component of technological change in rabi maize production was 45 per cent and the rest 35 per cent was attributed to higher input use level on HYVs farms of maize. Thus it can be inferred that if *rabi* maize growers shift from local varieties to HYVs of maize, they can increase their income by 45 per cent of the existing level being used on HYVs farms, they could raise their income by 80 per cent of existing level.

Singh and Chandra (2001) the growth in food grain production and productivity trend in state of Madhya Pradesh have increased while area has showing decreasing trend. But rates of production was low during the pre-green revolution period (3.12%) compared to green revolution period (4.27%). The

difference in growth rate for production between pre and post-green revolution did not differ significantly. In case of area, growth rate has declined during the post green revolution period and this decline was significant compared to pre-green revolution period but rate of growth in productivity has shown increasing trend.

Wasim,-M-P (2001) studies the analysis of growth and variability/instability in area, production and yield of major crops for two different periods in China: period I (1976-77 to 1987-88) and period II (1988-89 to 1999-2000). The study reveals that the high yield growth rate of rice, maize, groundnuts and rapeseed was mainly due to favorable price incentives, expanded irrigation system, use of HYVs, application of rising level of chemical fertilizer and implementation of the production responsibility system in period I, The study also confirms that in period II not arty the production of wheat, soybean, groundnuts and rapeseed declined significantly but instability in their production also declined The study also concludes that changes in production which cause instability are due to a number of factors including availability of irrigation water, prices of competing crops and availability of agricultural Inputs.

Awastht and Rathi (2002) study on Performance and Supply Response Analysis of Slow Growth Maize Crop in Madhya Pradesh *Examine* the spatial and temporal variations in growth rates in area, production and productivity and the causes of slow performance of *maize* in Madhya Pradesh, assess the factors attributing supply response of maize and suggest appropriate policy measures The study utilized time-series data on area. Production and productivity of maize and competing crop, i*.e.,* soybean, farm harvest price, pre-sowing rainfall and net Irrigated area of major maize producing districts (Dhar Jhabua, Mandsaur, Ratlam, Shivpuri and Guna) of Madhya Pradesh during the period 1966-67 to 1998-99. The growth rates were estimated in relation

to two time-periods, i.e., 1966-67 to 1985-86 (period I) and 1986-87 to 1998-99 (period II). The rate of growth was higher in period I than in period II. The growth of maize production during period I was area ted whereas in period II. The growth *of* maize production was both area led as well as productivity led. There has been a negative growth rate of area in Mandsour. Ratlam, *Shivpuri,* Guna and the state as a whole, which is attributable to amny factors, viz.. competing crops, price fluctuation, unfavorable weather, etc. The fall in maize area is substituted by a corresponding increase in the area under soybean which is a competing crop of maize. Among the selected districts only Jhabua and Khargone showed promising results.

Mamatha *et al.* (2002 **)** the growth rate of area of cashew in Kerala was declined (-4.32% per annum) due to felling of cashew trees, conversion of cashew area into rubber plantation due to its rise in prices. The cashew production growth rates were positive and significant for Andhra Pradesh (10.16%), West Bengal (12.56%). Karnataka (7.72%), Tamil Nadu (12.84%) and Maharashtra (24.95%). The growth rate of production in Orissa was negative (-5.25%) and non-significant due to decline in the productivity. The productivity growth rate in Goa (-7.78%), Kerala (-0.96%), Orissa (-7.49%) and Tamil Nadu (-0.14%) were indicated negative and decreasing trend. The growth rate of area (5.20%), production (2.26%) and productivity (2.87%) at all India level were experienced positive, significant and shown increasing trend.

Singh *et* al. (2003) examined transformation of Indian maize economy. Maize was traditionally grown as staple food, primarily for household consumption, but it is demanded for feed and industrial uses which has increased rapidly in the recent past . In our country, more than 50 percent of maize produce is being used as animal feed.

Deka and Sarmah (2004) examined growth trends in area, production and productivity of Banana in Assam. The paper attempted to estimate trend in area, production and productivity of banana in the state of Assam for the period 1980-81 to 1999-2000. The fitted trend revealed that area and production of banana in the period under reference had been in upward trend in initial period, yet decreased area and production had been prominent in the later period.

Jahagirdar *et al.* (2004) analyzed growth rate of production components of cotton in Maharashtra covered data from 1960-61 to 1995-96. They observed that production and productivity of cotton were found to be high inconsistent over the entire period of study. Significant growth rates were not observed for almost all districts during any phase.

Kumar et al. (2004) examined the adoption pattern of improved maize technology in the traditional maize growing states, viz., Bihar Madhya Pradesh. Punjab. Rajasthan and Uttar Pradesh, along with its impact on farm earning and trade prospects. Although, the adoption of modem technology by farmers in this region has been low, the impact of these technologies has been found significant. The yield of hybrid cultivars was more than 4 tonne/ha compared to less than 2.5 tonne/ha from the traditional cultivars during the kharif season. Similarly, during the tab* season, yield from hybrids has been about 6 tonne/ha and from composite*, 4 tonne/ha The unit cost of production has declined considerably, adding to the farm profits, and turning maize more profitable in comparison to its competing crops It has been suggested that the adoption of improved technologies and improvements in infrastructure and processing could help farmers to realize the benefits of trade liberalization.

Samui *et al.* (2004) studied trends in area, production and productivity of sugarcane in relation to weather in Maharashtra and Uttar Pradesh Period under study 1970-71 to 1990-91. The

compound growth rate of area, production and productivity of sugarcane in Maharashtra and Uttar Pradesh were positive except in few cases where it was negative the total output of sugarcane has increased mainly due to rise in area and productivity in the states of India.

Shibu *et al*. (2004) the annual compound growth rate of area was highest (5.97%) in period-l compared to whole period (2.22%) with declining trend in period-ll (-1.82%). A positive significant growth rate of production was noticed (3.76%) in period-l with stagnation in production growth rate (0.02%) in whole period and showing a decline trend (-1.18%) in period-ll. The negative productivity growth rate was registered in the whole period (-2.11%) as well as in period-l (-2.08%) with a low and positive growth rate was recorded in period-ll (0.87%).The production growth rate was recorded a positive (2.62%) in period-l with a negative growth rate (-2.37%) in period-ll. The productivity showed a decline in period-l (-3.54%) and period (-0.76%).

Varghese (2004) worked out the trend in area, production and productivity of Cardamom in Kerala for a period from 1970-71 to 2002-03. Using semi logarithmic growth equation. The area under cardamom registered a negative percentage) annual trend growth rate of -1.216 which is statistically significant The output grows at an average annual trend growth rate of 4.14 per cent and yield registered an average annual growth rate of 5.51 per cent

Velvan (2004) revealed that the world growth rate of area and production in the pre-liberalization period (1980-81 to 1990-91) was higher than the post-liberalization period (1991-92 to 2000-01). However, the India's growth rate of cashew area was higher in post-liberalization period (4%) than the pre-liberalization period (1.5%) but the production growth rate was slightly lower in

the post-liberalization (4.63%) than the pre-liberalization period (4.82%).

Lathika and Ajith Kumar (2005) analyzed the growth trends in Area, Production and Productivity of coconut In India of all the coconut producing states/union territories for which the period has been divided into two sub-periods as phase I (1951 to 1995) and phase II (1999 to 2002).

Ahirwar *et al.* (2006) the present address the issues concerning growth in area, production, productivity and supply response of soybean in different district in Malwa plateau of Madhya Pradesh. The result shows that the growth of soybean productivity was positive in Dhar, Mandsaur, Ratlam, and Rajgarh districts but it was insignificant except for Dewas. Where in case of area growth was positive and significant for all district of Malwa Plateau.

Bala et al. (2006) estimated temporal changes in area and production of barley in Himachal Pradesh. Trends in area, production and productivity of major crops namely barley, wheat, rice and all cereal crops increased throughout, registering a significant impact of cereal production. The compound growth rate for area as well as production of barley in Himachal Pradesh have shown a sharp decline over the period. The crop seems to be at very of extinction as its acreage has declined at an average annual compound decline rate of 1.98 percent, resulting in about 35 percent decreases over the last 25 years.

Borah and chakarborty (2006) made an attempt examined the pattern of growth of some important crops and changes in cropping pattern in the north eastern region (NER). The study has indicated that rice productivity has recorded an increase of 1.02 percent annum in the region, where as in the case of Maize the annual compound growth rate in productivity is 1.03percent. Vegetables and tuber crops registered a decline from 260.03

thousand hectares to 189. 40 thousand hectares. The highest yield variability is found in pulse crop, which can be attributed to the climatic conditions.

Devraj *et al.* (2006) analyzed growth and instability of chickpea (gram) production in Madhya Pradesh. Study revealed that state registered a positive compound growth rate in case of area, production and productivity of chickpea but significant growth rate was observed only for area under the crop. An inter period analysis indicated that the state witnessed insignificant growth rate of chickpea production during 1990-91 to 2000-01 instead of significant positive growth rate during 1980-81 to 1989-90.

Ayandiji, *et al.* (2011) analyzed that there was an increase in the pressure to improve the quantity food produced relation to rapid increase population. This examined the trends of the output five food crops grown Nigeria between year 1990 and 2005, the production and recommends policies for sustainable increase food in Nigeria. Secondary data were obtained and regression analysis was used for data analysis. The result showed that the physical output food crops in Nigeria portrayed a clear trend over the period reviewed. Out of all the crops studied cassava constituted 62.27% in the total output the crops within the period under review, followed by maize (14.3%), and then millet (11.96%); rice was 6.54%. the lowest contribution 4.92% came from beans. The neglect the agricultural sector has negative effect on the food crops and therefore needs effective policies to boost nit. These policies will turn ensure the much expected positive.

PROFILE OF THE STUDY AREA

Madhya Pradesh, as the name indicates is located in the central India and comes under the North Central Zone of India. Its central position only gives it a name Madhya, meaning 'centre' in Hindi. Madhya Pradesh is bordered by the states of Rajasthan to the northwest, Uttar Pradesh to the north, Chhattisgarh to the east, Maharashtra to the south and Gujarat to the west Madhya Pradesh was the largest state in India until 1 November 2000, when the state of Chhattisgarh was carved out of it. The capital of the state is Bhopal.

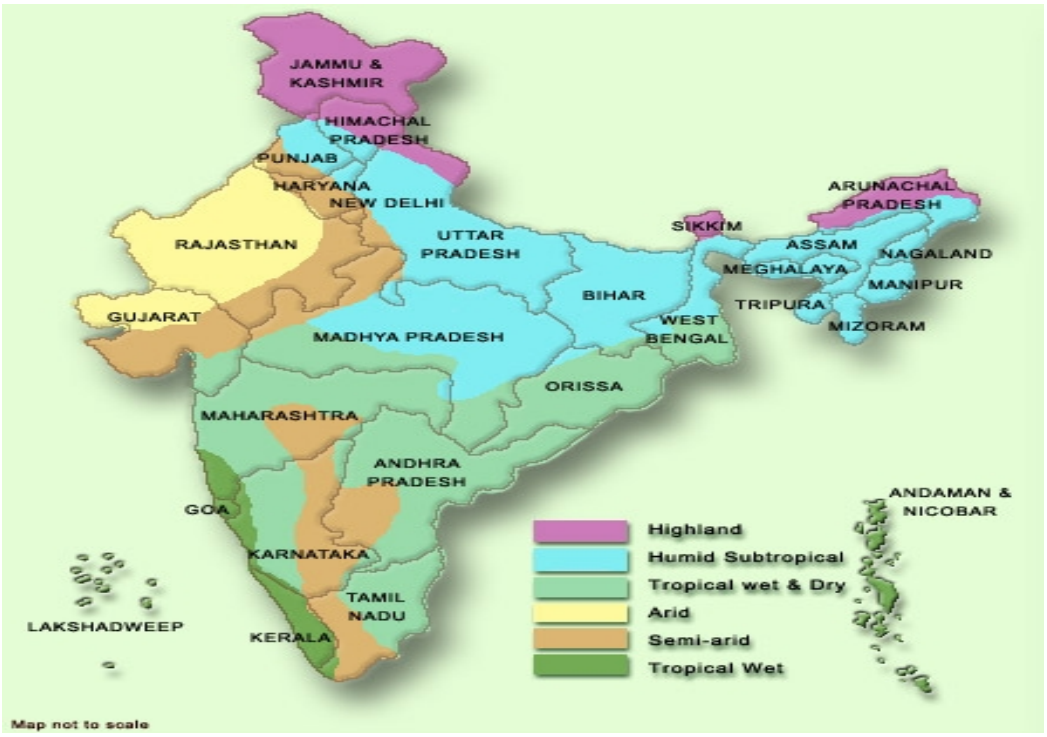
The magic of Madhya Pradesh lies in its exquisitely carved temples, proud fortresses and variety of wildlife. Madhya Pradesh has everything from rich history and heritage, divinity, colorful simple people, art and architecture, wonderful handicrafts to unique wildlife.

