Study No. 96

AN ECONOMIC ANALYSIS OF CHICKPEA AND ITS VALUE ADDED PRODUCTS IN AGRI EXPORT ZONE FOR PULSES OF MADHYA PRADESH

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PREFACE

The study entitled "An economic analysis of chickpea and its value added products in Agri-Export Zones for Pluses in Madhya Pradesh" was conducted as per the directives of the Directorate of Economics and Statistics, Ministry of Agriculture, Government of India.

The study is based on the primary data collected from selected chickpea growers, market intermediaries, traders etc., and secondary data related area, production and productivity of chickpea in different agri-export districts for pulses in M.P. The study reveals that there is a tremendous scope for the increasing production as well as export potential of chickpea by taking extra efforts from the Government of Madhya Pradesh in dissemination of exiting production and marketing technology in the area under study. The development of infrastructural facilities, training and exposures to chickpea grower, traders etc. is also needed for the development of economically viable and technical feasible agri-export zone for pulses in the state.

On behalf of the Centre, I express my deep sense of gratitude to Dr. Goutam Kaloo, Hon'ble Vice-Chancellor, Dr. S.S. Tomar, Daen Faculty (Agriculture) & Director Research Services, Dr. K.K. Saxena, Director Extension Services, Dr. P.K. Mishra, Dean, College of Agriculture, Dr. S.B. Nahatkar, Deputy Director Research (Agril. Econ.) and other officials of J.N. Krishi Vishwa Vidyalaya, Jabalpur for extending help and guidance at various stages in successful completion of this study of high importance. I am very thankful to the Late Dr. K.S. Pawar, Ex-Dean, Dr. R.V. Singh, Dean, College of Agriculture, Ganjbasoda, and Dr. Mamutaz Khan, Technical Office , Krishi Vigayan Kendra, Narsinghpur and their staff member for providing vehicles and necessary help during the course of investigation respectively of Vidisha and Narsinghpur location of study.

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I gave my sincere thanks for the efforts of Dr. H.O. Sharma , Research Officer for planning for the field work ,classification tabulation, analysis and interpretation of the data and timely submission of the report to the ministry, besides he is fully engaged as the in-charge examination of the university. He was ably assisted by Mr. C.K. Mishra, Junior Computer and Mr. S.K. Upadhye, Junior Computer the collection, classification, tabulation and analysis of primary and secondary data related to the project. Thanks are also being given to Mr. Sikandar Khan and Mr. C.K. Mishra for doing typing the photocopy work respectively. Dr. A.M. Mishra, Dr. N. Khan, Mr. B.S. Patel, Mr. A. K .Daniel. Mr. S.K. Sharma, Mr. Rohani Prasad, and Mr. Kapoor Chand the staff member of the Agro-Economic Research Centre for their untiring efforts in bringing this study to its perfect shape.

I hope the findings and suggestions made in the study would be useful to the policy makers of the States and Govt. of India.

(P.K. Mishra)
Honorary Director

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CHAPTER I

INTRODUCTION

On the agricultural front, India has moved from chronic food security to food surplus in the last four decades. This was possible due to cutting edges of science coupled with the fast adoption of production technology by the farmers and government policies according high priorities to agricultural production by making large planned investment in infrastructure; - irrigation, power, credit, research and extension. As a result of technological breakthrough and their effective dissemination, food grain production increased from 50.82 (1950-51) to 217.3 million t (2006-07), oilseeds production increased from 5.16 (1950-51) to 24.29 million t (2006-07), pulses production also increased from 8.41(1950-51) to 14.02 million t (2006-07). And now these reached to plateau and stagnate to only 208.80 million t, 18.05 million t and 13.57 million t (TN up to 2007) respectively

At this juncture, there not only need to increased productivity of crops in per unit area but also required quantum up gradation of value addition activities of internationally quality standards for providing extra sustainable income and employment to farmers. Also, the farmers of country are not getting remunerative prices of the products that they produce and fight from poverty. Therefore, at this stage it is necessary to him to know the value addition technology for the products and byproducts that they produce. This will not only provide them extra income but also gave additional and sustainable income and employment throughout the year. These value added activities also enhanced income and employment of market intermediaries involved in the marketing of value added product and by products.

Value addition technology includes all post harvest techniques and marketing technology, which creates the time, place, form and possession utilities in a particular farm product. These includes, winnowing, threshing, grading, standardization, quality control, storage, processing, packaging, transportation, brand name, publicity, selling of produce through suitable market channel etc. This value addition for sustainability also gave the answers of all these questions that (i) what will the best alternative channel of product marketing? (ii) What will be the best alternative technology for grading/

standardization/ storage/ processing/ packaging/ transportation/ publicity of their products? (iii) What are the factors that affect the post harvest losses? and lastly (iv) How the farmers became entrepreneur? Chickpea has all prominent properties of value addition. All the farmers/ people known these qualities even before 10000 B.C. but can't harvest them properly. Due the result of this they are not getting remunerative price of the product that they produce and fight from poverty.

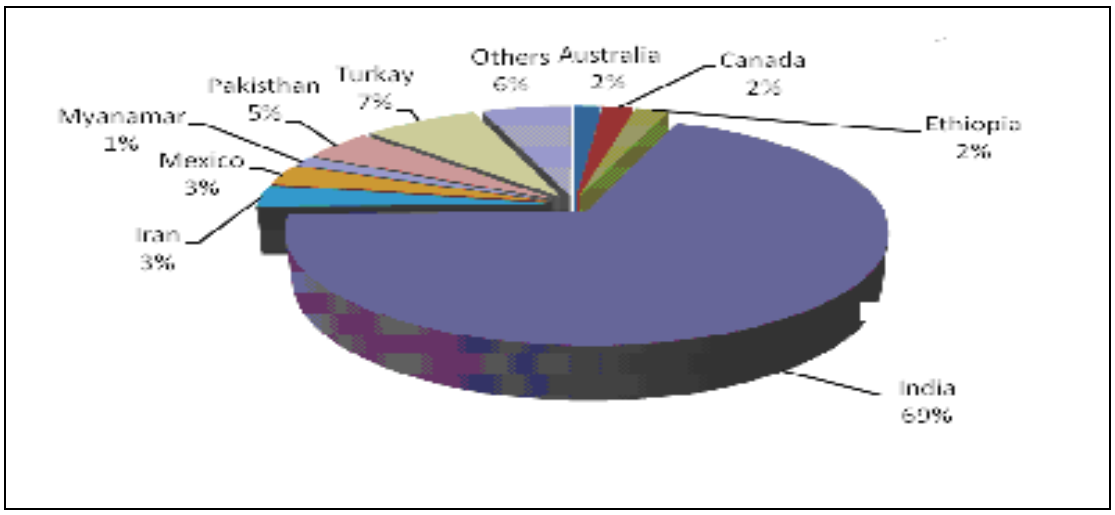
Chick pea (*Cicer arietinum*) is a very important pulse crop in the leguminous family. This light brown coloured pulse is considered to be a good source of protein and is also called by the name of "Garbanzo beans". It is used as an edible seed and is also used for making flour throughout the globe and having a capacity to stand in drought conditions. This crop doesn't have the requirement of being fed with nitrogen fertilizers. Chickpea is a highly nutritious pulse and places third in the importance list of the food legumes that are cultivated throughout the world. Chickpea seed has carbohydrate (38-59%),fiber √(3%), √oil (4.8 to 5.5%), √ash (3%), Calcium (0.2%) and phosphorus(0.3%). Digestibility √of protein varies from 76-78 per cent and its carbohydrate from 57-60 per cent (Hulse,1991, Huisman and van der poel,1994). Raw whole seeds contain per 100g:357 calories,4.5 – 15.69 per cent moisture,14.9 – 24.6 g proteins, 0.8-6.4 per cent fat, √2.1-11.7 g fiber, √2-4.8 g ash, √140-440 mg Ca, √190-382 mg P, √9 mg Fe, √0.21-1.1 mg thiamin, √0.12 -0.33 mg riboflavin√ and 1.3 -2.9 mg niacin √ (duke,1981;Huisman and van der Poel,1994).Boiled and roasted seeds contain similar amounts. √Among the legumes, chickpea is the most hypocholesteremic agent; germinated chickpea was reported to be effective in controlling cholesterol level in rats (Geervani,1999).

The varieties of chickpea are separated on the basis the seed size, colour and taste. Two of those varieties, namely *Kabuli* and *Desi*, can be separated on the basis of their following features

I) *Desi* chickpea – These are spilt peas and are relatively smaller in size having a thicker seed coat. They appear dark brown in color and they can be used and served in many ways.

ii) *Kabuli* Chickpeas – *Kabuli* chickpeas have a whitish-cream color and are relatively bigger in size having a thinner seed coat. They are generally used in soups /salads or as flour.

Apart from these, Gulabi chickpea also cultivated in India, smaller in size having a thinner seed coat. They appear pink in color. van der Maesen (1972) believed that the species originated in the Southern Caucasus and Northern Persia. However, Ladizinsky(1975), reported the centre of origin of chickpea to be south East Turkey. Van der Maesen (1987) recognized the South Eastern part of Turkey adjoining Syria as the possible centre of origin of chickpea based on presence of the closely related annual species, *C. reticulamtum* Ladizinsky ans *C. echinospermum*. and they can also be used and served in many ways. According to De Candolle, the fact that the chickpea has a Sanskrit name " *Chanaka*", which indicates that the crop was under cultivation in India longer than in any country in the world. (Fig.1.1)



Fig, 1.1 : Share of different countries in Chickpea Production (Total 8.3 million t)

The world's total production of chickpeas is around 8.5 million metric t annually and is grown over 10 million hectares of land approximately. The Desi type chickpea contribute to around 80% and the Kabuli type around 20% of the total production. India is the largest producer of chickpea contributing to around 70% (around 6 million t) of the world's total production. A part from India , turkey (7%), Pakistan (5%), Iran (3%), Mexico (3%), Australia (2%) Canada (2%) and Ethiopia (2%) are the other major chickpea producing countries of the world. (Fig. 1.2).