3.1 Geography

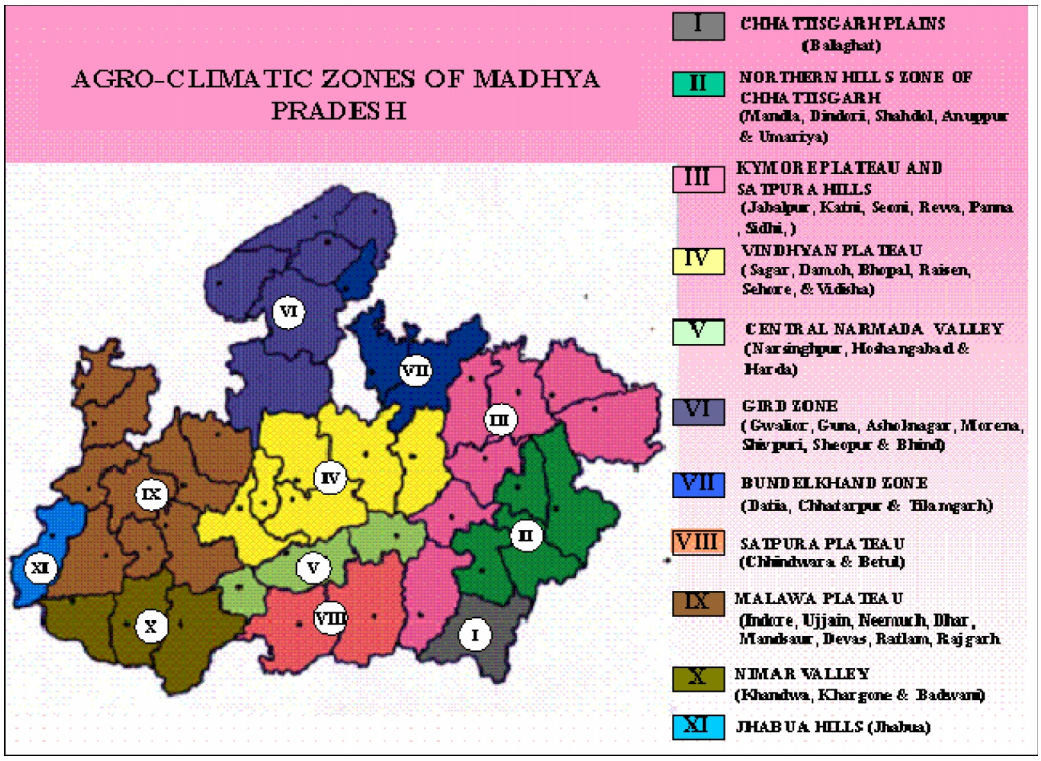
Madhya Pradesh is located between 21 degree 4 minutes north latitude and 74 degrees 2 minutes and 82 degrees 49 minutes east longitude. Total geographical area of the state is nearly 3, 08,252 sq.km, which constitutes almost 9.38 percent of the total land of the country. Forests cover one third area of the state. The forest area of the state is near about 95,221 sq. km, which is 33 percent of the total geographical area of the state and 12.44 percent of the forest area of the country.

3.2 Climate

Madhya Pradesh has a mixed topography that consists of both hills and plains the state has three predominant seasons: winter (October-February), summer (March-May), and monsoon season (June-September). Madhya Pradesh receives an average annual rainfall of about 1200mm (nearly 50 inch), of which 90 percent falls during the monsoon season.



Agro Climatic Map Of India



Agro climatic zones of Madhya Pradesh

3.3 Administration

There are 50 districts in the state of Madhya Pradesh. The State Agricultural Universities were advised to divide each zone into subzone, under the National Agricultural Research Project (NARP). According to which the whole state is divided into 11 Agro climatic regions, which is based on rainfall, soil type and topography.

Agro climatic Region	Soil Type	Rainfall (mm)	Districts
Chhattisgarh Plains	Red & Yellow	1200 to 1600	Balaghat
Northern Hills Region of Chhattisgarh	Red & yellow, medium black & Skeletal (medium/light)	1200 to 1600	Shahdol, mandla, dindori, anuppur, umariya
Kaymore Plateau & Satpura Hills	Mixed red & black soil	1000 to 1400	Rewa, Satna, Panna, Jabalpur, Seoni, Katni, Sidhi, singrolli
Central Narmada Valley	Deep black	1200 to 1600	Narsingpur Hoshangabad
Vindhya Plateau	Medium black & deep black (medium/heavy)	1200 to 14000	Bhopal Sehore Damoh Vidhisha Raisen sagar
Gird Region	Alluvial (light)	800 to 1000	Gwalior, Bhind, Morena, Sheopur, Guna, Ashok
Bundelkhand	Mixed red & black	800 to 1400	Chattarpur Datia tikamgarh
Satpura Plateau	Shallow black	1000 to 1200	Betul chhindwara
Malwa Plateau	Medium black (medium)	800 to 1200	Dhar Mandsour Neemach Ratlam Ujjain Dewas Indore shajapur
Nimar Plateau	Medium black (medium)	800 to 1000	Khandwa Burhanpur Khargone Barwani harda
Jhabua Hills	Medium black skeletal (light/medium)	800 to 1000	Jhabua alirajpur

3.4 Culture

Madhya Pradesh is bestowed with a rich historical background and cultural heritage. It is home of about 40 percent of India's tribal population. There are three distinct tribal groups in the state. The largest chunk is formed by the Gonds, who once ruled a major part of the state and after whom Gondwana, the central portion of the state is known. Western Madhya Pradesh is inhibited by the hills.

3.5 Demography

Population Census Data of one of the Indian state Madhya Pradesh shows that it has total population of 7.25 Crore which is approximately 6.00% of total Indian population.

Population	72,597,565 (census 2011)
Male	37,612,920
Female	34,984,645
Area (in Sq. KM)	3,08,245 sq. km
Revenue Divisions	10
Districts	50
Tehsils	272
Developmental Block	313
Populated Villages	56346
Gram Panchayat	22029
Literacy	70.63
Male (Literacy)	80.53
Female (Literacy)	60.02
Density of population	236 km sq
Male – Female Ratio	1000:930

3.6 Economy

About 80 percent of the population of Madhya Pradesh depends on agriculture for its livelihood. The major crops of the state are categories into three major types and these are food grains, oilseeds and cash crops. The state is the largest soybean producer in India. Other crops include linseed.

3.7 Cropping Pattern of Madhya Pradesh:

Crops of Madhya Pradesh are basically divided into three categories namely cash crops, oilseeds and food grains. Major crops of Madhya Pradesh include soybean, wheat, gram, paddy, maize, rapeseed & mustard and cotton. Madhya Pradesh is primarily kharif crop growing state.

Area under the Major Crops of Madhya Pradesh: -

Sl. No.	Name of Crop	Unit: Thousand hectare					
		2007 – 08	2008 – 09	2009 – 10	Average	% Covered	Rank
1	Soybean	5201.7	5295.1	5439.8	5312.2	25.4	I
2	Wheat	4101.4	4009.8	4459	4190.1	20	II
3	Gram	2661.8	2875.1	3007.7	2848.2	13.6	III
4	Paddy	1645.1	1716.8	1593.1	1651.7	7.89	IV
5	Maize	852.7	837.6	812.5	834.3	3.99	V
6	Mustard	636.3	757.4	768.7	720.8	3.44	VI
7	Cotton	624.9	612.3	623.1	620.1	2.96	VII
8	Urd	570.1	516.6	574.2	553.6	2.65	VIII
9	Lentil	521.8	530.8	519.3	524	2.5	IX
10	Jowar	546.3	485.5	456.1	496	2.37	X
11	Tur	304.4	310.1	324.9	313.1	1.5	XI
12	Sesamum	309.9	244.4	320.5	291.4	1.39	XII
13	Ground Nut	204.4	205.6	188.1	199.4	0.95	XIII
14	Bajra	202.4	175.3	198.1	191.9	0.92	XIV
15	Pea	170.6	203.5	194.1	189.4	0.9	XV
	Other Crops	1965.9	1984.2	2035.3	1995.13	9.53	
	Gross Cropped Area	20519	20760	21515	20931.2		

RESEARCH METHODOLOGY

The purpose of this chapter is to discuss the different analytical tools and procedure, used to determine empirically the changes, trends and variations in area, production and productivity and relative contributions of area, production and productivity to the changes in production of maize crop in different agro – climatic regions of Madhya Pradesh.

4.1 Area under Study

Madhya Pradesh, the whole state was studied, considering its agro climatic regions as units of investigation, because in Madhya Pradesh, a marked variation prevails in soil and climate which divided the state in eleven distinct agro climatic regions, which have resulted in great variation in farming patterns and growth rates in area, production and productivity in different parts of the state. In order to make the differences easily understandable, different districts were grouped under the following regions instead of accounting them separately.

4.2 Sources of Data Collection

Times series data of area, production and productivity of Maize was obtained from various issues of M.P. Agricultural Statistics published by Directorate of Land Record and Directorate of Farmer Welfare and Agriculture Development, Madhya Pradesh.

4.3 Period under Study

The study covered 10 years from 2000 – 01 to 2009 – 10.

4.4 Analytical Tools

Complete behavior of a variable cannot be understood by a single statistical tool. The science of statistics provides various tools to look into the variables at depth the tools used in this study have been spelled out in details in the following section

(A) Absolute change

One of the methods of studying comparison into change over time/state/crop is by estimation of absolute change. This can be carried out by the base and end year of the concerned period. These years (beginning and end) may be exceptionally good/bad and will give a distorted picture of the change. Therefore, it was considerable proper to take an average of three years, base and end of a particular period. For measuring the absolute change in area, production and productivity, the mean value of each of these elements for the first (base) and the last (current) triennium ending 2000 – 01 to 2009 – 10 are used. Absolute change in area, production and yield are carried out by the formula:-

$$\text{Absolute change} = Y_n - Y_0 \quad \ldots\ldots\ldots\ldots \text{(i)}$$

Where,

Y_n = Mean value (area, production and productivity) for the last triennium ending.

Y_0 = Mean value (area, production and productivity) for the first (base) triennium ending.

The absolute change has been worked out for eleven agro climatic regions and maize crop.

(B) Relative change

Absolute change fails to depict a comparative change among the variables and therefore, in addition to absolute change, relative change has also been included in the present study. Relative changes have been worked out by the index number, which is a good measure of relative performance.

$$\text{Relative change} = Y_n - Y_0/Y_0 \times 100 \quad \ldots\ldots\ldots \text{(ii)}$$

This measure has been worked out for the variables for which absolute change has been worked out.

(C) Growth rate — Linear and Exponential

The following models were fitted from the regression analysts method (Least square technique) to judge the trends in area, production and productivity of maize crop in eleven agro climatic regions for 10 years period.

Linear model

$$Y = a + bx \qquad \ldots\ldots\ldots\ldots \text{ (iii)}$$

Where,

Y = dependent variable (area, production and productivity)

X = independent variable (years)

a = intercept

b = regression co-efficient

Simple growth rate = $\frac{b}{\bar{Y}} X 100$

Exponential model:

$Y = ab^x$

OR, $\log Y = \log a + x \log b \qquad \ldots\ldots\ldots\ldots$ (iv)

Compound growth rate = (Antilog b -1) x 100

Where,

b = antilog (b)

The compound growth rate represents a uniform rate of change from year to year.

The linear trend (iii) shows a constant amount of change or constant arithmetic rate of growth (b) or an estimate of the absolute increase per unit, but the percent values varies from year to year. The exponential trend, on the other hand, gives directly a constant rate of change or geometric rate of growth. It represents a uniform rate of change from observation to observation (year to year). It Is compound in nature.

D. Measure of instability: -

To measure the extent of instability (variability) in production component of maize for the study period i.e. 2000 – 01 to 2009-10 the coefficient of variation were worked out using the formula

$$\text{C.V.(\%)} \frac{\text{S.D.}}{\text{mean}} \text{X100}$$

Where

$$\overline{X} = \frac{\sum X}{n}$$

$$S.D. = \sqrt{V}$$

E. Trend analysis and growth rates:

To study the growth rate of maize crop in selected district end agro climatic regions the trend analysis was carried out using linear trend method

Linear trend, Y = a ± bx + E

Where,

Y = dependent variables (Area, Production and Yield)

a = intercept/ constant

b = Regression co-efficient

x = time period

E = Error term with zero mean & constant variance

Where regression coefficient (b) was worked as

A) Two estimate the trend and growth rate: -

Y = a + bx

$$b = \frac{\sum xy - \frac{(\sum x)(\sum y)}{n}}{\sum X^2 - \frac{(\sum x)^2}{n}}$$

The homogeneity of trend value (b) for the 10 years period was tested using following formula

$$t = b/SE_b$$

Where

b = trend value of the study period (2000 – 01 to 2009 – 10)

SE_b = standard error of b

(F) Projection

The projection of area, production and productivity of crop, for required projection period (x), is estimated by substituting the value of coefficient a and b of the respective series, in the linear equation.

RESULTS AND DISCUSSION

The present chapters use economic interpretation of the observations being presented in tabular form distinctly in respect of various regions. The specific attempt has been made to exhibit the maize crop in different agro- climatic regions *of Madhya* Pradesh, indicating the behavior of producers regarding importance laid *by* them as regards to area, production and yield of the above mentioned crop based on the measures like arithmetic average, absolute and relative changes. The other statistical measures applied to demonstrate the magnitude of changes in the area production and yield are *coefficient* of variance, simple *growth* rate, compound growth rate, trend analysis & projection.

4.*1* Region wise arithmetic average of Area, Production and Productivity of maize crop under different agro-climatic regions of *Madhya Pradesh* –

From the table 4.1 arithmetic averages is the indicator to access the performance of the farmers in different agro-climatic zones of Madhya Pradesh,

So far the discussion was confined to arithmetic averages of area, total production and yield of maize crop of the different agro- climatic regions in terms of time, i.e. the base year average of the three years *(2000 – 01* to 2002 –0*3)* and the current year average of the three years *(2007-08* to *2009 -10) t*his gave an idea about what happened to the areas, total production and yield of the maize crop mentioned above over the base year. In fact, the method followed so far was silent about the yearly fluctuation in crop acreage, total production and yield of various agro-climatic regions of the stats the common measure of assessing the arithmetic average which has been worked out for each region of the state and presented in the table 4.1. of the crop under study.

It was observed from the above table 4.1. that, the Malwa plateau has the highest arithmetic average in terms of area, production and productivity for the production of maize , and central Narmada valley has the lowest arithmetic average . Several factors such as institutional policies, micro and macro policies like land policy, agricultural credit, subsidies of inputs and farmers training programs etc. But the government has more impact in Malwa Plateau as compared to the rest of the zones in Madhya Pradesh. On the other hand, in addition, Central Narmada valley, Chhattisgarh Plains, Bundelkhand, Jhabua hills have lowest arithmetic average values. It was observed from the study that several factors such as urbanization, bad government policy, and technological backward and unsuitable soil pattern were responsible for the decrease in production of the Maize**.**

Table 4.1: Arithmetic Average of maize of the study period

Agro – climatic zones	Area '000ha	Production '000tonnes	Productivity kg/ha
Chhattisgarh Plain	4.48	7.44	1669.42
Northern hill Region of Chhattisgarh	73.91	93.1	6054.51
Kymore Plateau & Satpura hills	60.61	79.03	9198.2
Central Narmada Valley	2.11	3.68	3692.41
Vindhya Plateau	31.62	48.9	9560.6
Gird Region	27.42	38.61	7140.12
Bundelkhand	4.09	3.92	2873.52
Satpura Plateau	123	257.38	4138.4
Malwa Plateau	294.42	509.12	1257.82
Nimar Plains	62.46	89.23	6150.32
Jhabua Hills	12.13	13.28	216.46
Madhya Pradesh	865.17	1327.57	1536.8

4.2 Absolute and Relative Changes in different Agro – climatic regions of Madhya Pradesh: -

The absolute and relative change in area, production and productivity of maize crop under different agro climatic regions of MP have been provided in table 4.2 .