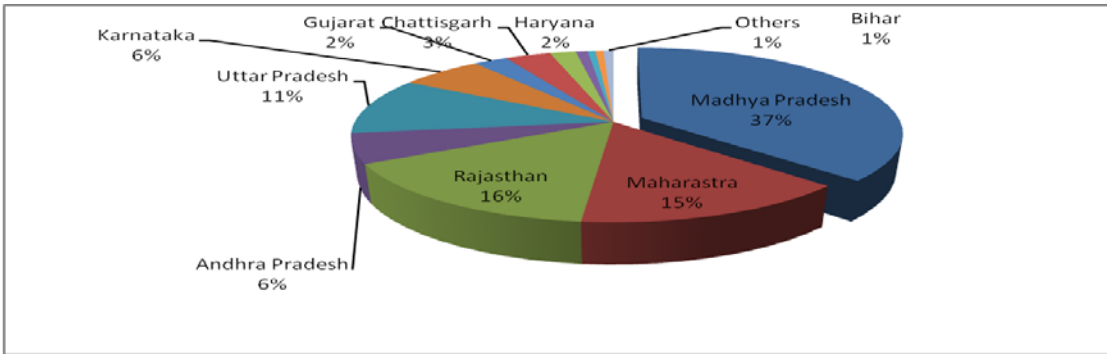


Fig. 1.2 Percentage Contribution of Area in different States of India

Desi type chickpeas largely dominate the ratio of production in India. Regarding the consumption pattern, all most all of the chickpea is consumed in the countries where it is produced.

As chickpea has a deep tap root which enhances its capacity to stand drought conditions, it is usually suited to those areas having relatively cooler climatic conditions and a low level of rainfall. It yields best when grown on sandy, loam soils having an appropriate drainage system as this crop is very sensitive to the excess water availability and a lack of such system can hamper the yield levels. The production of chickpea is also affected in excessive cold conditions.

Chickpea is seeded in the months of September to November (Rabi crop) in India. In US, this crop is planted around mid April. The maturity period of desi/ gulabi type chickpea is 95-105 days and of kabuli type chickpea is 100-110 days. Harvesting of the plant is done when its leaves start drying and shedding and can be done directly or with the help of a harvester. In India, it is harvested in February, March and April.

This crop is often cultivated as a sole crop but sometimes it is also grown rotationally with other crops such as jowar, bajra, wheat and coriander. Pale yellow, dark brown, black or reddish chickpea are some of the varieties that are grown today.

The major exporter countries of chickpea namely Turkey, Australia, Mexico, Canada ,Syria and United States The top three exporting countries i.e. Turkey, Australia and Mexico have a combine share of over 75% of the world total exports of chickpeas. The imports figure around 500 thousand t in a year and are not concentrated as in the case of the chickpea exports. Around 3/4th share of imports is divided among Spain, Bangladesh, Algeria, Tunisia, Jordan, Italy, Pakistan and Sri Lanka are the major importer of *Desi* type chickpea countries with India representing a share of around 30%

of the total world imports are India and the remaining countries like United Kingdom, United States, Saudi Arabia are the importer Kabuli type chickpea..

In India Chickpea is grown in the rain-fed areas as there are best suited for its production. Chickpea producing states in India are Madhya Pradesh, Uttar Pradesh, Rajasthan, Maharashtra and Andhra Pradesh. Madhya Pradesh produces the major share of 42% in the Indian production of around 6 million t. Andhra Pradesh Uttar Pradesh, Maharashtra and Rajasthan follow Madhya Pradesh with contributing around 11%, 12%, 13% and 9% of production respectively. (Fig. 1.3)

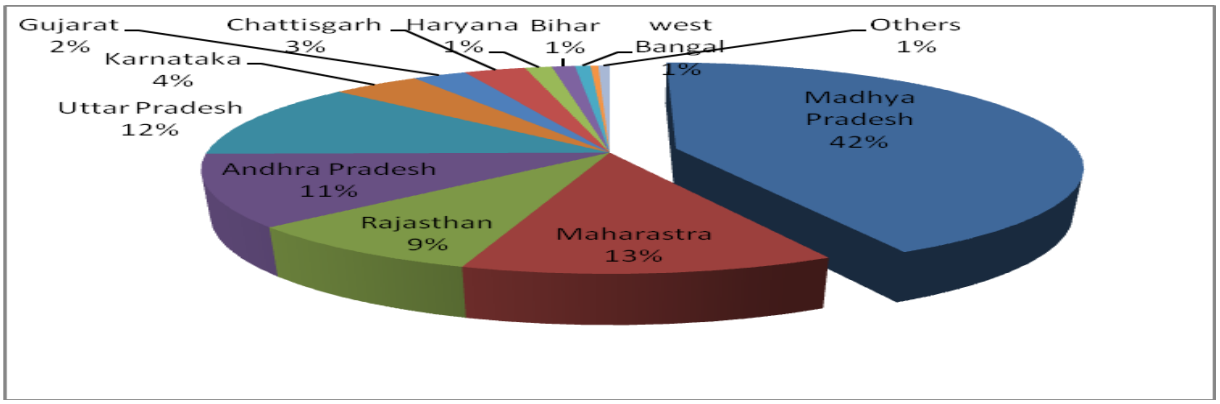


Fig .1.3 : Percentage Contribution of production in different States of India

Since 1990, a rise in the productivity of chickpea in India has been observed from 614 kg per hectare to 735 kg per hectare. The yield of chichpea (Fig.1.4) was highest in Andhra Pradesh(1615 kg./ha), followed by Bihar (1000 kg./ha), West Bengal (1000 kg./ha.) M.P. (926 kg.ha). U.P. (892 kg./ha) and Gujrat (892 kg./ha.). The yield of other states are below the country average (808 kg.ha.).

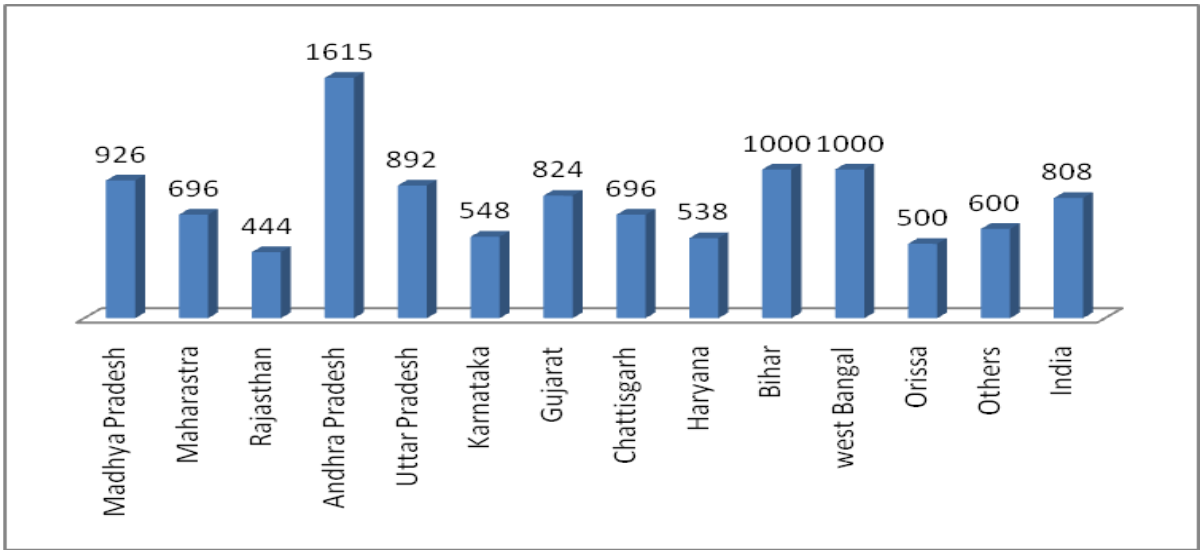


Fig. 1.4 : Yield of Chickpea (kg/ha) in different states of India (2006)

The area and production of chickpea showed static growth in India (Fig. 1.5). During the last 15 years. The productivity also showed the same trend. (Fig.1.6).