It revealed from the table that the absolute change in area of maize crop in MP was found negative value (-13.47 Th. ha.) which shows that the area of maize crop was decreases . among the agro climatic regions the area of maize crop increase only in vindhya plateau, gird region , bundelkhand, and satpura plateau, and more changes was observed in satpura plateau(23.13 th. ha.). In case of relative change Bundelkhand has the maximum increase followed by Satpura plateau, Gird region, Northern hills region of Chhattisgarh and Vindhya Plateau.

As for as absolute change in the production of maize crop was concerned , it was observed that in all the agro climatic regions except Bundelkhand was negative which indicates that production of maize crop in all the regions was also decreases. In terms of relative change Northern hills region of Chhattisgarh ranks first, followed by Bundelkhand.

The same pattern was observed in case of absolute change in the productivity of maize crop in all the agro climatic regions. In terms of relative change all the agro climatic regions shows the decrease in terms of yield.

4.3 Variability's in area, production and productivity of Maize of the study period (2000–01 to 2009–10) of different agro- climatic zones of Madhya Pradesh –

The area, production and yield of maize crop of different agro-climatic regions in MP based on chronological order of time i.e. the base year average of the three years (2000–01 to 2002–03) and the current years (2007-08 to 2009-10). This gave an idea about what was happened in area, production and yield of the maize crop during 2009-10. The method explained the yearly fluctuations in crop acreage, total production and yield in various agro-climatic regions of the state. The common measure of assessing the area variability is coefficient of *variance*, which has been worked out for each region of the state.

From the table 4.3 it can be noted that in Bundelkhand region has the highest coefficient variance (40.44) with respect to area and production. In Nimar plains there was a decrease in coefficient *variance* in terms of area. In case of Satpura plateau there was a decrease in coefficient *variance* of area , production and productivity.

Table 4.3: Coefficient of variance (%) of Maize crop under different Agro – Climatic regions of Madhya Pradesh:-

Agro – climatic zones	Indicator	Area	Production	Productivity
Chhattisgarh Plain	CV(%)	6.29	23.56	21.8
NH hill Region of Chhattisgarh	CV(%)	7.92	30.17	27.16
Kymore Plateau & Satpura hills	CV(%)	3.78	22.45	40.8
Central Narmada Valley	CV(%)	12.69	31.86	27.95
Vindhya Plateau	CV(%)	5.32	21.7	18.82
Gird Region	CV(%)	11.46	32.66	36.59
Bundelkhand	CV(%)	40.44	38.85	30.11
Satpura Plateau	CV(%)	11.33	16.26	15.58
Malwa Plateau	CV(%)	8.31	27.04	19.98
Nimar Plains	CV(%)	2.93	34.95	27.33
Jhabua Hills	CV(%)	12.58	30.78	19.09
Madhya Pradesh	CV(%)	3.29	19.9	18.18

4.4 Trend analysis

In the previous section a detailed discussion on the absolute and relative changes in area, production & productivity of maize crop in different agro climatic regions of M.P. during the period of 2000 – 01 to 2009 – 10 have been synthesized. The other statistical tool like linear equation has been used in this section, the result of this analysis provided trends of area production and productivity in linear forms, linear function was fitted in the study and compared in the preliminary analysis. For the purpose of giving agro climatic region wise picture of the trends in, area, production & productivity of maize crop, this has been fitted on the time series data. Linear trend value of Area, Production and Productivity of maize crop under different agro-climatic regions of Madhya Pradesh have been provided in table 4.4.

Table shows that the trend value of area of maize crop in M.P. has negative (-0.022) and non significant. Among the agro climatic regions, only in four regions vindhya plateau, bundelkhand , gird region & satpura plateau the value of regression coefficient were positive and also found significant at 1% level, in case of bundelkhand & satpura plateau region only. The value of regression coefficient of production in all the agro-climatic regions except bundelkhand negative trend was observed. Which shows that the production comes in decreasing order. Regarding the value of regression coefficient for productivity of maize , negative significant trend value were observed , which indicates the productivity decreases in all the agro-climatic regions during the study period. In mp value of regression coefficient of production and productivity was also found negative and non significant.

Overall it could be concluded that in most of the agro-climatic regions the trend value of area, production and productivity were observed negative. It shows that area, production and productivity decrease during the study period.

Table 4.4: Agro-Climatic region wise trend in Area, Production & Productivity of Maize: -

Agro climatic Region	Area		Production		Productivity	
	Constant (a)	Coefficient (b)	Constant (a)	Coefficient (b)	Constant (a)	Coefficient (b)
Chhattisgarh Plains	27.39	-4.88	15.80	-1.38*	16.03	-0.006*
Northern Hill Region of Chhattisgarh	38.47	-0.44*	14.07	-0.09*	16.23	-0.001*
Kymore Plateau & Satpura Hills	46.92	-0.68	16.71	-0.14*	9.23	-0.0004
Central Narmada Valley	7.99	-1.18	12.69	-1.95*	14.43	-0.002*
Vindhya Plateau	0.53	0.15	17.16	-0.23*	19.82	-0.001*
Bundelkhand	-0.58	1.48*	4.14	0.34	13.40	-0.002*
Gird Region	-1.76	0.26	8.75	-0.08	9.31	-0.0005
Satpura Plateau	-14.80	0.16*	7.37	-0.007	20.29	-0.003*
Malwa Plateau	35.20	-0.08*	12.88	-0.014**	12.67	-0.0005
Nimar Plateau	17.34	-1.03**	11.01	-0.06**	13.07	-0.001**
Jhabua Hills	17.86	-0.08	10.21	-0.02	12.07	-0.002
Madhya Pradesh	31.83	-0.022 (0.036)	15.21	-0.007 (0.003)	16.63	-0.007 (0.002)

Note: **Significant at 1% (3.25) level

* Significant at 5% (2.26) level

4.5 Simple Growth Rate of maize crop in different agro climatic regions of Madhya Pradesh: -

The value of simple growth rate of area in Bundelkhand and Satpura plateau region, were observed positive and significant at 1% level, which indicates the area under maize crop on these regions comes increasing order. In M.P. state the value of simple growth rate of area was found negative and non significant.

The value of simple growth rate of production in maize crop were observed negative in all the agro climatic regions except Bundelkhand. It was also observed that in most of the agro climatic region the value of simple growth rate were found significantly negative. In case of productivity of maize crop the value of simple growth rate in all the agro climatic regions as well as M.P. state were estimated negative and also in some regions value were observed negatively significant, i.e. Chhattisgarh plains, Northern region of Chhattisgarh, Central Narmada valley, Gird region, Nimar plains, Bundelkhand, Vindhya Plateau, Satpura Plateau.

Thus it could be concluded that in most of the agro climatic except Bundelkhand, Vindhya Plateau, Gird Region, Satpura Plateau the value of simple growth in area production and productivity of maize crop were found negative and also in some regions negatively significant in all the three variables i.e. area production and productivity of maize crop during the study period. So efforts are needed to increase the area and productivity of maize crop by adopting improved technology by the concern persons. As this is one of the important cereal crop in Madhya Pradesh.

Table 4.5: Simple Growth Rate

Agro – climatic zones	Indicator	Area	Production	Productivity
Chhattisgarh Plain	SGR	-109.111	-18.604**	-0.0003**
NH Region of Chhattisgarh	SGR	-0.604**	-0.105**	-2.9005**
Kaymore Plateau & Satpura hills	SGR	-1.124	-0.179**	-4.4006
Central Narmada Valley	SGR	-55.932	-53.124**	-6.6005**
Vindhya Plateau	SGR	0.496	-0.483**	-1.6005**
Bundelkhand	SGR	36.384**	8.796	-9.6005**
Gird Region	SGR	0.966	-0.216	-7.5005
Satpura Plateau	SGR	0.134**	-0.002	-8.6005**
Malwa Plateau	SGR	-0.027**	-0.002*	-4.1006
Nimar Plains	SGR	-1.666*	-0.069*	-2.0056*
Jhabua Hills	SGR	-0.064	-0.013	-0.0001
Madhya Pradesh	SGR	-0.0020	-0.0050	-0.0040

Note: **Significant at 1% (3.25) level

* Significant at 5% (2.26) level

4.5 Compound Growth Rate of maize crop in different agro-climatic regions of Madhya Pradesh: -

The compound growth rate in Area, total production and productivity of maize crop under different agro climatic regions of Madhya Pradesh have been provided in Table 4.6.

Estimate of compound growth rate of maize in different agro climatic regions and the state as a whole during the period 2000– 01 to 2009 – 10. Maize crop has registered an annual growth rate of (0.123%) in area (0.128%) in production and (0.138%) in productivity in whole Madhya Pradesh level, which were statistically non significant. Among the agro climatic regions all the regions have shown a declining trend except Bundelkhand region in terms of area only. Northern region of Chhattisgarh, Satpura plateau, Malwa plateau and Nimar plains have shown a negative significant trend, in terms of

area. In production all region have shown a declining trend , which were highly significant except bundelkhand, gird region, satpura plateau, jhabua hills. The yield in all the regions have shown declining trend, and highly significant except kymore plateau, gird region, malwa plateau and jhabua hills. Nimar plain and northern region of chhattisgarh had registered negative and significant growth rate for area, production & productivity. In the above discussion we conclude that only bundelkhand region shows the positive &significant growth rate in terms of area but its production & yield trend were negative.

Table 4.6: Compound Growth Rate

Agro – climatic zones	Indicator	Area	Production	Productivity
Chhattisgarh Plain	CGR	-588.82	-238.44**	-100.63**
NH hill Region of Chhattisgarh	CGR	-144.62**	-109.52**	-100.17**
Kymore Plateau & Satpura hills	CGR	-168.26	-114.19**	-100.04
Central Narmada Valley	CGR	-218.22	-295.54**	-100.24**
Vindhya Plateau	CGR	-84.30	-123.83**	-100.15**
Bundelkhand	CGR	48.80**	-65.51	-100.27**
Gird Region	CGR	-73.51	-108.41	-100.05
Satpura Plateau	CGR	-83.50**	-100.71	-100.35**
Malwa Plateau	CGR	-108.99**	-101.45*	-100.05
Nimar Plains	CGR	-203.82*	-106.17*	-100.12*
Jhabua Hills	CGR	-108.90	-102.52	-100.26
Madhya Pradesh	CGR	0.123	-0.128	-0.138

Note: **Significant at 1% (3.25) level

*Significant at 5% (2.26) level

4.7 Projection in area, production, and productivity of maize crop in different agro climatic regions of Madhya Pradesh: -

The data on projected area, production and productivity of maize crop in different agro climatic regions of Madhya Pradesh is given below in table 4.7. It is apparent from the table that is area under maize crop will expected to increase in Kymore plateau and Satpura

hills 36.17 thousand hectare in 2014–15, which is highest among different agro climatic regions of state. The area under maize for malwa plateau will expected to 34 thousand hectare in 2014-15 followed by northern region of Chhattisgarh 31.87thousand hectare, bundelkhand (21.62 th.ha.), jhabua hills(16.66 th.ha.), vindhya plateau (02.78 th.ha.) gird region (02.14 th. ha.), nimar plain (1.89 th.ha.). the increment of area under maize will expected to 31.5th.ha. at whole Madhya Pradesh level in 2014-15. The production of maize will expected to increase in all the agro climatic regions except Chhattisgarh plain and central narmada valley. The productivity of maize will expected to 20.24 kg/ha. In satpura plateau, followed by vindhya plateau (19.80kg/ha.), northern region of Chhattisgarh (15.94kg/ha.), central Narmada valley (14.45kg/ha.), bundelkhand (13.37kg/ha.), nimar plain(13.05), malwa plateau (12.66kg/ha), jhabua hills (12.04kg/ha.), gird region (19.30kg/ha), and kymore plateau (9.22kg/ha). It is remarkable to note that all the agro climatic regions registered a positive in the projected productivity of maize in 2014-15.

Table 4.7: Projection For Area, Production & Productivity of Maize In Different Agro – Climatic Regions Of Madhya Pradesh

Agro – Climatic Regions	Area '000ha	Production '000 tones	Productivity Kg/Ha
Chhattisgarh Plain	-45.81	-4.92	15.94
NH hill Region of Chhattisgarh	31.87	12.72	16.21
Kymore Plateau & Satpura hills	36.17	14.61	9.22
Central Narmada Valley	-9.71	-16.56	14.4
Vindhya Plateau	2.78	13.71	19.8
Bundelkhand	21.62	9.24	13.37
Gird Region	2.14	7.55	9.3
Satpura Plateau	-12.4	-7.26	20.24
Malwa Plateau	34	12.67	12.66
Nimar Plains	1.89	10.11	13.05
Jhabua Hills	16.66	9.91	12.04
Madhya Pradesh	31.5	15.1	16.52

SUMMARY, CONCLUSIONS AND SUGGESTIONS FOR FURTHER WORK

Increased production of maize could not cope up with their increasing demand in india even after addition of large area under maize crop, as a result of that , india is still starving for a lrge quantum of maize production, in order to feed teeming millions, maize based industries and for streanthning india's external reserve position. India had produced 16.68 million tonnes of maize in 2009-10, down from 19.73 million tonnes in 2008-09.The dip in production last year was mainly because of poor monsoon. Greater availability of hybrid seeds would also help boost maize production. In the last few years, the trend has moved towards hybrid seeds. The maize acreage is around 8.17 million hectares.

With regards to the facts an accurate appraisal of trends in maize production is of great importance so as to provide with a critical evaluation of the past trends in are production and productivity with a view to assess the future production potential of the state while preparing a development plan.

The study was undertaken with a view to analyze the pattern of development in area production and productivity of maize crop in different agro climatic regions of Madhya Pradesh. In view of importance of this crop in the state the proposed study seeks to diagnose the answers of following questions like: -

1. What is the performance of maize crop in terms of area production and productivity in study area?
2. What are the factors influencing the growth rate of the maize crop?

Cases of slow growth rate the proposed study will be undertaken with the following specific objectives –

1. To study absolute and relative changes in area, production & productivity of maize crop in different agro climatic regions of Madhya Pradesh.
2. To study the trend and growth rate in area, production, and productivity of maize crop in different agro climatic regions of Madhya Pradesh.
3. To project the expected area and production of maize crop.
4. To suggest policy implication based on the analysis.