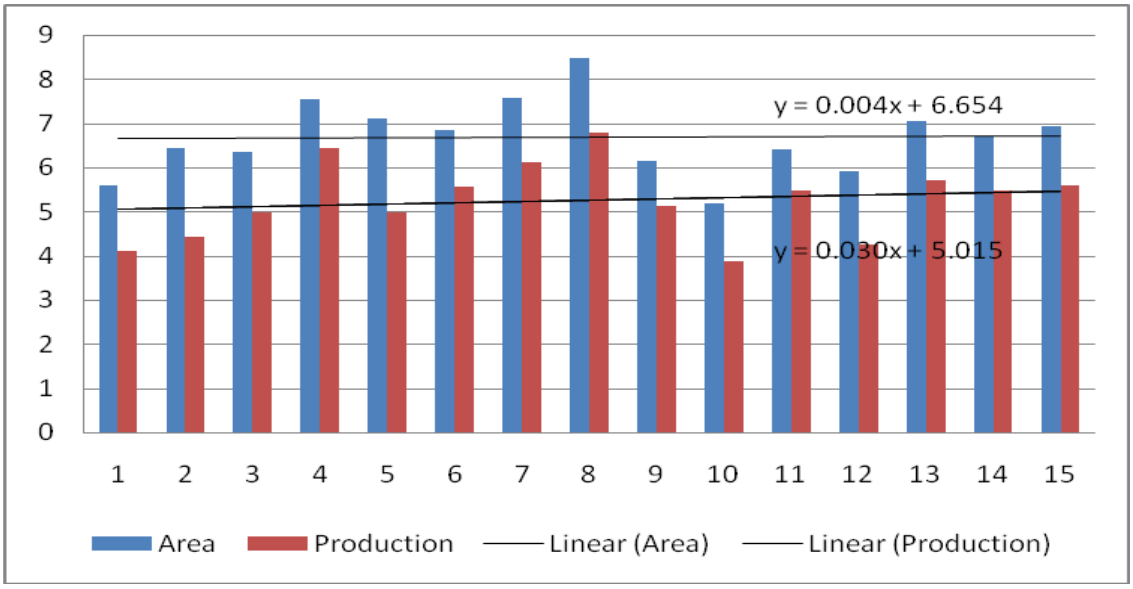


Fig.1.5 Area (million ha) & Production (million t) of chickpea in India (1992-2006)

The domestic demand of chickpea is so large that after it being the largest producer of chickpea, India is also the largest importer of chickpea in the world. Over 4/5ths of the chickpea produced in the country is used to produce '*Chana Dal*' and over 4/5ths of this '*Dal*' is ground to make flour termed as '*Besan*'. The countries which exports chickpea to India are Canada, Australia, Iran, Myanmar, Tanzania, Pakistan, Turkey and France. India also exports some of its chickpea produce to other nations for the consumption of people of Indian origin living in those countries. These countries are USA, UK, Saudi Arabia, UAE, Sri Lanka, and Malaysia.

During the last 15 years. The productivity also showed the same trend. (Fig.1.6).

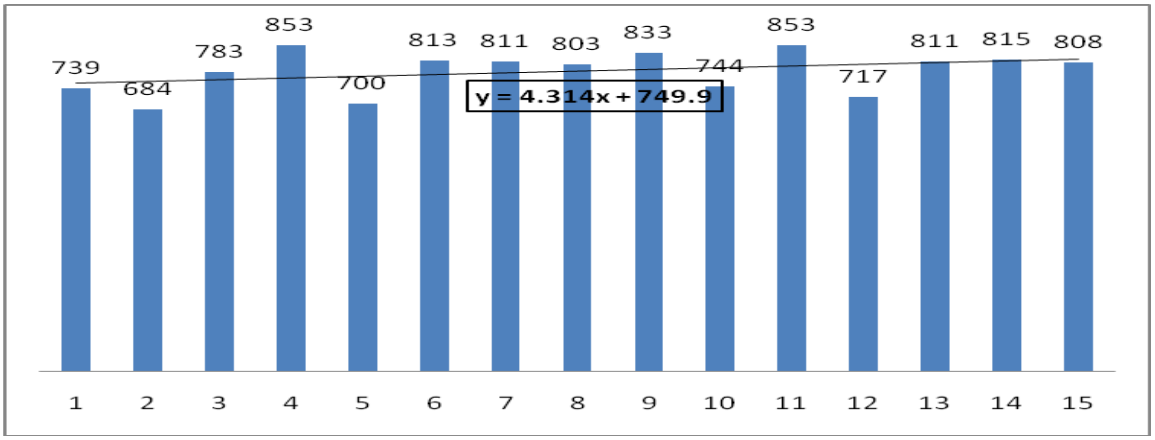


Fig. 1.6 : Productivity (kg/ha) of Chickpea in India during 1992-2006

Chickpea is the most important pulse grown in the Indian subcontinent. Most of the people in the country satisfy their appetite requirements by consuming pulses and it is the most dominating pulse in their monthly consumption list.

In Madhya Pradesh chickpea is cultivated in 2692.6 thousand ha with a production of 2474.6 thousand t. But an average farmer harvested its productivity only up to 926 kg/ha (2006). The districts Vidisha, Raisen, Hasangabad, Rajgarh, Chhindwara, Narsighpur, Shivpuri, and Guna identified as Agri-Export Zone for Pulses in the state. These districts contributed about 53.97 per cent and 63.66 per cent of production of the state. The area and production of this particular crop in the state showed increasing trend but the yield showed a constant trend from last 10 to 15 years.

The productivity levels of these districts (1082kg/ha) is found more than 155.4 kg/ha than the state (927 kg/ha) but, it is found less than the potential/recommended yield (3000 kg/ha) of the chickpea in the state. This might be due to the low adoption of the recommended crop production and marketing technologies and various constraints associated with thereof. Hence, in order to analyse the cost and return structure of chickpea and its value added products and marketing aspects related to these, this study is framed to find out the exact solution for increasing the production as well as income and employment of cultivators and market functionaries in AEZ for Pulses in the state. As the lower post harvest losses increases net income of the farmers hence an attempt will also be made to find out nature and types of losses in production and marketing of product.

1.2. Objective of the study:

1. To determine the growth of chickpea in last 15 years (1992-2006) in AEZ of pulses in M.P.
2. To analyze the yield and expenditure gap of chickpea in different levels of adoption.
3. To analyze the cost and return structure, and resource the efficiency in chickpea production in different level of adoption.
4. To identify types and extent of losses in different stages of production and marketing of Chickpea.
5. To examine the nature and extent of value addition (primary processing) and their profitability over grains in different size of farms.
6. To assess marketing pattern and trade related issue in chickpea products under AEZ for pulses.
7. To examine the present status of secondary and tertiary processing and its future prospects in AEZ of pulses.
8. To identify constraints in production and marketing of chickpea.

1.3 Scope of the Study:

The study provides the information about the yield, adoption gap, marketing pattern, processing, trade and supply of input and output of chickpea in AEZ for pulses of Madhya Pradesh. It also provides information about the factors which are responsible for the low productivity of chickpea production in the state. This study will not only identify the possibilities of increasing productivity and value addition in the product though proper post harvest handling of chickpea but also provides feed back to researchers, extension workers, and policy makers from the cultivators and market functionaries .

Ultimately, research provides answer to a complex question that how the producer of raw product (farmer) become entrepreneur?

1.4. Limitation of the Study:

As Chickpea is a miracle crop and several value added products are prepared from its product and by products. The various value added activities are also performed by farmers and processors in the state. It is not possible to undertake all the value added activities in a study. Hence, the value added activities confined only to primary processing, secondary processing (grain to *dal*) and tertiary processing (*Dal* to chickpea flour) will be taken in to consideration in this study.

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CHAPTER II
BACK GROUND OF STUDY AREA

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This Chapter deals with the background information of the study area. It included the information about the selected state viz. Madhya Pradesh, The selected districts i.e. Vidisha and Narsinghpur, the selected development blocks i.e. Basoda of Vidisha district and Chavarpatha of Narsinghpur district. And finally, it also provided the general information of selected sample respondents through whom, the primary data have been collected for the study.

2.1 Madhya Pradesh:

Madhya Pradesh, in its present form, came into existence on November 1, 2000 following its bifurcation to create a new state of Chhatisgarh. The undivided Madhya Pradesh was founded on November 1, 1956.Madhya Pradesh, because of its central location in India, has remained a crucible of historical currents from North, South, East and West.

2.1.1 Location:

. Madhya Pradesh is situated in the heart of India between latitudes 21^0 - 53' to 22^0 53' North and longitude 77^0 47' to 78 ^{0} 44'East. It is the second largest state after Rajasthan of Indian Union with a total geographical area of 307.56 thousand square Kilometers. In terms of population (6, 0348023) it occupies 5^{th} position in India (2001). It has 10 -commissionaire division (Chambal, Gwalior, Bhopal, Ujjain, Indore, Sagar, Rewa, Jabalpur, Hoshangabad and Shahdol) divided into 45 districts, 272 tehsils, 313 development block & 370 towns and 76,468 villages. (Table 2.1) It is abundantly rich in minerals and bio resources. With 27% of land area under forests, it supports a wide variety of animal and plant life. The state has a rich history, culture and crafts.

Table 2.1: Location of Madhya Pradesh

S. No.	Particulars	
1	Number of Tehsils	272
2	Number of Blocks	313
3	Number of Villages	55393
4	Latitude	21° 53' to22° 59'N
5	Longitude	76°47' to 78°44'E
6	Height from see means level	50-1200
7	No of districts	48
8	No. of Gram panchayat	22029
9	No. of electrified Villages	50474
10	Percentage of electrified villages to total Villages	65.92