Material & Methods –

Whole Madhya Pradesh was studied considering its eleven agro climatic regions as a unit of investigation. Regarding area production and productivity were collected from secondary sources absolute and relative changes were worked out for the maize crop, for all agro climatic regions and for the state as whole. Trend analysis of area production and productivity of maize crop was done using linear and exponential growth model.

Conclusions: -

The present study attempts to estimate the trend and growth rate and their projection in area production and productivity of maize crop in different agro climatic regions of Madhya Pradesh. The study is based on secondary data and related to 2000 – 01 to 2009 – 10 periods; collected from various publications. The absolute change relative change trend and growth rate analysis were done for maize crop in different agro climatic regions of the state.

The analysis of data provides the following conclusion: -

1. It was observed from the analysis that among the different agro climatic regions, malwa plateau has the highest airthmatic average in terms of area, production & productivity. where as central Narmada valley has the lowest airthmatic average values.

2. Among the different agro climatic regions, bundelkhand has the highest relative change in terms of area.
3. Bundelkhand region has the highest coefficient variance with respect to area and production. In Nimar plains there was a decrease in coefficient variation in terms of area.
4. In case of Satpura plateau there was a decrease in coefficient variation of area production and productivity.
5. Agro climatic regions wise analysis shows that there was negative trend in area, production and productivity at whole Madhya Pradesh.
6. Trend coefficient for area were positive in vindhya plateau, bundelkhand, gird region, satpura plateau, but it was found significant only in bundelkhand &satpura plateau.
7. The trend coefficient for area, and production, was positive in only bundelkhand region.
8. Among the agro climatic regions all the regions have shown a compound growth rate except Bundelkhand region in terms of area only.
9. Highest positive & significant SGR found in Bundelkhand region in case of area. In production remarkable SGR was visible in bundelkhand region.
10. Nimar plain had registered negative & significant growth rate for area, production, & productivity.
11. Only bundelkhand region shows the positive & significant growth rate in terms of area but its production & yield trend were negative.
12. Area under maize will expected to increase in kaymore plateau & satpura hills.

13. The projection of production of maize will expected to increase in all the agro climatic regions except chhattisgarh plain and central Narmada valley.
14. The productivity of maize will expected to increase In satpura plateau.
15. The projection was found positive in the projected productivity of maize in all agro climatic regions.

Suggestions for improvement of maize crop production

1. Surveying and identification of the problems in different agro climatic regions of the state very closely.
2. For different agro climatic regions, suitable package of practices should be searched out and recommended.
3. Intensive need oriented researches should be done and on that basis planning and designing be made in such a way which will iceally be fruitful.
4. Prices offered to maize should not only be reasonable but also attractive enough so that switch over to other crops are checked.
5. To encourage growers of maize crops the inputs should be made available from nearest distribution centers at a reasonable rate and the loan system for that should be liberalized and be given in kind as for as possible.
6. Maize plan requires inputs from many disciplines and linkage of many governmental and voluntary organizations.
7. Depending on the potential situations of the agro climatic regions, the agencies should normally include finance, information, market regulation.
8. In order to achieve the maximum potential intensified cultivation of maize crop in the state, it will be necessary to modernize production techniques and provide adequate finance for the purpose.

Suggestions for further work

The problem of maize production should be examined critically for different agro climatic regions and it will be judged through scientific procedures. programme for the different regions should be made in such a way that procedures may get the advantage of the season, rainfall and soil behavior. The movement should result a richer harvest which will lead to more income to the producers. If possible, district – wise studies should be conducted to make the future programme of production more effective. The constraints which are hindering the production should be identified micro level.

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Fig.5.10: Trend of area production and productivity of Maize in Nimar plain

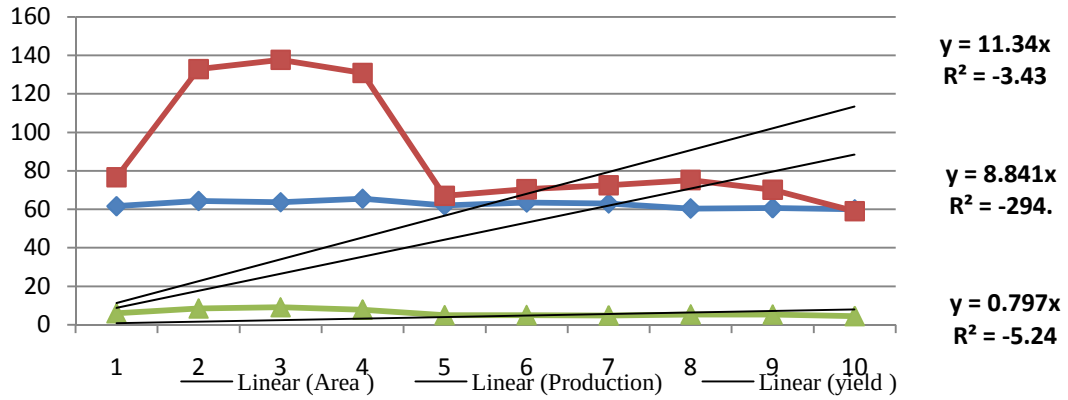


Fig.5.11: Trend of area production and productivity of Maize in Jhabua Hill

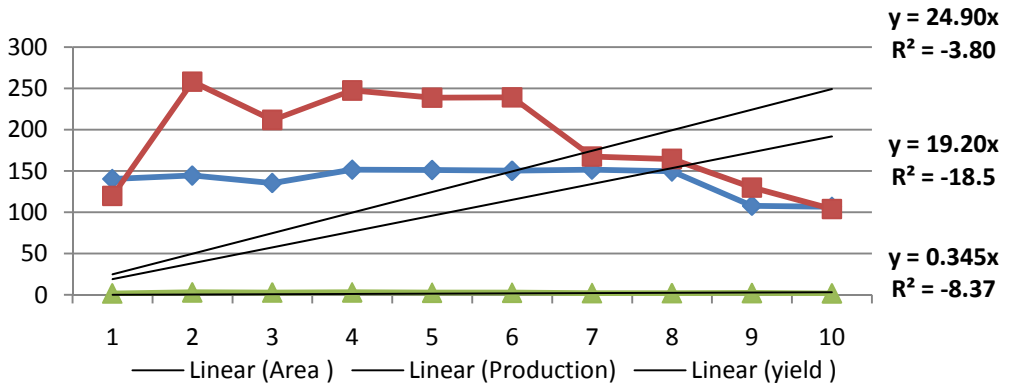


Fig.5.12:Trend of area production and productivity of Maize in Madhya Pradesh

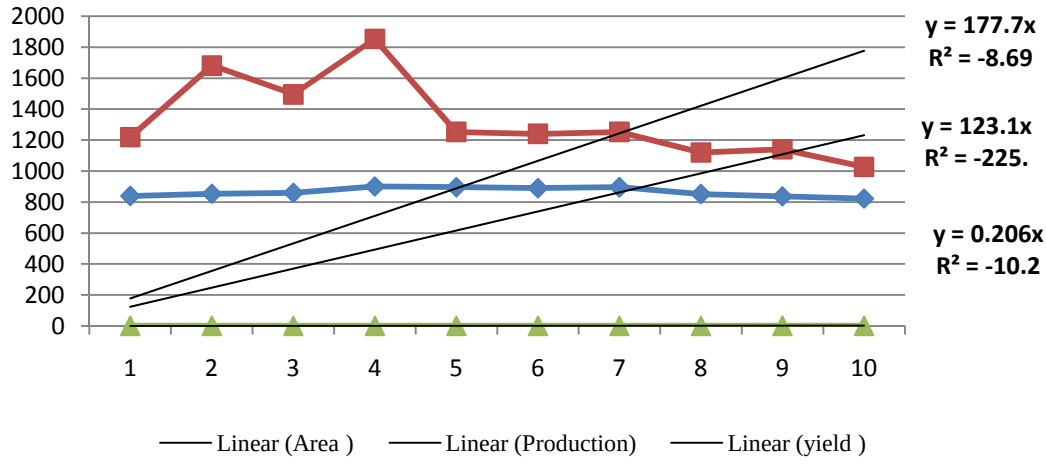


Fig.5.7: Trend of area production and productivity of Maize in Bundelkhand

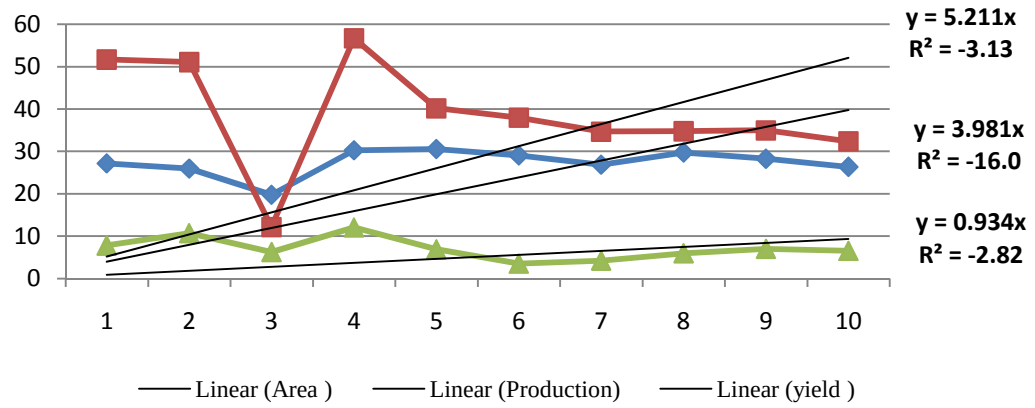


Fig.5.8: Trend of area production and productivity of Maize in Satpura Plateau

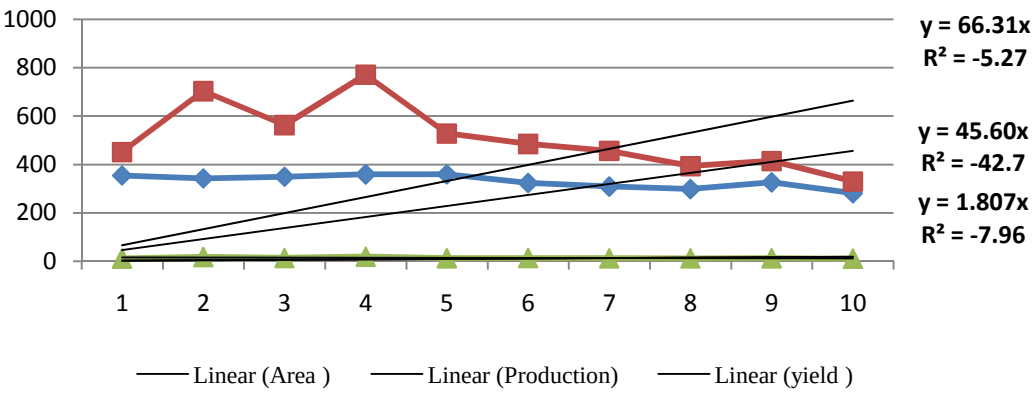


Fig.5.9:Trend of area production and productivity of Maize in Malwa Plateau

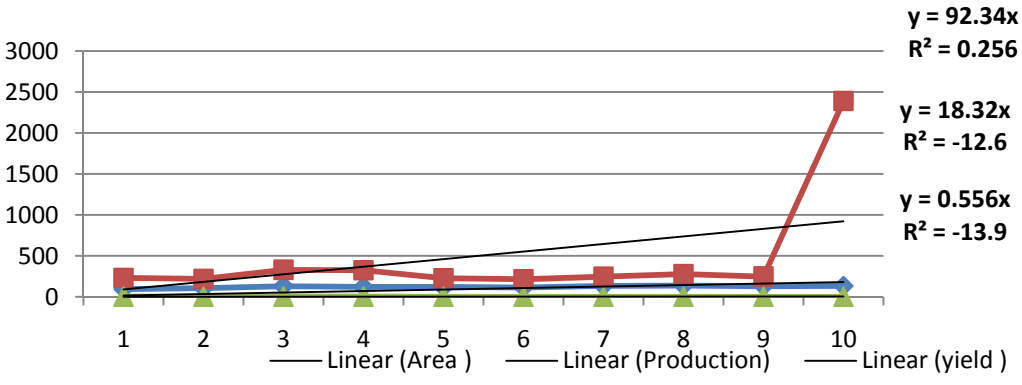


Fig.5.4: Trend of area production and productivity of Maize in Central Narmada Valley

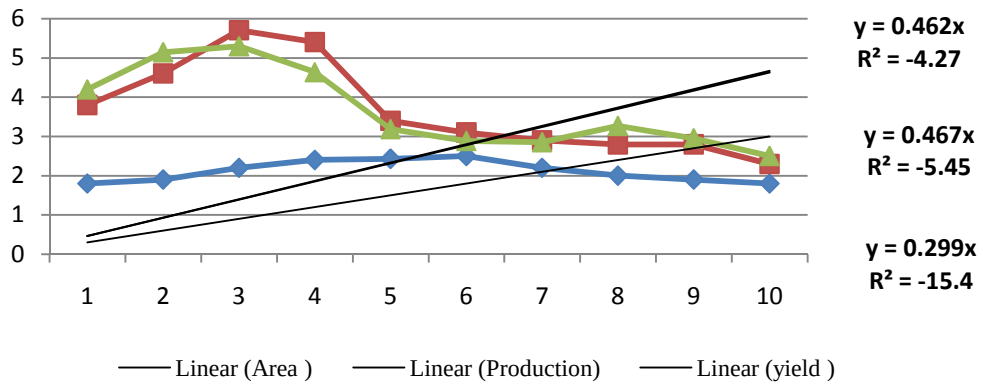


Fig.5.5:Trend of area production and productivity of Maize in Vindhya Plateau

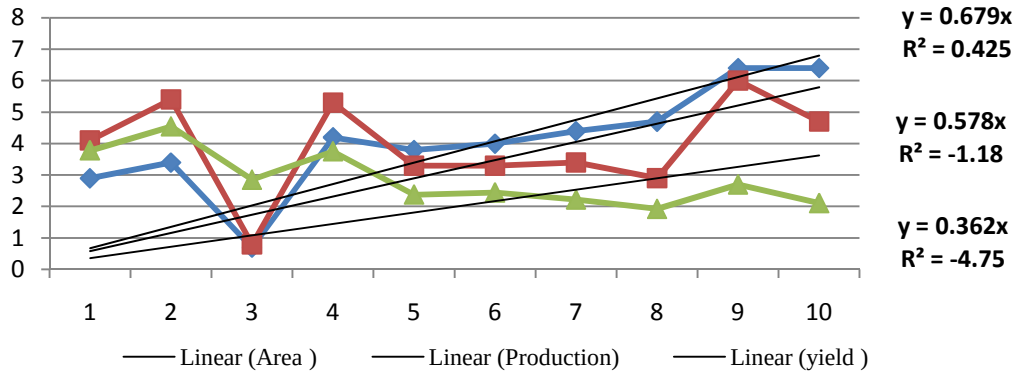


Fig. 5.6: Trend of area production and productivity of Maize in Gird Region

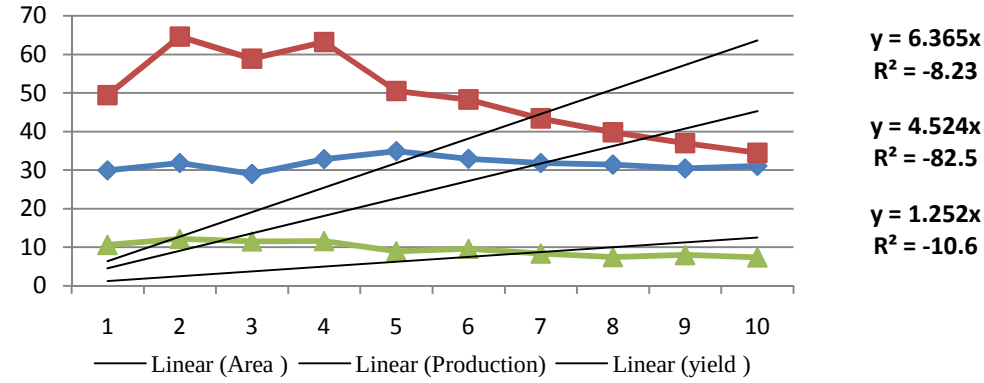


Fig. 5.1: Trend of area production and productivity of Maize in Chhattisgarh Plain

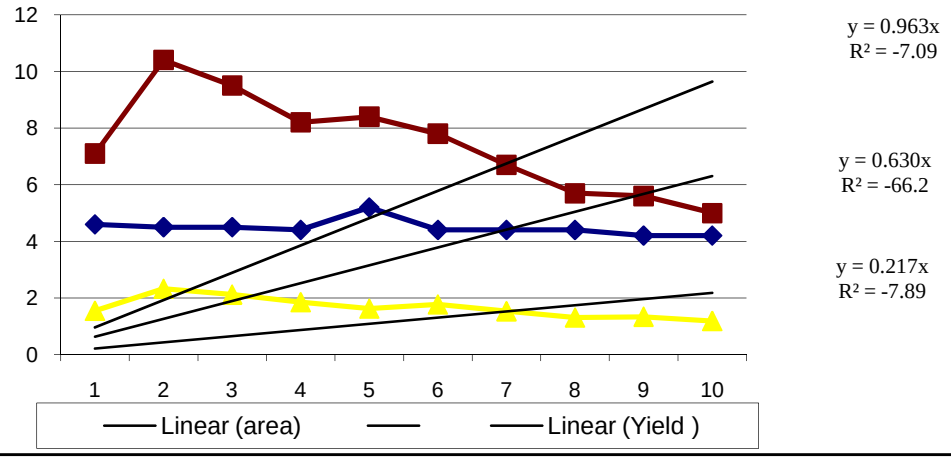


Fig. 5.2 : Trend of area production and productivity of Maize in northern hill regions of Chhattisgarh

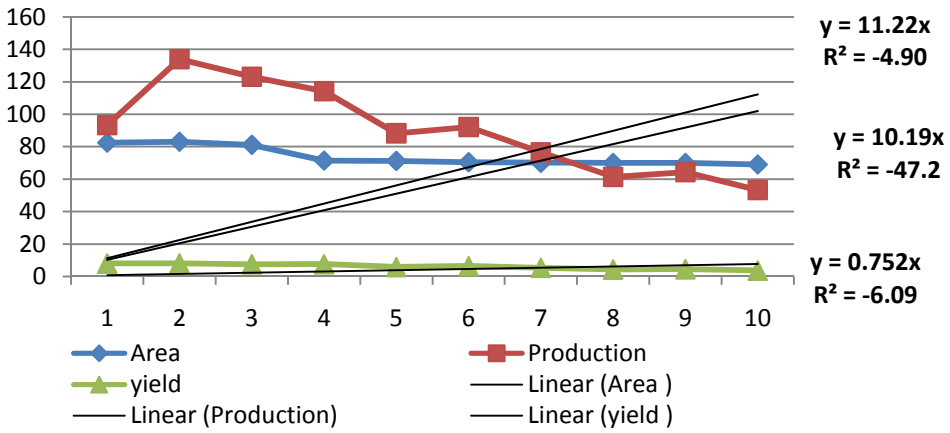
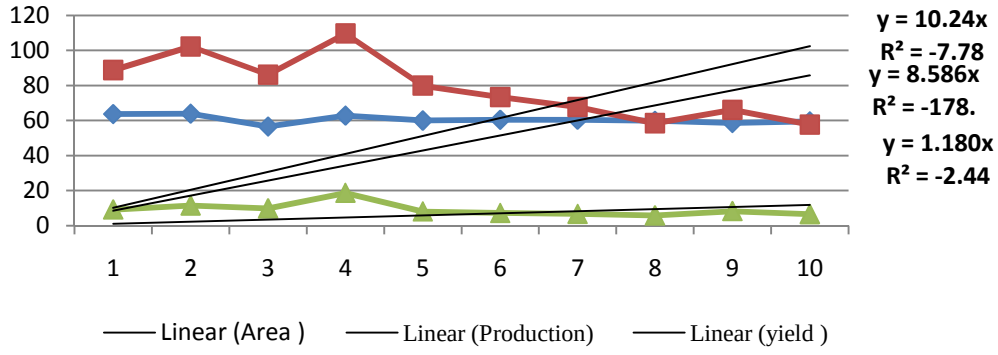


Fig. 5.3: Trend of area production and productivity of Maize in Kymore plateau & Satpura hill



		2000-01			2001-02		
Chattisgarh		**Area**	**Prod**	**yeild**	**area**	**prod**	**yeild**
balaghat		4.6	7.1	1546	4.5	10.4	2326
		4.6	7.1	1546	4.5	10.4	2326
NORTHEN HILLS							
shahdol		24.1	32.5	1351	24.1	29.3	1214
mandla		17.8	30	1681	17.9	35.8	1994
dindori		17.9	38..3	2136	18.1	38.8	2144
anuppur		12	16	1333	12.1	15.8	1305
umariya		10.7	14.9	1400	10.9	14.3	1319
	TOTAL	82.5	93.4	7901	83.1	134	7976
	AVERAGE	16.5	23.35	1580.2	16.62	26.8	1595.2
kymore plateau							
rewa		1.2	1.3	1070	1.1	1.4	1193
satna		1	1.4	1477	1	1.7	1700
panna		2.7	2.6	961	2.5	3.2	1283
jabalpur		4.3	9	2098	4.4	10.1	2314
seoni		14.1	12.5	886	15	30.3	2018
katni		4.1	4.7	1147	4.1	6.6	1623
sidhi		36.4	57.3	1573	35.9	49	1365
singrolli		0	0	0	0	0	0
	TOTAL	63.8	88.8	9212	64	102.3	11496
	AVERAGE						
central narmada valley							
narsingpur		0.5	1.1	2184	0.6	1.7	2984
hoshangabad		1.3	2.7	2012	1.3	2.9	2161
	TOTAL	1.8	3.8	4196	1.9	4.6	5145
	AVERAGE	0.9	1.9	2098	0.95	2.3	2572.5
vindhya plateau							
bhopal		2.2	3.4	1569	2.3	3.9	1686
sehore		14.1	19.6	1392	15.6	31	1993
damoh		2.2	3.9	1772	2.2	5	2227
vidhisha		5.1	10.8	2092	5.2	12.4	2390
raisen		2.5	5.1	2026	2.7	5.8	2176
sagar		3.8	6.6	1739	3.8	6.5	1698
	TOTAL	29.9	49.4	10590	31.8	64.6	12170
	AVERAGE						
bundelkhand							
chattarpur		0.6	0.5	866	0.6	0.7	1073
datia		0.5	0.7	1322	0.9	1.6	1808
tikamgarh		1.8	2.9	1597	1.9	3.1	1662

	TOTAL	2.9	4.1	3785	3.4	5.4	4543
	AVERAGE						
gird region							
gwalior		0.1	0.2	2303	0.1	0.4	4114
bhind		N	N	1660	N	0.1	2025
morena		N	N	1130	N	0.1	1250
guna		26.3	50.9	1938	23.9	47.7	1993
sheopur		0.8	0.6	805	2	2.8	1381
ashok nagar		0	0	0	0	0	0
	TOTAL	27.2	51.7	7836	26	51.1	10763
	AVERAGE						
satpura plateau							
betul		24.4	72.9	2982	26.6	60.5	2273
chhindwara		70.1	158.6	2262	80.7	160.1	1984
	TOTAL	94.5	231.5	5244	107.3	220.6	4257
	AVERAGE						
malwa plateau							
dhar		70.8	76.6	1083	75.7	161	2126
mandsour		59.9	82.3	1374	45.8	115.7	2525
neemach		35.7	55.5	1555	33	75.7	2292
ratlam		59.8	85.7	1432	65	159	2455
ujjain		8.1	9.1	124	12.8	16.7	1302
dewas		12.51	18.9	1509	13.5	23.9	1830
indore		11.1	18.3	1656	7.7	11.1	1450
shajapur		49.2	77.1	1798	45.5	87.9	1931
rajgarh		47.6	27.4	575	43.8	51.7	1182
	TOTAL	354.71	450.9	11106	342.8	702.7	17093
	AVERAGE						
nimar plain							
khandwa		7.1	11.4	1607	8.7	20.9	2408
burhanpur							
khargone		20.8	24.5	1178	20.9	43	2061
barwani		32.4	38.2	1178	33.2	66.1	1988
harda		1.3	2.5	1978	1.5	2.9	2019
		61.6	76.6	5941	64.3	132.9	8476
jhabua hills							
jhabua		102.4	80.3	785	106.6	215.7	2023
alirajpur		38	39.5	1052	37.9	42.2	1111
		140.4	119.8	1837	144.5	257.9	3134

Non reported	7.9	7.8	987	10.9	7.8	715
mp total	840.2	1217.8	1459	854	1680.5	1984

2002-03			2003-04			2004-05		
area	**prod**	**yeild**	**area**	**prod**	**yeild**	**area**	**prod**	**yeild**
4.5	9.5	2119	4.4	8.2	1853	5.2	8.4	1625
4.5	9.5	2119	4.4	8.2	1853	5.2	8.4	1625
24.1	35.1	1458	11.6	15.1	1344	12.1	10.4	904
17.7	28.3	1600	18.3	33.2	1819	18.2	26	1367
17.5	32.2	1840	18.2	34	1854	18	28.2	1499
12.2	15.4	1293	12.1	15.4	1300	12.2	12.7	1014
9.7	12.2	1262	11.2	16.6	1275	10.7	11	1014
81.2	123.2	7453	71.4	114.3	7592	71.2	88.3	5798
16.24	24.64	1490.6	14.28	22.86	1518.4	14.24	17.66	1159.6
0.9	1.1	1220	1.1	1.2	8951	1.1	0.9	802
0.6	0.7	1084	1	1.3	1691	0.8	1	952
2.2	2	909	2.4	2.5	1029	2.5	1.6	668
4.4	11	2524	4.4	11	2486	4.5	9	2058
15.2	19.6	1287	14	26.3	1876	11.5	12.3	1069
3.6	4.4	1214	3.9	6.4	1620	3.9	4.5	1155
29.8	47.4	1589	36.1	61	1067	35.8	50.6	1408
0	0	0	0	0	0	0	0	0
56.7	86.2	9827	62.9	109.7	18720	60.1	79.9	8112
1.1	3.2	2962	0.5	1.5	2629	0.63	1.2	1977
1.1	2.5	2335	1.9	3.9	2008	1.8	2.2	1213
2.2	5.7	5297	2.4	5.4	4637	2.43	3.4	3190
1.1	2.85	2648.5	1.2	2.7				
2	3.7	1822	2.9	4.6	1567	2.9	3.6	1296
16.2	34.4	2119	15.8	29.4	1853	15.7	21.9	1393
1	1.8	1795	2	4.4	2171	2	3.5	1657
4.5	9.4	2123	5.2	11	2056	5.6	8.8	1645
2.6	6	2314	3.1	7.1	2207	4.7	7.7	1660
2.7	3.6	1335	3.8	6.7	1736	4	5	1305
29	58.9	11508	32.8	63.2	11590	34.9	50.5	8956
0.2	0.2	831	0.7	0.8	1181	0.7	0.7	905
0.4	0.5	1183	1.2	1.7	1346	0.9	0.7	740
0.1	0.1	840	2.3	2.8	1227	2.2	1.9	737

0.7	0.8	2854	4.2	5.3	3754	3.8	3.3	2382
N	N	1391	0.2	0.6	3625	0.6	1.5	2310
N	N	2250	N	N	2000	N	N	N
0.1	0.1	1566	N	0.1	1275	0.1	0.1	959
18.8	11.7	623	21.7	41.4	1908	21.4	27.2	1270
0.9	0.4	471	0.9	1.5	1539	0.2	0.2	1039
0	0	0	7.5	13.1	1744	8.3	11.2	1352
19.8	12.2	6301	30.3	56.7	12091	30.6	40.2	6930
40.1	88.2	2197	42.1	85.1	2017	44.5	71.7	1613
92.2	243.1	2636	81.9	241.9	2950	76	156.7	2080
132.3	331.3	4833	124	327	4967	120.5	228.4	3693
84.1	181.8	2154	81.7	171.8	1526	82.4	105.2	1277
45.7	85	1858	47.1	110.5	2126	42.1	60.5	1439
34.4	48.3	1404	31.1	77.66	2347	32.7	57.8	1765
62	79.8	1288	68.8	167.5	2492	76.9	140.8	1830
13.3	15.7	1182	15.6	33.1	3421	14	14.3	1021
12	20.6	1723	14.3	23.4	1628	12.9	14.1	1096
8.1	11.8	1454	9.8	15	1472	9.7	11.2	1147
45.3	84.1	1855	42.9	88.9	2071	41.6	66.9	1609
44.5	35.6	800	47.8	82.7	1724	47.3	56.9	1202
349.4	562.7	13718	359.1	770.56	18807	359.6	527.7	12386
9.7	25.8	2657	7.3	16.9	1681	7.4	12.9	1747
19.6	51.9	2652	20.5	50.4	1828	20.4	22.5	1112
32.8	56.6	1730	35.8	60.2	2454	32.8	29.9	910
1.6	3.4	2071	1.9	3.4	1909	1.4	1.7	1213
63.7	137.7	9110	65.5	130.9	7872	62	67	4982
97.7	166.3	1702	113.5	207.6	2100	112.8	204.3	1811
37.7	45.4	1205	38	39.7	1044	38.3	34.4	900
135.4	211.7	2907	151.5	247.3	3144	151.1	238.7	2711