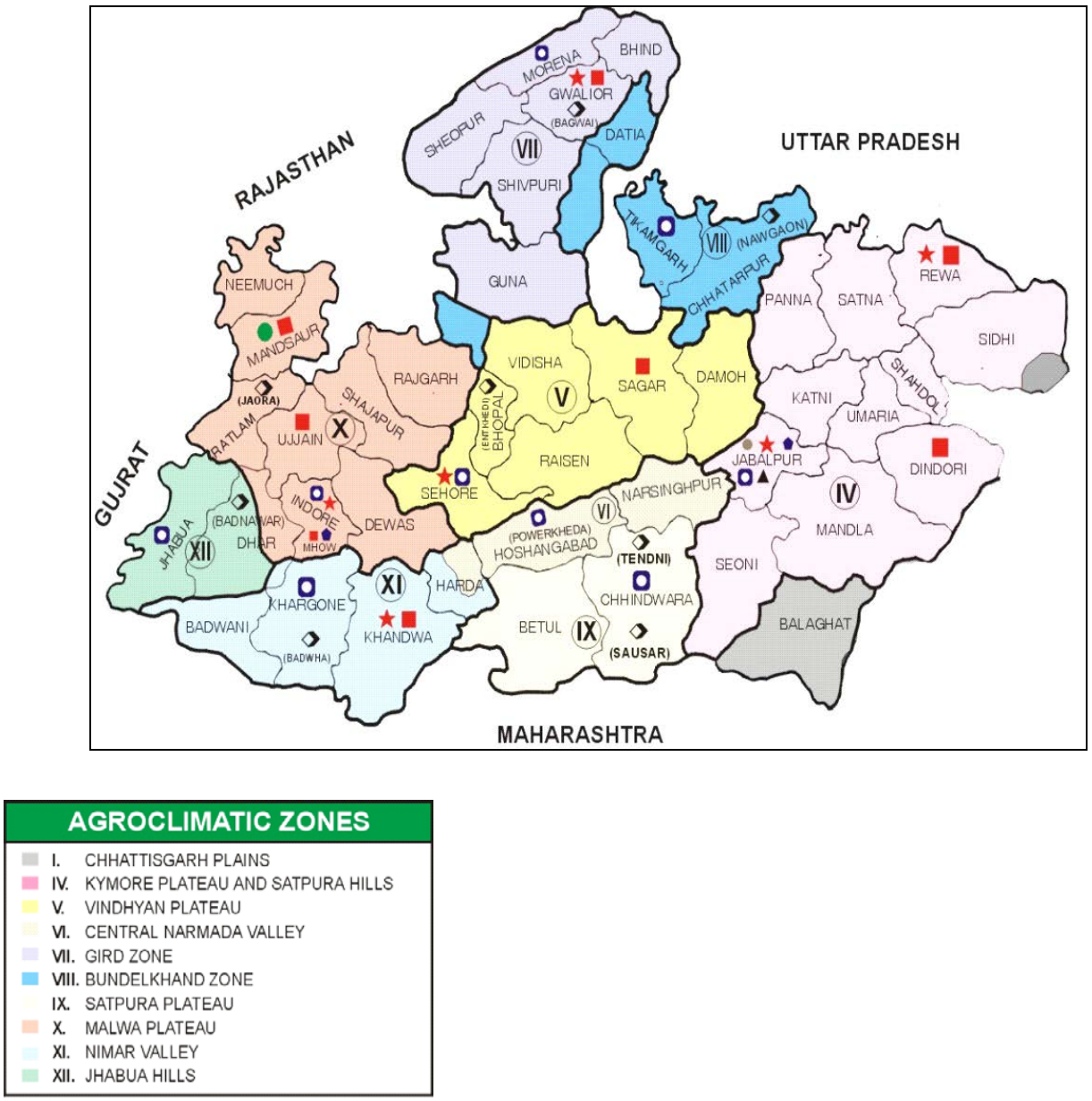
2.1.2 Physiography:

The Physiography of the state exhibits a great deal of diversity with areas ranging from less than 50 meter above mean sea level to more than 1200 meter. The state falls under the catchments of Jamuna, Ganga, Narmada, Mahanadi and Godavari. On the basis of broad land features, the state could be classified in 5 physiographic regions and 11 agro-climatic zones (Table2.2)

1. Northern low lying plains comprising Gwalior, Bhind and Morena districts and extend to Bundelkhand up to the west of Panna range and excludes certain parts of Rewa district between Panna and Kaymore hills of Baghelkhand.
2. The Malwa and Vindhyan Plateau comprises of Vidisha, Shivpuri, Datia, Guna, Morena, Ujjain and Mandsour districts and parts of Sehore, Raisen and Dewas districts. It consists of large undulating plains of black cotton soil dotted with flat-topped hills. It has also hilly Vindhyan Plateau situated it the north of Narmada Valley and to the south of the low-lying regions of Bundelkhand and Baghelkhand. It spared from east of Malwa plateau to Maikal and Dorea hills Satpura range
3. The Narmada Valley stretching from Jabalpur in the east up to Barwani district in the west. It is nearly 560 Km long and 48 Km wide and is walled on the north by the Vindhyan range and on the south by Satpura range. It covers the districts of Jabalpur, Nasinghpur, Hoshangabad, Khandwa, Khargone, Barwani, Dhar, and some parts of Raisen, Sehore, and Dewas districts.
4. The Satpura range runs from west to east for about 640 Km through Khandwa, Betul, Chhindwara, Seoni, Mandla, Bilaspur and Sarguja districts. Its northern spurs go into Hoshangabad and Nasinghpur districts

and in the south an extensive spur of 160 Km covers entire Balaghat districts.

5. Madhya Pradesh also covers Balaghat and Shahdol district of Chhatisgarh Plains and Northern Hills of Chhatisgarh zone respectively.



AGROCLIMATIC ZONES

- I. CHHATTISGARH PLAINS
- IV. KYMORE PLATEAU AND SATPURA HILLS
- V. VINDHYAN PLATEAU
- VI. CENTRAL NARMADA VALLEY
- VII. GIRD ZONE
- VIII. BUNDELKHAND ZONE
- IX. SATPURA PLATEAU
- X. MALWA PLATEAU
- XI. NIMAR VALLEY
- XII. JHABUA HILLS

Fig. 2.1: Agro-Climatic Zones of Madhya Pradesh

Table-2.2: Agro-Climatic Regions and covered Districts /Tehsils in Madhya Pradesh (Area in Lakh ha)

Agro-Climatic Regions	Districts/Tehsils	Geogra-phical Area	Percent to Geograp hical Area
1.Malwa Plateau	Indore, Dhar, (Dhar, Badnawar, Sardarpur tehsils) Shajapur, Mandsour, Nimuch, Ratlam, Ujjain, Dewas Rajgarh districts and Petlawad tehsil of Jhabua district	51.47	16.74
2.Vindhyan Plateau	Bhopal, Vidisha, Sehore (Sehore, Ashta, Ichhawar, Narsullaganj tehsils) Raisen (Raisen, Gairatganj, Begamganj, Silwani, Goharganj, Udaipura tehsils), Damoh, Guna (Chachora & Raghogarh tehsils) & Sagar districts	42.59	13.85
3.Central Narmada Valley	Hoshangabad (Seoni-Malwa, Hoshangabad, Sohagpur tehsils), Harda, Nasinghpur districts, Budhani and Barelli tehsil of Sehore and Raisen districts respectively	17.45	5.67
4.Satpura Plateau	Betul, Chhindwara districts	21.93	7.13
5.Jhabua Hills	Jhabua, Jobat, Alirajpur tehsils of Jhabua district & kukshi tehsil of Dhar district	6.88	2.24
6.Gird Region	Gwalior, Bhind, Morena, Shivpur-Kalan, Guna (Mungawali and Ashoknagar tehsils), Shivpuri (Shivpuri, Kalaras, Pohari tehsils)	31.85	10.36
7. Kaymore Plateau	Jabalpur, Katni, Rewa, Panna, Satana, Sidhi, Seoni and Gopadbana & Deosar tehsils of Sidhi district.	49.97	16.25
8.Bundel Khand Region	Tikamgarh, Chhatarpur, Datia districts, Karela, Pachore tehsil of Shivpuri and Guna tehsil of Guna district	22.82	7.42
9.Nimar Valley	Khandwa, Khargone, Barwani district, Manawar tehsil of Dhar district and Harda district	25.17	8.18
10.Northern Hills of Chhatigarh	Shahdol, Umariya Mandla, Dindori district & Singrauli tehsil of Sidhi district	28.17	9.16
11.Chhatigarh plain	Balaghat district	9.25	3.00
Madhya Pradesh		**307.55**	**100.00**

2.1.3 Soils:

The main soil types found in Madhya Pradesh are alluvial, deep black, medium black shallow black, mixed red and black, mixed red and yellow and skeletal soils. (Table 2. 3)

Table 2.3: - Soil types and districts covered in Madhya Pradesh.

Types of Soil	Districts covered
Alluvial Soil	Bhind, Morena and Gwalior
Deep Black Soil	Hoshangabad and Nasinghpur
Medium Black Soil	Jabalpur, Sagar, Vidisha, Sehore, Damoh, Guna, Bhopal, Raisen, Rajgarh, Indore, Dewas, Ujjain, Mandsour, Shajapur, Ratlam, Dhar, Khargone and Khandwa
Shallow Black Soil	Betul, Chhindwara and Seoni
Red & Black Soil	Shivpuri, Rewa, Satna, Panna, Sidhi, Chhaterpur, Tikamgarh, Datia and some parts of Guna district.
Red & Yellow Soil	Balaghat.
Gravelly Soil	Mandla.

2.1.4 Climate:

The climate of Madhya Pradesh by virtue of its location is predominately moist sub humid to dry sub humid, semi arid to dry sub-humid and semi arid in east, west and central plateau and hills respectively, according to agro-climatic regions of India. The seasons in Madhya Pradesh are as given below:

Table 2.4: Seasons and their periods in Madhya Pradesh

Seasons	Period	
	From	**To**
Rainy	June	September
Post Monsoon	October	November
Winter	December	February
Summer	March	May

2.1.4.1 Rain fall:

The annual rainfall received in the state varies from 800 mm. in the northern and western regions to 1600 mm in the eastern districts. In some years rainfall goes much below to the normal. Most of rainfall is received in the Monsoon season from June to September and about 10 per cent of the rainfall is received in the remaining part of the year.

2.1.4.2 Temperature:

The maximum temperature during extreme summer reaches as high as 47^0C and the minimum during winter dips up to 5^0C. The maximum normal temperature varies between 25 and 35^0C and minimum normal between 10^0 to 20^0C.The relative humidity ranges from 40 to 70 % throughout the year.

2.1.5 Population:

According to 2001 census the population of the state was 60348023 comprises of 52.10% of male and 47.90% female. Over 1000 male there were only 927 females. State had a rural background as the 73.54% of total population lives in villages and rest 26.46% in urban areas. The percentage of literacy was found only 64.11% with male female ratio of 1:1. Madhya Pradesh comes under tribal area 20.27% of total population were belongs to scheduled tribes. The percentage or workers were 42.68% of total population, while 57.16% of total population belongs to non worker category. 31.16% population classified order main worker category, while, only 18.32% were falls in farmers.

Table 2.5: Population parameters of Madhya Pradesh (Census 2001)

S. No.	Particulars	Population	Percentage to total
1	**Total Population**	**60348023**	**100**
A	Male	31443852	52.10
B	Female	28904371	47.90
2	**Sex ratio**	**927**	
3	**Rural Population**	**44380878**	**73.54**
A	Male	23031093	51.89
B	Female	21349785	48.11
4	**Urban Population**	**15967145**	**26.46**
A	Male	8412559	52.69
B	Female	7554586	47.31
5	**Population of Schedule Caste**	**9155177**	**15.17**
A	Male	4804881	52.48
B	Female	4350296	47.52
6	**Population of Schedule Tribes**	**12233474**	**20.27**
A	Male	6195240	50.64
B	Female	6038234	49.36
7	**Number of Literate persons**	**38689103**	**64.11**
8	**Number of Farmers**	**11058500**	**18.32**
A	Male	6935121	62.71
B	Female	4123379	37.29
9	**Agriculture Labour**	**7380878**	**12.23**
A	Male	3485987	47.23
B	Female	3894891	52.77
10	**Home Industry**	**1010067**	**1.67**
A	Male	501369	49.64
B	Female	508698	50.36
11	**Other Workers**	**6307040**	**10.45**
A	Male	5279810	83.71
B	Female	1027230	16.29
12	**Total Main Workers**	**19077568**	**31.61**
A	Male	14081689	73.81
B	Female	4995879	26.19
13	**Marginal Workers**	**6678917**	**11.07**
A	Male	2120598	31.75
B	Female	4558319	68.25
14	**Total Workers**	**25756485**	**42.68**
A	Male	16202287	62.91
B	Female	9554198	37.09
15	**Non Workers**	**34496254**	**57.16**
A	Male	15184279	44.02
B	Female	19311975	55.98

2.1.6 Land use classification:

The total geographical area of the State is 307.56 lakh ha. in which 49.01% land was found to be under cultivation (**Table 2.6)** and 11.02 per cent land not available for cultivation. The 4.42 per cent of total land was classified under culturable waste land, while 3.38% of total is in fallow land. The cropping intensity of the state was found to be 130.76 per cent.

Table 2.6: Land use Classification of Madhya Pradesh 2005-06

S.No.	Particulars	Area (Lakh ha)	Percentage to Geographical Area
1	Geographical Area	307.56	100
2	Forest	85.89	27.93
3	Area not available for cultivation	33.89	11.02
4	Other non agricultural land (excluding fallow land)	13.58	4.42
5	Culturable Waste lands	11.61	3.77
6	Fallow land	11.85	*3.85*
7	Net area sown	150.74	49.01
8	Double cropped Area	46.37	
9	Gross Area sown	197.11	
10	**Cropping Intensity (%)**	**130.76**	

2.1.7 Irrigation status

Wells (39.93%), tube wells (25.42%), canals (18.31%) and tanks (2.35%) are found the major sources of irrigation in M.P. The state had 5681 thousand ha. area under irrigation. The irrigation intensity of the state is only.103.47 per cent and 37.69 per cent of the net irrigation are of the state was found under irrigation. (**Table 2.7**)

Table 2.7 Irrigation Status of Madhya Pradesh 2005-06 (000'ha)

S. No.	Source	Net Irrigated Area	Percentage to total	Gross Irrigated Area	Percentage to total
1	Canal	1030	18.13	1076	18.31
2	Tanks	134	2.36	138	2.35
3	Tube-well	1449	25.51	1494	25.42
4	Well	2246	39.54	2347	39.93
5	Others	822	14.47	823	14.00
6	Total	5681	100.00	5878	100.00
7	% to net area sown	37.69			
8	Irrigation intensity (%)	103.47			

2.1.8 Cropping pattern:

Madhya Pradesh had rich diversity and occupied nearly all the cereals (38.33%), pulses (21.38%), oilseeds (30.73%) fibres (3.09%), fruits and vegetables (1.23%), spices(1.06%) in his total food and non food basket (19710 thousand ha.) (**Table 2.8**)

Table 2.8 : Cropping Pattern of Madhya Pradesh 2005-06

S. No.	Crops	Area 000ha	Percentage to total cropped area	YIELD (kg/ha)
1	Wheat	3785	**19.20**	**1638**
2	Paddy	1711	**8.68**	**990**
3	Jowar	583	**2.96**	**1041**
4	Maize	863	**4.38**	**1446**
5	Other cereals	613	**3.11**	
6	**Total cereals**	**7555**	**38.33**	
7	Gram	2541	**12.89**	**936**
8	Tur	323	**1.64**	**749**
9	Lentil	582	**2.95**	**503**
10	Peas	219	**1.11**	**475**
11	Torea	48	**0.24**	**667**
12	Urad	483	**2.45**	**354**
13	Moong	77	**0.39**	**325**
14	Kulthi	27	**0.14**	**296**
15	Other Pulses	32	**0.16**	
16	**Total Pulses**	**4332**	**21.98**	**752**
17	Total food gains	11887	**60.31**	**1135**
18	Sugarcane	52	**0.26**	**4308**
19	Total Spices	208	**1.06**	
20	Total Fibers	609	**3.09**	
21	Total Fruits and Vegetable	243	**1.23**	
22	**Total Food Crops**	**12424**	**63.03**	
23	Sesamum	185	**0.94**	**395**
24	Linseed	132	**0.67**	**402**
25	Groundnut	208	**1.06**	**1111**
26	Rapeseed & Mustard	831	**4.22**	**1030**
27	Soybean	4590	**23.29**	**1049**
28	Other Oilseed	111	**0.56**	**0**
29	**Total Oilseed**	**6057**	**30.73**	**1000**
30	Cotton	603	**3.06**	**1176**
31	Total Medicinal & Narcotics	16	**0.08**	
32	Fodder Crops	588	**2.98**	
33	Other Miscellaneous Crops	22	**0.11**	
34	**Total Non Food Crops**	**7286**	**36.97**	
35	**Total Food & Non Food Crops**	**19710**	**100**	

The wheat (19.20%), Paddy (8.68%), Jowar (2.96%), Maize (4.38) are found the main cereals (7555 thousand ha.) crops of the state. The chickpea (12.89%) Tur (1.69%), lentil (2.95%), peas (1.11%), are the main pulse crop of the state. Madhya Pradesh known for Soybean and occupied 23.29% of the state food and non food crop area of the state (**Table 2.9**). Apart from soybean, Sesamum, linseed, Groundnut, Mustard and Rape seed over the other oilseeds grown by the cultivators in the state.

Table 2.9 Area of Food and Non Food Crops of Madhya Pradesh 2005-06

S. No.	Particulars	Area (ha)	Percentage to total
1	Total cereals	7555	38.33
2	Total Pulses	4332	21.98
3	Total Oilseed	6057	30.73
4	Total Food Crops	7286	36.97
5	Total Non Food Crops	7286	36.97
6	**Total**	**19710**	**100**

Table 2.10: Area, Production& Yield of Major Crops in Madhya Pradesh 2005-06

Crops	Area 000ha	Production (000 t)	YIELD (kg/ha)
Wheat	3785	6200	1710
Paddy	1711	1694	1045
Jowar	583	607	1093
Maize	863	1248	1455
Gram	2541	2378	937
Tur	323	242	744
Lentil	582	293	503
Peas	219	104	474
Torea	48	32	674
Urad	483	171	354
Moong	77	25	305
Kulthi	27	8	276
Sugarcane	52	224	4327
Sesamum	185	73	394
Linseed	132	53	401
Groundnut	208	231	1105
Rapeseed & Mustard	831	856	1032
Soybean	4590	4814	1050
Cotton	603	709	600

Table 2.11: Farm Implements in Madhya Pradesh 2005-2006

S. No.	Particulars	Number
1	Plough(Wooden)	3213638
2	Plough(Iron)	625233
3	Bullock Cart	1400495
4	Oil Pump	322918
5	Electric Pump	1459184
6	Tractor	266591
7	Miller	
8	Sugarcane Cutter(Power)	7514
9	Sugarcane Cutter(Bullock)	6103
10	Ghanis	3515
11	Plant Protection Implements	234692
12	Persian Wheels	8446

2.1.9 Yield of major crops

The yield potential of all the major crops is found weak in the plot. The wheat (1710 kg./ha) gave maximum average yield followed by maize (1455 kg./ha) groundnut (1105kg./ha), jowar(1093kg./ha), paddy(1045kg./ha)and soybean(1050kg.ha). Sugarcane produces a yield of 4327 kg./ha. Other crops yield were found to be below 1000 kg./ha. Hence, their is a tremendous scope of harvesting better yield of these crops in the state. (Table 2.10)

2.1.10 Farm Implements

The maximum farms of the state non mechanize. The number of plough (wooden) per ha. are found only 0.21, while plough (iron), bullock carts, oil-pumps, electric pumps, tractors, and plant protection implements are respectively of 0.04, 0.09, 0.02, 0.09,0.02,0.02 only. (Table 2.11)

2.1.11 Live Stock Population

There are 3345 thousand of domestically animals population in the state, in which the number of cows were found maximum (52.55%) followed by buffaloes (20.83%) and goat (22.45%) The maximum number of livestock population are of *deshi* breed yielded low production.