10.9	7.8	715	10.9	7.8	715	10.9	7.8	715
859.9	1494.4	1751	901.3	1852.6	2027	896.2	1252.6	1406

2005-06			2006-07			2007-08		
area	**prod**	**yeild**	**area**	**prod**	**yeild**	**area**	**prod**	**yeild**
4.4	7.8	1772	4.4	6.7	1534	4.4	5.7	1309
4.4	7.8	1772	4.4	6.7	1534	4.4	5.7	1309
11.6	9.5	818	11.3	9.6	853	11.3	9.8	870
17.9	24	1340	18	22.2	1233	18.1	20.4	1126
18.3	31.1	1693	18.3	23.7	1297	18.1	16.4	909
12.1	14.1	1198	12	11.5	958	12	8.9	743
10.5	13.5	1285	10.5	9.6	919	10.4	5.8	560
70.4	92.2	6334	70.1	76.6	5260	69.9	61.3	4208
14.08	18.44	1266.8	14.02	15.32	1052	13.98	12.26	841.6
0.9	0.8	888	1.1	0.7	636	1.1	0.7	620
0.8	0.6	750	0.7	0.6	850	0.8	0.5	654
2.3	1.4	608	2.1	1.2	571	2	1.2	576
4.6	7	1521	4.2	6.4	1523	4.5	5.2	1157
12.5	13.4	1072	12.7	13.8	1086	11.9	14.3	1205
3.6	4	1111	3.9	3.2	820	3.3	2.2	661
35.8	46.2	1290	35.9	41.8	1164	36.4	34.4	946
0	0	0	0	0	0	0	0	0
60.5	73.4	7240	60.6	67.7	6650	60	58.5	5819
0.6	1.1	1833	0.6	1	1666	0.6	0.9	1958
1.9	2	1052	1.6	1.9	1187	1.4	1.9	1309
2.5	3.1	2885	2.2	2.9	2853	2	2.8	3267
2.8	3.7	1822	2.8	3.6	1285	3	3.5	1157
15.3	21.9	1440	14.6	19.5	1335	14.6	18.9	1298
2	3.5	1657	2	3	1500	1.9	2.4	1260
5.7	8.2	1438	5.3	7.4	1396	5.3	7.1	1353
3.4	6.5	1911	3.3	5.8	1757	3.1	4.1	1325
3.7	4.5	1323	3.8	4.1	1078	3.5	3.8	1095
32.9	48.3	9591	31.8	43.4	8351	31.4	39.8	7488
0.6	0.5	833	0.7	0.5	714	0.7	0.4	627
1.2	0.9	750	1.4	0.9	642	0.9	0.4	627
2.2	1.9	863	2.3	2	869	3.1	2.1	676

4	3.3	2446	4.4	3.4	2225	4.7	2.9	1930
0.1	N	N	0.2	0.2	908	0.2	0.2	908
N	N	N	N	N	N	N	N	667
N	N	N	N	N	N	N	N	1000
21	25.4	1210	18.9	23.1	1222	20.8	22.3	1070
0.9	0.6	666	0.3	0.2	666	1.3	1.1	886
7.1	12	1690	7.5	11.2	1482	7.5	11.2	1482
29.1	38	3566	26.9	34.7	4278	29.8	34.8	6013
40.5	67.2	1659	48	65.8	1370	46.3	63.5	1373
74.8	150.2	2008	85.1	182.7	2149	92.1	216.7	2352
115.3	217.4	3667	133.1	248.5	3519	138.4	280.2	3725
67.1	89	1326	61.8	79.2	1281	59	71.4	1212
40.5	56	1382	39	52.8	1353	38.1	50.5	1322
23.3	32	1470	24.2	35.8	1479	27.4	39.8	1455
62.6	131.8	2100	60	124.8	2080	53.5	104.6	1963
13.9	14.2	1021	10.9	10.8	990	8.9	10.4	1169
15.2	14.1	927	13	15.8	1215	12.3	16.8	1360
5.8	10.8	1862	8.5	10.4	1223	8.9	10.4	1168
44.3	54.3	1225	43.4	43.8	1009	41.7	33.1	792
50.7	82.7	1631	47.8	82.7	1724	48.6	55.7	1144
323.4	484.9	12944	308.6	456.1	12354	298.4	392.7	11585
7.4	12.8	1729	7.5	12.6	1680	6.6	12.6	1907
21	24.6	1171	20.4	25.1	1230	19.8	26.3	1332
33.8	31.4	928	33.5	33.3	994	32.6	34.8	1067
1.3	1.6	1230	1.6	1.5	937	1.4	1.5	1088
63.5	70.4	5058	63	72.5	4841	60.4	75.2	5394
112	203.8	1819	113.5	128	1127	111.5	125	1121
38.2	35.2	921	38	39.5	1052	38	39.5	1052
150.2	239	2740	151.5	167.5	2179	149.5	164.5	2173

10.7	7.6	710	10.8	7.7	712	10.8	7.7	712
890.2	1240	1392	896.2	1252.6	1406	852.7	1119	1320

2008-09			2009-10		
area	**prod**	**yeild**	**area**	**prod**	**yeild**
4.2	5.6	1340	4.2	5	1190
4.2	5.6	1340	4.2	5	1190
11.1	10.6	955	10.9	6.4	540
18.1	20.8	1153	18	18.1	1004
18.5	16.9	915	18.1	16.3	896
11.9	9.9	826	11.7	7.1	604
10.3	6.2	603	10.3	5.4	527
69.9	64.4	4452	69	53.3	3571
13.98	12.88	890.4	13.8	10.66	714.2
1	0.8	845	1.2	0.7	565
0.7	0.5	772	0.8	0.5	669
2.3	2.1	891	2.4	1.3	537
4.6	6	1305	4.3	4.6	1067
11.2	12.8	1139	11.6	12.7	1096
3.5	3.6	1061	3.4	2.5	743
9.1	10.4	1139	9.42	8.5	927
26.3	29.9	1139	26.5	26.9	1011
58.7	66.1	8291	59.62	57.7	6615
0.6	1	1612	0.6	0.8	1331
1.3	1.8	1340	1.2	1.5	1171
1.9	2.8	2952	1.8	2.3	2502
2.8	2.3	1150	2.8	2.8	1007
14.3	16.3	1139	14.3	13.3	927
2.1	3.8	1819	2.1	3.6	1698
4.5	6.4	1406	4.7	5.9	1267
3.3	4.4	1357	3.8	4.6	1204
3.4	3.8	1121	3.4	4.3	1267
30.4	37	7992	31.1	34.5	7370
0.8	0.5	683	0.8	0.5	582
2.4	2.6	1122	2.7	2.4	914
3.2	2.9	900	2.9	1.8	615

6.4	6	2705	6.4	4.7	2111
0.2	0.3	1577	0.2	0.2	1329
N	N	1000	N	N	1000
N	N	1000	N	N	1000
20.2	23.7	1159	18.4	22.7	1235
0.7	0.8	904	0.9	0.7	735
7.2	10.2	1412	6.9	8.8	1273
28.3	35	7052	26.4	32.4	6572
42.5	59.8	1406	46.6	59	1267
87.1	190.1	2183	88.9	2331	2623
129.6	249.9	3589	135.5	2390	3890
61.1	75.8	1240	52.6	56	1066
37.3	52.1	1398	36.7	43.4	1183
27.3	48.7	1787	30.1	39.8	1323
83.1	107.6	2010	49.8	88.9	1785
7.4	8.3	1122	6.7	6.9	1030
10.5	14.6	1392	9.4	11.4	1236
8.1	10.9	1291	5	5.8	1163
41.1	36	877	39.6	32.4	817
50.4	59.9	1188	51	45.1	884
326.3	413.9	12305	280.9	329.7	10487
6.8	11.5	1687	6.6	8.2	1245
20.3	21.4	1054	20.7	19.8	954
32.1	35.1	1093	31.9	29.9	937
1.4	2.1	1505	0.8	1.1	1354
60.6	70.1	5339	60	59	4490
70.2	84.6	1205	68.4	69.7	1019
37.7	45.4	1205	38.3	34.4	900
107.9	130	2410	106.7	104.1	1919

10.8	7.7	712	10.9	7.8	715
837.6	1139.6	1369	823.4	1026.6	1254

Chattisgarh

	area	production	Yield		
1	4.6	7.1	1.546	15.46	1546
2	4.5	10.4	2.326	23.26	2326
3	4.5	9.5	2.119	21.19	2119
4	4.4	8.2	1.853	18.53	1853
5	5.2	8.4	1.625	16.25	1625
6	4.4	7.8	1.772	17.72	1772
7	4.4	6.7	1.534	15.34	1534
8	4.4	5.7	1.309	13.09	1309
9	4.2	5.6	1.34	13.4	1340
10	4.2	5	1.19	11.9	1190

	Area	Production	yield	
1	82.5	93.4	7.901	7901
2	83.1	134	7.976	7976
3	81.2	123.2	7.453	7453
4	71.4	114.3	7.592	7592
5	71.2	88.3	5.798	5798
6	70.4	92.2	6.334	6334
7	70.1	76.6	5.26	5260
8	69.9	61.3	4.208	4208
9	69.9	64.4	4.452	4452
10	69	53.3	3.571	3571

	Area	Production	yield	
1	63.8	88.8	9.212	9212
2	64	102.3	11.496	11496
3	56.7	86.2	9.827	9827
4	62.9	109.7	18.72	18720
5	60.1	79.9	8.112	8112
6	60.5	73.4	7.24	7240
7	60.6	67.7	6.65	6650
8	60	58.5	5.819	5819
9	58.7	66.1	8.291	8291
10	59.62	57.7	6.615	6615

kymore plat

	Area	Production	yield	
1	1.8	3.8	4.196	4196
2	1.9	4.6	5.145	5145
3	2.2	5.7	5.297	5297
4	2.4	5.4	4.637	4637
5	2.43	3.4	3.19	3190
6	2.5	3.1	2.885	2885
7	2.2	2.9	2.853	2853
8	2	2.8	3.267	3267
9	1.9	2.8	2.952	2952
10	1.8	2.3	2.502	2502

	Area	Production	yield	
1	29.9	49.4	10.59	10590
2	31.8	64.6	12.17	12170
3	29	58.9	11.508	11508
4	32.8	63.2	11.59	11590
5	34.9	50.5	8.956	8956
6	32.9	48.3	9.591	9591
7	31.8	43.4	8.351	8351
8	31.4	39.8	7.488	7488
9	30.4	37	7.992	7992
10	31.1	34.5	7.37	7370

vindhya

bundelkhand

	Area	Production	yield	
1	2.9	4.1	3.785	3785
2	3.4	5.4	4.543	4543
3	0.7	0.8	2.854	2854
4	4.2	5.3	3.754	3754
5	3.8	3.3	2.382	2382
6	4	3.3	2.446	2446
7	4.4	3.4	2.225	2225
8	4.7	2.9	1.93	1930
9	6.4	6	2.705	2705

10	6.4	4.7	2.111	2111

gird region

	Area	Production	yield	
1	27.2	51.7	7.836	7836
2	26	51.1	10.763	10763
3	19.8	12.2	6.301	6301
4	30.3	56.7	12.091	12091
5	30.6	40.2	6.93	6930
6	29.1	38	3.566	3566
7	26.9	34.7	4.278	4278
8	29.8	34.8	6.013	6013
9	28.3	35	7.052	7052
10	26.4	32.4	6.572	6572

satpura plateau

	Area	Production	yield	
1	94.5	231.5	5.244	5244
2	107.3	220.6	4.257	4257
3	132.3	331.3	4.833	4833
4	124	327	4.967	4967
5	120.5	228.4	3.693	3693
6	115.3	217.4	3.667	3667
7	133.1	248.5	3.519	3519
8	138.4	280.2	3.725	3725
9	129.6	249.9	3.589	3589
10	135.5	2390	3.89	3890

malwa plateau

	Area	Production	yield	
1	354.71	450.9	11.106	11106
2	342.8	702.7	17.093	17093
3	349.4	562.7	13.718	13718
4	359.1	770.56	18.807	18807
5	359.6	527.7	12.386	12386

6	323.4	484.9	12.944	12944
7	308.6	456.1	12.354	12354
8	298.4	392.7	11.585	11585
9	326.3	413.9	12.305	12305
10	280.9	329.7	10.487	10487

nimar plain

	Area	Production	yield	
1	61.6	76.6	5.941	5941
2	64.3	132.9	8.476	8476
3	63.7	137.7	9.11	9110
4	65.5	130.9	7.872	7872
5	62	67	4.982	4982
6	63.5	70.4	5.058	5058
7	63	72.5	4.841	4841
8	60.4	75.2	5.394	5394
9	60.6	70.1	5.339	5339
10	60	59	4.49	4490

jhabua hills

	Area	Production	yield	
1	140.4	119.8	1.837	1837
2	144.5	257.9	3.134	3134
3	135.4	211.7	2.907	2907
4	151.5	247.3	3.144	3144
5	151.1	238.7	2.711	2711
6	150.2	239	2.74	2740
7	151.5	167.5	2.179	2179
8	149.5	164.5	2.173	2173
9	107.9	130	2.41	2410
10	106.7	104.1	1.919	1919

mp total

	Area	Production	yield	
1	840.2	1217.8	1.459	1459

2	854	1680.5	1.984	1984
3	859.9	1494.4	1.751	1751
4	901.3	1852.6	2.027	2027
5	896.2	1252.6	1.406	1406
6	890.2	1240	1.392	1392
7	896.2	1252.6	1.406	1406
8	852.7	1119	1.32	1320
9	837.6	1139.6	1.369	1369
10	823.4	1026.6	1.254	1254