Table 2.12: Live Stock Population of Madhya Pradesh

S. No.	Particulars	Number	Percentage to total
1	**Cow**	17688875	52.88
2	Male	6691268	37.83
3	Female	5292357	29.92
4	Cattle	5705250	32.25
5	**Buffalo**	6968929	20.83
6	Male	328116	4.71
7	Female	3613649	51.85
8	Cattle	3042164	43.65
9	Ship	600820	1.80
10	Total Goat	7508359	22.45
11	Total Horse	38607	0.12
12	Mules	8262	0.02
13	Donkey	39730	0.12
14	Camel	6032	0.02
15	Pig	577603	1.73
16	Total Livestock	**33452217**	**100.00**
17	Poultry	9689967	

2.2 VIDISHA DISTRICT:

The District derives its Name from the Head Quarters town of Vidisha. The earliest reference of Vidisha is contained in Ramayana by Valmiki. It is stated there that Shatrughna's Son Shatrughati was placed in charge of Vidisha. In Brahmanical religious observance again, the place is called Bhadravati, the residence of Yuvanashva who supplied the famous horse to Yudhishthira during his Ashvamedha sacrifice.

The historicity of the ancient city of Besnagar, three Kilometers from Vidisha and identified with ancient Vidisha, goes back to some centuries before the birth of Christ. Besnagar figures prominently in Buddhist, Jain and Brahmanical Literature in various forms such as Vessanagar, Vaisyanagar etc. Tradition connects the town with Raja Rukmangada who neglecting his own wife for the Apsara Visva named the town Vishvanagar after her.

On the destruction of Besnagar, located on the western side of the river Betwa sometime after 7th century A.D., a new town sprang up on the Eastern bank of the River. This new town was known as Bhailaswamin or Bhillaswamin, the name of the place was later corrupted to 'Bhilsa' or Bhelsa. The name Bhelsa appears to have probably been obtained on account of the famous Suryamandir dedicated to God Sun.

Vidisha district situated at $23^{o}20'$to $24^{o}.22'$ North longitude and $77^{o}.16'$ to $78^{o}.18'$ East latitude in the Global of the earth. It is situated 428.96M height from MSL. Their are 7 tehsils namely Vidisha, Gyaraspur, Basoda, Nateran, Kurvai, Sironj, Lateri and 7 development blocks namely Vidisha, Gyaraspur, Basoda, Nateran, Kurvai, Sironj, Lateri present in the district. The district having 1533 villages comprises in 580 village panchayat. The number of electrify villages are 98.30% in the village reveals that the whole district have electricity facilities (Table 2.13). The total geographical area of the district of 7371 sq.km.

Table 2.13: Location of Vidisha District

S. No.	Particulars	Figures
1	Geographical Area (Sq. km.)	7371
2	Height from Mean Sea level (m)	428.96
3	North Longitude	$23^{0}.20'$ to $24^{0}.22'$
4	East Latitude	$77^{0}.16'$ to $78^{0}.18'$
5	Number of Tehsil	7
6	Number of Blocks	7
7	Number of Villages	1533
8	No. of Gram-panchayat	580
9	No. of Electrified Villages	1507
10	Percentage of Electrified Villages to total Villages	98.30

Fig. 2.2 : Map of Vidisha District of Madhya Pradesh

As per the 2001 census the total population of the district was 12.15 lacs, out of which the percentage of male and female was 53.33% and 46.67% respectively. Vidisha district is a rural background district as 78.57% population of the district residing in rural area. The percentage of Schedule Caste and Schedule Tribes was 19.85% and 4.88% respectively. The total number of farmers has 11.86% to the total population of the district. The 37.19% of the population were found engaged in the works, while 62.81% were under non worker category (Table 2.14).

Table 2.14: Population Parameters of Vidisha District (Census: 2001)

S. No.	Particulars	Numbers	Percentage to total
1	**Total Population**	**1214860**	**100**
A	Male	647840	53.33
B	Female	567020	46.67
2	**Sex ratio per thousand male**	**875**	
3	**Rural Population**	**954490**	**78.57**
A	Male	509861	53.42
B	Female	444629	46.58
4	**Urban Population**	**260367**	**21.43**
A	Male	137977	52.99
B	Female	122390	47.01
5	**Population of Schedule Caste**	**241131**	**19.85**
A	Male	129018	53.51
B	Female	112113	46.49
6	**Population of Schedule Tribes**	**59323**	**4.88**
A	Male	30960	52.19
B	Female	28363	47.81
7	**Number of Literate Persons**	608083	50.05
8	**Number of Farmers**	**144055**	**11.86**
A	Male	129297	89.76
B	Female	14758	10.24
9	**Agriculture Labor**	**100508**	**8.27**
A	Male	74861	74.48
B	Female	25647	25.52
10	**Home Industry**	**8435**	**0.69**
A	Male	5691	67.47
B	Female	2744	32.53
11	**Other Workers**	**93223**	**7.67**
A	Male	81601	87.53
B	Female	11622	12.47
12	**Total Main Workers**	**346221**	**28.50**
A	Male	291450	84.18
B	Female	54771	15.82
13	**Marginal Workers**	**105566**	**8.69**
A	Male	39941	37.84
B	Female	65625	62.16
14	**Total Workers**	**451787**	**37.19**
A	Male	331391	73.35
B	Female	120396	26.65
15	**Non Workers**	**763070**	**62.81**
A	Male	316447	41.47
B	Female	446623	58.53

The total geographical area of the district was 730197 ha., out of which 14.86% of the total land was found under forest area (2006). The 72.73% of land was comes under net area sown, while only 6.48% of land was comes under non agricultural uses. The cropping intensity of the district was found to be 124.83% (Table 2.15).

Table 2.15: Land Use Classification of Vidisha District

S. No.	Particulars	Area (ha)	Percentage to Geographical area
1	Geographical Area	730197	100
2	Area under forest	108580	14.86
3	Area not available for cultivation	47314	6.48
4	Area under other non agricultural land (excluding fallow land)	19460	2.67
5	Area under Cultivable Waste land	17405	2.38
6	Fallow land	6367	.87
7	Net area sown	531071	72.73
8	Double cropped Area	131859	
9	Gross Area sown	662930	
10	**Cropping Intensity (%)**	**124.83**	

The Vidisha district had 45.78% of net irrigated area to net cultivated area. The 16.16%, 15.90%, and 1.75% well, total net irrigated area by all resources was 243150 ha. Out of which 41.25% was irrigated by tube well, canals and tanks respectively. The irrigated area by other sources (24.92%) such as ponds, tanks also found a major source of irrigation in the area (Table 2.16).

Table 2.16: Irrigation Status of Vidisha District

S. No.	Particulars	Number	Area (ha)	Percentage to total
1.	**Canal Govt. /Private**	11	38656	***15.90***
2.	**Tube well**	12193	100295	***41.25***
3.	**Well**	11822	39305	***16.16***
4.	**Tank**	23	4256	***1.75***
5.	**Other Sources**	-	60638	***24.94***
6.	**Net Irrigated Area by all sources**	-	243150	***100.00***
7.	**% of Net Irrigated Area to Net Cultivated Area**		**45.78**	

Vidisha district had 662894 ha. of land under total food and non food crops. Out of which total food grain (79.38%) possesses the highest area. The district is pre-dominantly pulse growing district, contributed 45.44% area to total food and non food crops. In pulse group chickpea (64.59%) had occupied. The highest area apart from

pulses, cereals contributed 32.92% area to total food and non food crops. In cereals, wheat (31.16%) had occupied maximum area under cultivation followed maize (2.65%), jowar (2.09%) and paddy (0.28%). Soybean, a oilseed crops also grown in kharif season by the cultivators, contributing 18.84% to total food and non food crops. In non food crops only fodder was found to be grown by the cultivators (Table 2.17).

Table 2.17 :Cropping Pattern of Vidisha District

S. No.	Crops	Area (ha.)	Percentage to Total
1.	Wheat	206566	31.16
2.	Paddy	619	0.09
3.	Jowar	4556	0.69
4.	Maize	5774	0.87
5.	Other cereals	721	0.11
A	**Total cereals**	**218236**	**32.92**
6.	Chickpea	194560	29.35
7.	Pigeon pea	916	0.14
8.	Black Gram	19231	2.90
9.	Other Pulses	86508	13.05
B	**Total Pulses**	**301215**	**45.44**
10.	Sugarcane	274	0.04
11.	Total Fruits	263	0.04
12.	Total Vegetables	1818	0.27
13.	Total Spices	4431	0.67
C	**Total Food grains**	**526237**	**79.38**
14.	Cotton	7	0.00
15.	Other Fibers	32	0.00
16.	Total Fibers	39	0.01
17.	Sesame	213	0.03
18.	Linseed	329	0.05
19.	Groundnut	684	0.10
20.	Rapeseed & Mustard	923	0.14
21.	Soybean	124862	18.84
22.	Other Oilseed	2173	0.33
D	**Total Oilseed**	**127035**	**19.16**
E	**Total Food Crops**	**653272**	**98.55**
23.	Tobacco	0	0.00
24.	Other Medicinal & Narcotics	3	0.00
25.	Total Medicinal & Narcotics	11	0.00
26.	Fodder Crops	9603	1.45
27.	Other Miscellaneous Crops	5	0.00
F	**Total Non Food Crops**	**9622**	**1.45**
G	**Total Food & Non Food Crops**	**662894**	**100**

As regards to yield per has of different crops grown in the district maize (1160 kg./ha.) gave highest yield to cultivators followed by paddy (1969 kg/ha.), wheat (811 kg/ha), soybean (789 kg/ha) jowar (702 kg/ha.), pigeon pea (655 kg/ha) and chickpea (689 kg/ha), while the production of wheat (167.5 thousand t) was found to be the highest

in the district followed by chickpea (132.9 thousand t) and soybean (985 thousand t). Other crops contributing negligible production in the district. (Table2.17)

There were 140351 number of land holdings present in the district in which small land holdings (24.67%) was found maximum followed by semi medium (23.71%), marginal (22.82%) medium (21.54%) and large (7.86%). These holdings occupied 540066 ha of land. The large size (35.97%) holdings occupied highest area followed by medium (34.89%), semi medium (17.09%), small (9.08%) and marginal (2.98%) in the district. The average size of holding of the district was of 3.85 ha. The average size of marginal holding was of 0.50 ha, while the average size of small, medium, semi medium, large size respectively was of 1.42 ha. 2.85 ha. 6.23 ha. and 17.61 ha. (Table 2.18)

Table 2.18: Size of Holdings in Vidisha District

S. No.	Particulars	Number	Area (ha)	Average size of Holding(ha)
1	Marginal Farmers(Below 1ha)	32026	16089	0.50
2	Percentage to total	22.82	2.98	
3	Small Farmers (1.01 To2.00 ha)	34629	49011	1.42
4	Percentage to total	24.67	9.08	
5	Semi Medium Farmers(2.01 To 4.00 ha)	32374	92284	2.85
6	Percentage to total	23.07	17.09	
7	Medium Farmers(4.01 To 10.00Hect)	30226	188411	6.23
8	Percentage to total	21.54	34.89	
9	Large Farmers(10.1&Above)	11033	194271	17.61
10	Percentage to total	7.86	35.97	
11	**Total**	140351	540066	3.85
		100.00	100.00	

As regards to live stock population of milch and drought animals, it is clear from the table 2.19 that their were 133305 animals are present in the district, in which percentage of cows (55%) was found more followed by buffaloes (20%) and goats (22.17%). The percentage of female buffaloes (54.98%) were found more as compared to male buffaloes (2.38%). In cows male, female and calves were found in same percentage.

Table 2.19 Live Stock Population of Vidisha District

S. No.	Particulars	Numbers	Percentage to total
1	**Cow**	**247479**	**55.02**
A	Male	81131	32.78
B	Female	81617	32.98
C	Caves	84681	34.22
2	**Buffalo**	**89974**	**20.00**
A	Male	2142	2.38
B	Female	49466	54.98
C	Caves	38366	42.64
9	Sheep	4120	0.92
10	**Total Goat**	**99741**	**22.17**
11	Total Horse	568	0.13
12	Ass	260	0.06
13	Donkey	1707	0.38
14	Camel	0	0.00
15	Pig	6006	1.34
16	Total Livestock	449805	100
17	Birds	133305	

2.2.1 Block: Basoda, District Vidisha

The total geographical area of block Basoda is of 1221 sq.km. There are 275 villages in the block and situated at 415.24m from MSL. In the globe of the earth it is located at $23^0$42' to 24^o02' North longitude and 77^o23' to 78^o18' East latitude. Their are 101 gram panchyat and all the villages of blocks are electrified except 3 villages. (Table 2.20)

Table 2.20: Location of Basoda Block

S. No	Particulars	Figures
1	Geographical Area (Sq.Km.)	1221
2	Number of Villages	275
3	Height from Sea level (Meter)	415.24
4	North Longitude	23^0.42' to 24^0.02'
5	East Latitude	77^0.23' to 78^0.18'
6	No. of Gram-panchayat	101
7	No. of Electrified Villages	272

The block had 177150 person, comprises of 53.33% of male and 46.67% of female. The male female ratio in the block was 1000: 878. It is a rural dominating block as the cent per cent population belongs to rural environment. In the population statistics there are 22.13% of Schedule Caste, 9.31 % of Schedule Tribes population to total population. Hence, it is clear that the maximum population of the block belongs to

general category including backward classes. The 50 per cent of the population of the block are comes under non workers. (Table 2.21)

Table 2.21 Population Parameters of Basoda Block 2001

S. No.	Particulars	Numbers	Percentage to total
1	**Total Population**	**177150**	**100**
A	Male	94470	53.33
B	Female	82680	46.67
2	**Sex ratio**	**878**	
3	**Rural Population**	**177148**	**100.00**
A	Male	94468	53.33
B	Female	82680	46.67
4	**Urban Population**	**0**	**0.00**
A	Male	0	0
B	Female	0	0
5	**Population of Schedule Caste**	**39211**	**22.13**
A	Male	21023	53.62
B	Female	18188	46.38
6	**Population of Schedule Tribes**	**16495**	**9.31**
A	Male	8451	51.23
B	Female	8044	48.77
7	**Number of Literate Persons**	78066	44.07
8	**Number of Farmers**	**28464**	**16.07**
A	Male	23009	80.84
B	Female	5455	19.16
9	**Agriculture Labor**	**23120**	**13.05**
A	Male	15266	66.03
B	Female	7854	33.97
10	**Home Industry**	**1246**	**0.70**
A	Male	810	65.01
B	Female	436	34.99
11	**Other Workers**	**10677**	**6.03**
A	Male	8869	83.07
B	Female	1808	16.93
12	**Total Main Workers**	**63507**	**35.85**
A	Male	47954	75.51
B	Female	15553	24.49
13	**Marginal Workers**	**25252**	**14.25**
A	Male	8127	32.18
B	Female	17125	67.82
14	**Total Workers**	**88759**	**50.10**
A	Male	56081	63.18
B	Female	32678	36.82
15	**Non Workers**	**88389**	**49.90**
A	Male	38387	43.43
B	Female	50002	56.57

Basoda block had 77.32% area under cultivation of total geographical area and only 15909 area of this was under double cropped area, resulting low cropping

intensity (116.82%). Only 8.95% and 6.58% of the total land was respectively comes under forest and non available for cultivation. The practice of fallow land to more than one year is not seen in the area as only 0.82% of fallow land was reported in the block statistics. (Table 2.22)

Table 2.22 : Land use Classification of Basoda Block

S. No	Particulars	Area (ha)	Percentage to Geographical area
1	Geographical Area	122324	100
2	Area under forest	10946	8.95
3	Area not available for cultivation	8044	6.58
4	Area under other non agricultural land (excluding fallow land)	3835.00	3.14
5	Area under Cultivable Waste land	3913.00	3.2
6	Fallow land	1008.00	0.82
7	Net area sown	94578.00	77.32
8	Double cropped Area	15909.00	
9	Gross Area sown	110487.00	
10	**Cropping Intensity (%)**	**116.82**	

As regards to irrigation facilities available in the block, only 42.44% of cultivated area are found under net irrigation. Tube well (31.99%) and wells (19.16%) were found the major sources of irrigation in the area, while other sources like ponds, tanks etc. were also contributing 39.51% to net irrigated area of the block. (Table 2.23)

Table 2.23: Irrigation Status of Basoda Block

S. No.	Particulars	Number	Area (ha.)	Percentage to Total
1.	Canal Govt /Private	1	2733	6.81
2.	Tube well	1440	12841	31.99
3.	Well	2212	7691	19.16
4.	Tank	6	1016	2.53
5.	Other Sources (Area)	15862		39.51
6.	Net Irrigated Area By All Sources		40143	100
7.	Percentage of Net Irrigated Area to Net Cultivated Area	42.44		

Pulse dominating cropping pattern is present in the block. Chick pea (64.59%) contributing the highest area in the category while, wheat (94.65%) is found dominating crop in the cereals. (Table 2.24)

Table 2.24 : Area of Food and Non Food Crops in Basoda

S. No	Particulars	Area (in ha)	Percentage to total
1	Total cereals	35006	31.68
2	Total Pulses	60371	54.64
3	Total Oilseed	13650	12.35
4	Total Food Crops	109446	99.06
5	Total Non Food Crops	1041	0.94
6	**Total**	110487	**100**

Cereals contributing 31.68% of the total food and non food crops of the block. A part from chickpea and wheat, soybean (kharif) is the third main crop of block contributing 12.16% of the total food and non food crop area. Hence, it is clear that kharif remains follow practice is popular in the block. About 90% of the net cultivated area remains follow in kharif season.

Table 2.25: Cropping Pattern of Basoda Block

S. No.	Crops	Area (ha)	Percentage to Total
1.	Wheat	34042	30.81
2.	Paddy	181	0.16
3.	Jowar	173	0.16
4.	Maize	461	0.42
5.	Other cereals	149	0.13
A	**Total cereals**	**35006**	**31.68**
6.	Gram	34735	31.44
7.	Tur	106	0.10
8.	Urad	2713	2.46
9.	Other Pulses	22817	20.65
B	**Total Pulses**	**60371**	**54.64**
10.	Sugarcane	2	0.00
11.	Total Fruits	39	0.04
12.	Total Vegetables	371	0.34
13.	Total Spices	7	0.01
C	**Total Food grains**	**95796**	**86.70**
14.	Cotton	0	0.00
15.	Other Fibers	3	0.00
D	**Total Fibers**	**3**	0.00
16.	Sesamum	4	0.00
17.	Linseed	59	0.05
18.	Groundnut	25	0.02
19.	Rapeseed & Mustard	124	0.11
20.	Soybean	13438	12.16
21.	Other Oilseed	212	0.19
E	**Total Oilseed**	**13650**	**12.35**
F	**Total Food Crops**	**109446**	**99.06**
22.	Tobacco	0	0.00
23.	Other Medicinal & Narcotics	3	0.00
24.	Total Medicinal & Narcotics	3	0.00
25.	Fodder Crops	1034	0.94
26.	Other Miscellaneous Crops	1	0.00
G	**Total Non Food Crops**	**1041**	**0.94**
H	**Total Food & Non Food Crops**	**110487**	**100**