NORTHEN HILLS

eau

central narmada valley

plateau

	2000-01			2001-02			
Chattisgarh	Area	Prod	yeild	area	prod	yeild	area
balaghat	4.6	7.1	1546	4.5	10.4	2326	4.5
	4.6	7.1	1546	4.5	10.4	2326	4.5
NORTHEN HILLS							
shahdol	24.1	32.5	1351	24.1	29.3	1214	24.1
mandla	17.8	30	1681	17.9	35.8	1994	17.7
dindori	17.9	38..3	2136	18.1	38.8	2144	17.5
anuppur	12	16	1333	12.1	15.8	1305	12.2
umariya	10.7	14.9	1400	10.9	14.3	1319	9.7
TOTAL	82.5	93.4	7901	83.1	134	7976	81.2
AVERAGE	16.5	23.35	1580.2	16.62	26.8	1595.2	16.24
kymore plateau							
rewa	1.2	1.3	1070	1.1	1.4	1193	0.9
satna	1	1.4	1477	1	1.7	1700	0.6
panna	2.7	2.6	961	2.5	3.2	1283	2.2
jabalpur	4.3	9	2098	4.4	10.1	2314	4.4
seoni	14.1	12.5	886	15	30.3	2018	15.2
katni	4.1	4.7	1147	4.1	6.6	1623	3.6
sidhi	36.4	57.3	1573	35.9	49	1365	29.8
singrolli	0	0	0	0	0	0	0
TOTAL	63.8	88.8	9212	64	102.3	11496	56.7
AVERAGE							
central narmada valley							
narsingpur	0.5	1.1	2184	0.6	1.7	2984	1.1
hoshangabad	1.3	2.7	2012	1.3	2.9	2161	1.1
TOTAL	1.8	3.8	4196	1.9	4.6	5145	2.2
AVERAGE	0.9	1.9	2098	0.95	2.3	2572.5	1.1
vindhya plateau							
bhopal	2.2	3.4	1569	2.3	3.9	1686	2
sehore	14.1	19.6	1392	15.6	31	1993	16.2
damoh	2.2	3.9	1772	2.2	5	2227	1
vidhisha	5.1	10.8	2092	5.2	12.4	2390	4.5
raisen	2.5	5.1	2026	2.7	5.8	2176	2.6
sagar	3.8	6.6	1739	3.8	6.5	1698	2.7
TOTAL	29.9	49.4	10590	31.8	64.6	12170	29
AVERAGE							
bundelkhand							
chattarpur	0.6	0.5	866	0.6	0.7	1073	0.2
datia	0.5	0.7	1322	0.9	1.6	1808	0.4
tikamgarh	1.8	2.9	1597	1.9	3.1	1662	0.1
TOTAL	2.9	4.1	3785	3.4	5.4	4543	0.7
AVERAGE							
gird region							
gwalior	0.1	0.2	2303	0.1	0.4	4114	N

bhind	N	N	1660	N	0.1	2025	N
morena	N	N	1130	N	0.1	1250	0.1
guna	26.3	50.9	1938	23.9	47.7	1993	18.8
sheopur	0.8	0.6	805	2	2.8	1381	0.9
ashok nagar	0	0	0	0	0	0	0
TOTAL	27.2	51.7	7836	26	51.1	10763	19.8
AVERAGE							
satpura plateau							
betul	24.4	72.9	2982	26.6	60.5	2273	40.1
chhindwara	70.1	158.6	2262	80.7	160.1	1984	92.2
TOTAL	94.5	231.5	5244	107.3	220.6	4257	132.3
AVERAGE							
malwa plateau							
dhar	70.8	76.6	1083	75.7	161	2126	84.1
mandsour	59.9	82.3	1374	45.8	115.7	2525	45.7
neemach	35.7	55.5	1555	33	75.7	2292	34.4
ratlam	59.8	85.7	1432	65	159	2455	62
ujjain	8.1	9.1	124	12.8	16.7	1302	13.3
dewas	12.51	18.9	1509	13.5	23.9	1830	12
indore	11.1	18.3	1656	7.7	11.1	1450	8.1
shajapur	49.2	77.1	1798	45.5	87.9	1931	45.3
rajgarh	47.6	27.4	575	43.8	51.7	1182	44.5
TOTAL	354.71	450.9	11106	342.8	702.7	17093	349.4
AVERAGE							
nimar plain							
khandwa	7.1	11.4	1607	8.7	20.9	2408	9.7
burhanpur							
khargone	20.8	24.5	1178	20.9	43	2061	19.6
barwani	32.4	38.2	1178	33.2	66.1	1988	32.8
harda	1.3	2.5	1978	1.5	2.9	2019	1.6
	61.6	76.6	5941	64.3	132.9	8476	63.7
jhabua hills							
jhabua	102.4	80.3	785	106.6	215.7	2023	97.7
alirajpur	38	39.5	1052	37.9	42.2	1111	37.7
	140.4	119.8	1837	144.5	257.9	3134	135.4
Non reported	7.9	7.8	987	10.9	7.8	715	10.9
mp total	840.2	1217.8	1459	854	1680.5	1984	859.9

2002-03			2003-04			2004-05		
prod	yeild	area	prod	yeild	area	prod	yeild	area
9.5	2119	4.4	8.2	1853	5.2	8.4	1625	4.4
9.5	2119	4.4	8.2	1853	5.2	8.4	1625	4.4
35.1	1458	11.6	15.1	1344	12.1	10.4	904	11.6
28.3	1600	18.3	33.2	1819	18.2	26	1367	17.9
32.2	1840	18.2	34	1854	18	28.2	1499	18.3
15.4	1293	12.1	15.4	1300	12.2	12.7	1014	12.1
12.2	1262	11.2	16.6	1275	10.7	11	1014	10.5
123.2	7453	71.4	114.3	7592	71.2	88.3	5798	70.4
24.64	1490.6	14.28	22.86	1518.4	14.24	17.66	1159.6	14.08
1.1	1220	1.1	1.2	8951	1.1	0.9	802	0.9
0.7	1084	1	1.3	1691	0.8	1	952	0.8
2	909	2.4	2.5	1029	2.5	1.6	668	2.3
11	2524	4.4	11	2486	4.5	9	2058	4.6
19.6	1287	14	26.3	1876	11.5	12.3	1069	12.5
4.4	1214	3.9	6.4	1620	3.9	4.5	1155	3.6
47.4	1589	36.1	61	1067	35.8	50.6	1408	35.8
0	0	0	0	0	0	0	0	0
86.2	9827	62.9	109.7	18720	60.1	79.9	8112	60.5
3.2	2962	0.5	1.5	2629	0.63	1.2	1977	0.6
2.5	2335	1.9	3.9	2008	1.8	2.2	1213	1.9
5.7	5297	2.4	5.4	4637	2.43	3.4	3190	2.5
2.85	2648.5	1.2	2.7					
3.7	1822	2.9	4.6	1567	2.9	3.6	1296	2.8
34.4	2119	15.8	29.4	1853	15.7	21.9	1393	15.3
1.8	1795	2	4.4	2171	2	3.5	1657	2
9.4	2123	5.2	11	2056	5.6	8.8	1645	5.7
6	2314	3.1	7.1	2207	4.7	7.7	1660	3.4
3.6	1335	3.8	6.7	1736	4	5	1305	3.7
58.9	11508	32.8	63.2	11590	34.9	50.5	8956	32.9
0.2	831	0.7	0.8	1181	0.7	0.7	905	0.6
0.5	1183	1.2	1.7	1346	0.9	0.7	740	1.2
0.1	840	2.3	2.8	1227	2.2	1.9	737	2.2
0.8	2854	4.2	5.3	3754	3.8	3.3	2382	4
N	1391	0.2	0.6	3625	0.6	1.5	2310	0.1

N	2250	N	N	2000	N	N	N	N
0.1	1566	N	0.1	1275	0.1	0.1	959	N
11.7	623	21.7	41.4	1908	21.4	27.2	1270	21
0.4	471	0.9	1.5	1539	0.2	0.2	1039	0.9
0	0	7.5	13.1	1744	8.3	11.2	1352	7.1
12.2	6301	30.3	56.7	12091	30.6	40.2	6930	29.1
88.2	2197	42.1	85.1	2017	44.5	71.7	1613	40.5
243.1	2636	81.9	241.9	2950	76	156.7	2080	74.8
331.3	4833	124	327	4967	120.5	228.4	3693	115.3
181.8	2154	81.7	171.8	1526	82.4	105.2	1277	67.1
85	1858	47.1	110.5	2126	42.1	60.5	1439	40.5
48.3	1404	31.1	77.66	2347	32.7	57.8	1765	23.3
79.8	1288	68.8	167.5	2492	76.9	140.8	1830	62.6
15.7	1182	15.6	33.1	3421	14	14.3	1021	13.9
20.6	1723	14.3	23.4	1628	12.9	14.1	1096	15.2
11.8	1454	9.8	15	1472	9.7	11.2	1147	5.8
84.1	1855	42.9	88.9	2071	41.6	66.9	1609	44.3
35.6	800	47.8	82.7	1724	47.3	56.9	1202	50.7
562.7	13718	359.1	770.56	18807	359.6	527.7	12386	323.4
25.8	2657	7.3	16.9	1681	7.4	12.9	1747	7.4
51.9	2652	20.5	50.4	1828	20.4	22.5	1112	21
56.6	1730	35.8	60.2	2454	32.8	29.9	910	33.8
3.4	2071	1.9	3.4	1909	1.4	1.7	1213	1.3
137.7	9110	65.5	130.9	7872	62	67	4982	63.5
166.3	1702	113.5	207.6	2100	112.8	204.3	1811	112
45.4	1205	38	39.7	1044	38.3	34.4	900	38.2
211.7	2907	151.5	247.3	3144	151.1	238.7	2711	150.2
7.8	715	10.9	7.8	715	10.9	7.8	715	10.7
1494.4	1751	901.3	1852.6	2027	896.2	1252.6	1406	890.2

2005-06			2006-07			2007-08		
prod	yeild	area	prod	yeild	area	prod	yeild	area
7.8	1772	4.4	6.7	1534	4.4	5.7	1309	4.2
7.8	1772	4.4	6.7	1534	4.4	5.7	1309	4.2
9.5	818	11.3	9.6	853	11.3	9.8	870	11.1
24	1340	18	22.2	1233	18.1	20.4	1126	18.1
31.1	1693	18.3	23.7	1297	18.1	16.4	909	18.5
14.1	1198	12	11.5	958	12	8.9	743	11.9
13.5	1285	10.5	9.6	919	10.4	5.8	560	10.3
92.2	6334	70.1	76.6	5260	69.9	61.3	4208	69.9
18.44	1266.8	14.02	15.32	1052	13.98	12.26	841.6	13.98
0.8	888	1.1	0.7	636	1.1	0.7	620	1
0.6	750	0.7	0.6	850	0.8	0.5	654	0.7
1.4	608	2.1	1.2	571	2	1.2	576	2.3
7	1521	4.2	6.4	1523	4.5	5.2	1157	4.6
13.4	1072	12.7	13.8	1086	11.9	14.3	1205	11.2
4	1111	3.9	3.2	820	3.3	2.2	661	3.5
46.2	1290	35.9	41.8	1164	36.4	34.4	946	9.1
0	0	0	0	0	0	0	0	26.3
73.4	7240	60.6	67.7	6650	60	58.5	5819	58.7
1.1	1833	0.6	1	1666	0.6	0.9	1958	0.6
2	1052	1.6	1.9	1187	1.4	1.9	1309	1.3
3.1	2885	2.2	2.9	2853	2	2.8	3267	1.9
3.7	1822	2.8	3.6	1285	3	3.5	1157	2.8
21.9	1440	14.6	19.5	1335	14.6	18.9	1298	14.3
3.5	1657	2	3	1500	1.9	2.4	1260	2.1
8.2	1438	5.3	7.4	1396	5.3	7.1	1353	4.5
6.5	1911	3.3	5.8	1757	3.1	4.1	1325	3.3
4.5	1323	3.8	4.1	1078	3.5	3.8	1095	3.4
48.3	9591	31.8	43.4	8351	31.4	39.8	7488	30.4
0.5	833	0.7	0.5	714	0.7	0.4	627	0.8
0.9	750	1.4	0.9	642	0.9	0.4	627	2.4
1.9	863	2.3	2	869	3.1	2.1	676	3.2
3.3	2446	4.4	3.4	2225	4.7	2.9	1930	6.4
N	N	0.2	0.2	908	0.2	0.2	908	0.2

N	N	N	N	N	N	N	667	N
N	N	N	N	N	N	N	1000	N
25.4	1210	18.9	23.1	1222	20.8	22.3	1070	20.2
0.6	666	0.3	0.2	666	1.3	1.1	886	0.7
12	1690	7.5	11.2	1482	7.5	11.2	1482	7.2
38	3566	26.9	34.7	4278	29.8	34.8	6013	28.3
67.2	1659	48	65.8	1370	46.3	63.5	1373	42.5
150.2	2008	85.1	182.7	2149	92.1	216.7	2352	87.1
217.4	3667	133.1	248.5	3519	138.4	280.2	3725	129.6
89	1326	61.8	79.2	1281	59	71.4	1212	61.1
56	1382	39	52.8	1353	38.1	50.5	1322	37.3
32	1470	24.2	35.8	1479	27.4	39.8	1455	27.3
131.8	2100	60	124.8	2080	53.5	104.6	1963	83.1
14.2	1021	10.9	10.8	990	8.9	10.4	1169	7.4
14.1	927	13	15.8	1215	12.3	16.8	1360	10.5
10.8	1862	8.5	10.4	1223	8.9	10.4	1168	8.1
54.3	1225	43.4	43.8	1009	41.7	33.1	792	41.1
82.7	1631	47.8	82.7	1724	48.6	55.7	1144	50.4
484.9	12944	308.6	456.1	12354	298.4	392.7	11585	326.3
12.8	1729	7.5	12.6	1680	6.6	12.6	1907	6.8
24.6	1171	20.4	25.1	1230	19.8	26.3	1332	20.3
31.4	928	33.5	33.3	994	32.6	34.8	1067	32.1
1.6	1230	1.6	1.5	937	1.4	1.5	1088	1.4
70.4	5058	63	72.5	4841	60.4	75.2	5394	60.6
203.8	1819	113.5	128	1127	111.5	125	1121	70.2
35.2	921	38	39.5	1052	38	39.5	1052	37.7
239	2740	151.5	167.5	2179	149.5	164.5	2173	107.9
7.6	710	10.8	7.7	712	10.8	7.7	712	10.8
1240	1392	896.2	1252.6	1406	852.7	1119	1320	837.6

2008-09			2009-10	
prod	yeild	area	prod	yeild
5.6	1340	4.2	5	1190
5.6	1340	4.2	5	1190
10.6	955	10.9	6.4	540
20.8	1153	18	18.1	1004
16.9	915	18.1	16.3	896
9.9	826	11.7	7.1	604
6.2	603	10.3	5.4	527
64.4	4452	69	53.3	3571
12.88	890.4	13.8	10.66	714.2
0.8	845	1.2	0.7	565
0.5	772	0.8	0.5	669
2.1	891	2.4	1.3	537
6	1305	4.3	4.6	1067
12.8	1139	11.6	12.7	1096
3.6	1061	3.4	2.5	743
10.4	1139	9.42	8.5	927
29.9	1139	26.5	26.9	1011
66.1	8291	59.62	57.7	6615
1	1612	0.6	0.8	1331
1.8	1340	1.2	1.5	1171
2.8	2952	1.8	2.3	2502
2.3	1150	2.8	2.8	1007
16.3	1139	14.3	13.3	927
3.8	1819	2.1	3.6	1698
6.4	1406	4.7	5.9	1267
4.4	1357	3.8	4.6	1204
3.8	1121	3.4	4.3	1267
37	7992	31.1	34.5	7370
0.5	683	0.8	0.5	582
2.6	1122	2.7	2.4	914
2.9	900	2.9	1.8	615
6	2705	6.4	4.7	2111
0.3	1577	0.2	0.2	1329

N	1000	N	N	1000
N	1000	N	N	1000
23.7	1159	18.4	22.7	1235
0.8	904	0.9	0.7	735
10.2	1412	6.9	8.8	1273
35	7052	26.4	32.4	6572
59.8	1406	46.6	59	1267
190.1	2183	88.9	2331	2623
249.9	3589	135.5	2390	3890
75.8	1240	52.6	56	1066
52.1	1398	36.7	43.4	1183
48.7	1787	30.1	39.8	1323
107.6	2010	49.8	88.9	1785
8.3	1122	6.7	6.9	1030
14.6	1392	9.4	11.4	1236
10.9	1291	5	5.8	1163
36	877	39.6	32.4	817
59.9	1188	51	45.1	884
413.9	12305	280.9	329.7	10487
11.5	1687	6.6	8.2	1245
21.4	1054	20.7	19.8	954
35.1	1093	31.9	29.9	937
2.1	1505	0.8	1.1	1354
70.1	5339	60	59	4490
84.6	1205	68.4	69.7	1019
45.4	1205	38.3	34.4	900
130	2410	106.7	104.1	1919
7.7	712	10.9	7.8	715
1139.6	1369	823.4	1026.6	1254

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
Chattisgarh	Area	area	area	area	area	area	area
balaghat	4.6	4.5	4.5	4.4	5.2	4.4	4.4
	4.6	4.5	4.5	4.4	5.2	4.4	4.4
NORTHEN HILLS							
shahdol	24.1	24.1	24.1	11.6	12.1	11.6	11.3
mandla	17.8	17.9	17.7	18.3	18.2	17.9	18
dindori	17.9	18.1	17.5	18.2	18	18.3	18.3
anuppur	12	12.1	12.2	12.1	12.2	12.1	12
umariya	10.7	10.9	9.7	11.2	10.7	10.5	10.5
TOTAL	82.5	83.1	81.2	71.4	71.2	70.4	70.1
AVERAGE	16.5	16.62	16.24	14.28	14.24	14.08	14.02
kymore plateau							
rewa	1.2	1.1	0.9	1.1	1.1	0.9	1.1
satna	1	1	0.6	1	0.8	0.8	0.7
panna	2.7	2.5	2.2	2.4	2.5	2.3	2.1
jabalpur	4.3	4.4	4.4	4.4	4.5	4.6	4.2
seoni	14.1	15	15.2	14	11.5	12.5	12.7
katni	4.1	4.1	3.6	3.9	3.9	3.6	3.9
sidhi	36.4	35.9	29.8	36.1	35.8	35.8	35.9
singrolli	0	0	0	0	0	0	0
TOTAL	63.8	64	56.7	62.9	60.1	60.5	60.6
AVERAGE							
central narmada valley							
narsingpur	0.5	0.6	1.1	0.5	0.63	0.6	0.6
hoshangabad	1.3	1.3	1.1	1.9	1.8	1.9	1.6
TOTAL	1.8	1.9	2.2	2.4	2.43	2.5	2.2
AVERAGE	0.9	0.95	1.1	1.2			
vindhya plateau							
bhopal	2.2	2.3	2	2.9	2.9	2.8	2.8
sehore	14.1	15.6	16.2	15.8	15.7	15.3	14.6
damoh	2.2	2.2	1	2	2	2	2
vidhisha	5.1	5.2	4.5	5.2	5.6	5.7	5.3
raisen	2.5	2.7	2.6	3.1	4.7	3.4	3.3
sagar	3.8	3.8	2.7	3.8	4	3.7	3.8
TOTAL	29.9	31.8	29	32.8	34.9	32.9	31.8
AVERAGE							
bundelkhand							
chattarpur	0.6	0.6	0.2	0.7	0.7	0.6	0.7
datia	0.5	0.9	0.4	1.2	0.9	1.2	1.4
tikamgarh	1.8	1.9	0.1	2.3	2.2	2.2	2.3
TOTAL	2.9	3.4	0.7	4.2	3.8	4	4.4
AVERAGE							

gird region							
gwalior	0.1	0.1	N	0.2	0.6	0.1	0.2
bhind	0	0	0	0	0	0	0
morena	0	0	0	0	0	0	0
guna	26.3	23.9	18.8	21.7	21.4	21	18.9
sheopur	0.8	2	0.9	0.9	0.2	0.9	0.3
ashok nagar	0	0	0	7.5	8.3	7.1	7.5
TOTAL	27.2	26	19.8	30.3	30.6	29.1	26.9
AVERAGE							
satpura plateau							
betul	24.4	26.6	40.1	42.1	44.5	40.5	48
chhindwara	70.1	80.7	92.2	81.9	76	74.8	85.1
TOTAL	94.5	107.3	132.3	124	120.5	115.3	133.1
AVERAGE							
malwa plateau							
dhar	70.8	75.7	84.1	81.7	82.4	67.1	61.8
mandsour	59.9	45.8	45.7	47.1	42.1	40.5	39
neemach	35.7	33	34.4	31.1	32.7	23.3	24.2
ratlam	59.8	65	62	68.8	76.9	62.6	60
ujjain	8.1	12.8	13.3	15.6	14	13.9	10.9
dewas	12.51	13.5	12	14.3	12.9	15.2	13
indore	11.1	7.7	8.1	9.8	9.7	5.8	8.5
shajapur	49.2	45.5	45.3	42.9	41.6	44.3	43.4
rajgarh	47.6	43.8	44.5	47.8	47.3	50.7	47.8
TOTAL	354.71	342.8	349.4	359.1	359.6	323.4	308.6
AVERAGE							
nimar plain							
khandwa	7.1	8.7	9.7	7.3	7.4	7.4	7.5
burhanpur							
khargone	20.8	20.9	19.6	20.5	20.4	21	20.4
barwani	32.4	33.2	32.8	35.8	32.8	33.8	33.5
harda	1.3	1.5	1.6	1.9	1.4	1.3	1.6
	61.6	64.3	63.7	65.5	62	63.5	63
jhabua hills							
jhabua	102.4	106.6	97.7	113.5	112.8	112	113.5
alirajpur	38	37.9	37.7	38	38.3	38.2	38
	140.4	144.5	135.4	151.5	151.1	150.2	151.5
Non reported	7.9	10.9	10.9	10.9	10.9	10.7	10.8

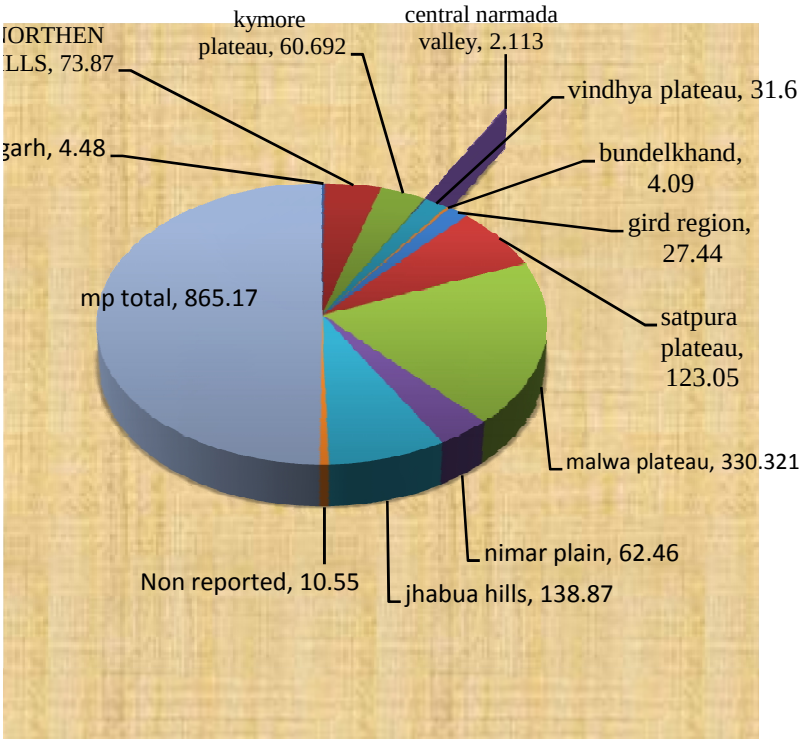
mp total	840.2	854	859.9	901.3	896.2	890.2	896.2

AGRO CLIMATIC ZONES	AREA
Chattisgarh	4.48
NORTHEN HILLS	73.87
kymore plateau	60.692
central narmada valley	2.113
vindhya plateau	31.6
bundelkhand	4.09
gird region	27.44
satpura plateau	123.05
malwa plateau	330.321
nimar plain	62.46
jhabua hills	138.87
Non reported	10.55
mp total	865.17

2007-08 area	2008-09 area	2009-10 area	
4.4	4.2	4.2	
4.4	4.2	4.2	4.48
11.3	11.1	10.9	
18.1	18.1	18	
18.1	18.5	18.1	
12	11.9	11.7	
10.4	10.3	10.3	
69.9	69.9	69	73.87
13.98	13.98	13.8	
1.1	1	1.2	
0.8	0.7	0.8	
2	2.3	2.4	
4.5	4.6	4.3	
11.9	11.2	11.6	
3.3	3.5	3.4	
36.4	9.1	9.42	
0	26.3	26.5	
60	58.7	59.62	60.692
0.6	0.6	0.6	
1.4	1.3	1.2	
2	1.9	1.8	2.113
3	2.8	2.8	
14.6	14.3	14.3	
1.9	2.1	2.1	
5.3	4.5	4.7	
3.1	3.3	3.8	
3.5	3.4	3.4	
31.4	30.4	31.1	31.6
0.7	0.8	0.8	
0.9	2.4	2.7	
3.1	3.2	2.9	
4.7	6.4	6.4	4.09

0.2	0.2	0.2	
0	0	0	
0	0	0	
20.8	20.2	18.4	
1.3	0.7	0.9	
7.5	7.2	6.9	
29.8	28.3	26.4	27.44
46.3	42.5	46.6	
92.1	87.1	88.9	
138.4	129.6	135.5	123.05
59	61.1	52.6	
38.1	37.3	36.7	
27.4	27.3	30.1	
53.5	83.1	49.8	
8.9	7.4	6.7	
12.3	10.5	9.4	
8.9	8.1	5	
41.7	41.1	39.6	
48.6	50.4	51	
298.4	326.3	280.9	330.321
6.6	6.8	6.6	
19.8	20.3	20.7	
32.6	32.1	31.9	
1.4	1.4	0.8	
60.4	60.6	60	62.46
111.5	70.2	68.4	
38	37.7	38.3	
149.5	107.9	106.7	138.87
10.8	10.8	10.9	10.55

852.7 837.6 823.4 865.17



varios Agroclimatic Zones from 2000-01 to 2009-10

ABSTRACT

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ABSTRACT

The present study entitled "**Trend and growth rate analysis of maize crop in different agro climatic regions of Madhya Pradesh"** was undertaken with a view to examine the trend and growth rate of maize production of Madhya Pradesh. Madhya Pradesh, the whole state was studied, considering its agro climatic regions as units of investigation, because in Madhya Pradesh, a marked variation prevails in soil and climate which divided the state in eleven distinct agro climatic regions, which have resulted in great variation in farming patterns and growth rates in area, production and productivity in different parts of the state. In order to make the differences easily understandable, different districts were grouped under the following regions instead of accounting them separately. Times series data of area, production and productivity of Maize was obtained from various issues of M.P. Agricultural Statistics published by Directorate of Land Record and Directorate of Farmer Welfare and Agriculture Development, Madhya Pradesh.

The study reveled that Malwa plateau has the highest arithmetic average in terms of area, production and productivity for the production of maize and central Narmada valley has the lowest arithmetic average . Bundelkhand region has the highest coefficient variance with respect to area and production. In case of Satpura plateau, there was a decrease in coefficient variance of area, production and productivity.

The absolute change in area of maize crop in m.p. was found negative value which shows that the area of maize crop was decreases. More changes was observed in satpura plateau. In case of production all Agro climatic regions reported a decreasing trend except Bundelkhand.

The trend value of area, Production and productivity of maize in M.P. was negative and non significant. In most of the agroclimatic region trend value was observed negative, for area, and production, it was positive only in bundelkhand region. It shows that area , production and productivity decreases during the study period.

Most of the agro climatic region except Bundelkhand , Vindhya plateau , Gird region , Satpura plateau the value of simple growth rate in area , production and yield of maize crop was found negative and also in some regions negatively significant, during the study period.

The area under maize for malwa plateau will expected to 34 thousand hetare in 2014-15. The production of maize will expected to increase in all the agroclimatic regions except Chhattisgarh plain and central Narmada valley. It is remarkable to note that all the agro climatic regions registered a positive in the projected productivity of maize in 2014-15.