The block had 66324 animals in which cows (55.06%) were found more than buffaloes (23.28%) and goats (20.20%); The live stock population present in the area is of local breed. The other animals like horse (0.09%), asses (0.03%) donkies (0.39%) and pigs (0.29%) were found in negligible quantity in the block. (Table 2.26)

Table 2.26: Live Stock Population of Basoda Block

S. No.	Particulars	Number	Percentage to total
1	**Cow**	36515	55.06
2	Male	12189	***33.38***
3	Female	10480	***28.70***
4	Cattle	13846	***37.92***
5	**Buffalo**	15438	23.28
6	Male	214	***1.39***
7	Female	9451	***61.22***
8	Cattle	5773	***37.39***
9	Ship	443	0.67
10	Total Goat	13400	20.20
11	Total Horse	57	0.09
12	Ass	17	0.03
13	Donkey	261	0.39
14	Camel	0	0.00
15	Pig	193	0.29
16	Total Livestock	66324	100
17	Birds	8901	

2.2.3 Sample Respondents:

Sample respondents of *basoda* blocks were selected from the 3 villages namely *Gamakar, Pachama, Mudra and in e*ach village 40 chickpea growers were selected > In this section of the chapter the general information of an average sample respondents is given, which provide information about his land utilization pattern, cropping pattern and value of his farm assets at different levels of adoption. There were 120 chickpea growers selected for the study in which 93 had moderate level of adoption, while 14 and 13 chickpea growers had high and low level of adoption.

The 56% of the total respondents comes under general category, while 46.67% were under other back ward classes. An average chickpea grower had 6 members in his family comprises of 2 male, 2 female and 2 children. His education status was found of 9 standard. The farming was found the main occupation of the all the respondents, while the 24.17 % of the sample farmers also engaged in other subsidiary occupation like dairy, poultry etc

Table 2.27: General Information of the sample Respondents (numbers)

Particulars	Level of Adoption			
	Low	**Moderate**	**High**	**Average**
Numbers of sample farmers	13	93	14	120
General	8	44	5	57
	61.54	***47.31***	***35.71***	***47.50***
OBC	1	46	9	56
	7.69	***49.46***	***64.29***	***46.67***
S.C	4	2	0	6
	30.77	***2.15***	***0.00***	***5.00***
ST	0	1	0	1
	0.00	**1.08**	**0.00**	**0.83**
Average size of family	6	6	5	6
Male	2	2	2	2
Female	2	2	2	2
Children	2	2	1	2
Educational status of head of the family	8	10	10	9
Occupation				
Main (farming)	13	93	14	120
	100.00	**100.00**	**100.00**	**100.00**
Subsidiary (Dairy, Poultry etc.)	7	19	3	29
	53.85	**20.43**	**21.43**	**24.17**

Figures denoted by bold italic show percentage to total

An average chickpea grower of the study area had 3.77 ha of land and he cultivated his 98.22 % of land. Only 1.74 ha of land was found in current fallow. His 68927 area was found under irrigation. The chickpea growers had low level of adoption had 1.92 ha.under cultivated land, while the high adopter had 5.04 ha. of land under cultivation

Table 2.28: Land utilization of sample farmers

Particulars	Level of adoption			
	Low	**Moderate**	**High**	**Average**
Size of holding	1.95	4.31	5.04	3.77
	100.00	***100.00***	***100.00***	**100.00**
Net Area Sown	1.92	4.18	5.00	3.70
	98.46	***96.98***	***99.21***	**98.22**
Leased in land	0.06	0.25	0.13	0.15
	3.08	***5.80***	***2.58***	**3.82**
Leased out land	0.00	0.00	0.00	0.00
	0.00	***0.00***	***0.00***	**0.00**
Fallow Land	*0.05*	*0.08*	*0.04*	0.06
	2.56	***1.86***	***0.79***	**1.74**
Irrigated Area	0.81	3.23	4.55	2.86
	41.54	***74.94***	***90.28***	**68.92**

Figures denoted by bold italic show percentage to total

Out of gross cropped area (7.24 ha) an average chickpea grower devoted his 47.38% area in *Kharif* , while he cultivated his 52.62% area in *Rabi* . Hence, the *rabi* was found to be main cropping season of the study area. Out of total *rabi* area chickpea (43.92%) occupied the maximum area followed by wheat (40.67 %) and lentil (14.82%). Soybean (69.04%) was found to be main crop of *kharif* season followed by urid (23.96%). The cropping intensity of low level of adoption was found to be highest (205.21 %) followed by moderate (192.11%) and high (194.80%) level of adoption . (Table 2.29).

Table 2.29: : Cropping pattern of sample farmer (ha.)

Particulars	**Levels of Adoption**			
	Low	**Moderate**	**High**	**Average**
Kharif				
Soybean	1.57	2.57	2.58	2.24
	79.70	***71.59***	***55.84***	**69.04**
Urid	0.40	0.88	1.25	0.84
	20.30	***24.51***	***27.06***	**23.96**
Sugarcane	0.00	0.00	0.00	0.00
	0.00	***0.00***	***0.00***	**0.00**
Mung	0.00	0.08	0.32	0.13
	0.00	***2.23***	***6.93***	**3.05**
Arhar	0.00	0.05	0.00	0.02
	0.00	***1.39***	***0.00***	**0.46**
Paddy	0.00	0.01	0.00	0.00
	0.00	***0.28***	***0.00***	**0.09**
Others	0.00	0.00	0.47	0.16
	0.00	***0.00***	***10.17***	**3.39**
Total Kharif	1.97	3.59	4.62	3.39
	50.00	**44.71**	**47.43**	**47.38**
Rabi				
Gram	0.78	2.08	2.32	1.73
	39.59	**46.85**	**45.31**	**43.92**
Wheat	0.91	1.64	1.99	1.51
	46.19	**36.94**	**38.87**	**40.67**
Lentil	0.28	0.64	0.81	0.58
	14.21	**14.41**	**15.82**	**14.82**
Others	0.00	0.09	0.00	0.03
	0.00	**2.03**	**0.00**	**0.68**
Total Rabi	1.97	4.44	5.12	3.84
	50.00	**55.29**	**52.57**	**52.62**
Gross Cropped Area	3.94	8.03	9.74	7.24
	100.00	**100.00**	**100.00**	**100.00**
Cropping Intensity (%)	205.21	192.11	194.80	197.37

Figures denoted by bold italic show percentage to total

An average farmer had total asset of Rs.4.13 lacs in the area under study comprises of Rs.2.08 lacs (50.28%) of land, 0.96 lacs (23.25%) of total machine and implements and 0.29 lacs of irrigation structure. The value of farm assets were found to be similar all the levels of adoption with minor variations (Table 2.30).

Table 2.30: Farm assets at different levels of adoption (Rs./ha)

Particulars	**Level of Adoption**			
	Low	**Moderate**	**High**	**Average**
Value of land	2.25	1.94	1.44	1.88
Value of Farm House	0.28	0.16	0.16	0.20
Total	**2.53**	**2.10**	**1.60**	**2.08**
	62.92	***50.00***	***38.37***	***50.28***
Well	0.13	0.19	0.27	0.20
Bore-well	0.00	0.00	0.00	0.00
Tube Well	0.10	0.14	0.20	0.15
Total irrigation structure	**0.23**	**0.28**	**0.35**	**0.29**
	5.72	***6.67***	***8.39***	***6.94***
Electric Pump & Pipe	0.26	0.40	0.45	0.37
Plough	0.00	0.01	0.00	0.00
Duffan	0.00	0.01	0.01	0.01
Pata	0.00	0.00	0.00	0.00
Bullock cart	0.00	0.00	0.01	0.00
Tractor	0.28	0.32	0.40	0.33
Cultivator	0.00	0.01	0.01	0.01
Seed drill	0.03	0.01	0.01	0.02
Trolley	0.12	0.14	0.20	0.15
Spade& Khurpi	0.00	0.00	0.00	0.00
Power Implement	0.00	0.00	0.00	0.00
Chaff Cutter	0.00	0.00	0.00	0.00
Sprayer	0.00	0.00	0	0.00
Thresher	0.05	0.07	0.08	0.07
Crusher	0.00	0	0	0.00
Others	0.00	0	0	0.00
Total Machines and implements	**0.74**	**0.97**	**1.17**	**0.96**
	18.43	***23.10***	***28.06***	***23.25***
Cow	0.20	0.25	0.33	0.26
Buffaloes	0.20	0.25	0.27	0.24
Bullocks	0.08	0.05	0.06	0.06
Others animals	0.04	0.3	0.39	0.24
Total Animals	**0.52**	**0.85**	**1.05**	**0.81**
	12.93	***20.24***	***25.18***	***19.53***
Total assets	**4.02**	**4.20**	**4.17**	**4.13**
	100.00	***100.00***	***100.00***	***100.00***

Figures denoted by bold italic show percentage to total

2.3 NARSINGHPUR DISTRICT

Narsinghpur is a district, which is well known for its fertile land, it is said to be the most fertile land all over Asia. Black soil suited for any kind of cultivation blessed with adequate irrigation facilities. District is famous for its rich agricultural production. Being situated at upper part of Narmada Valley, which is much important for agriculture. District's production of grains is more than the actual requirement. For agriculture both old and new techniques are equally in practice. In old equipments there are Ploughs, Bullock Carts, Bakhar, Hnasiya Various types of knives and khurpi etc. In new methods or techniques Thrashers, Tractors, Harvesters, electric pumps, sprinklers etc. Along with these better quality seeds and best quality pesticides are used.

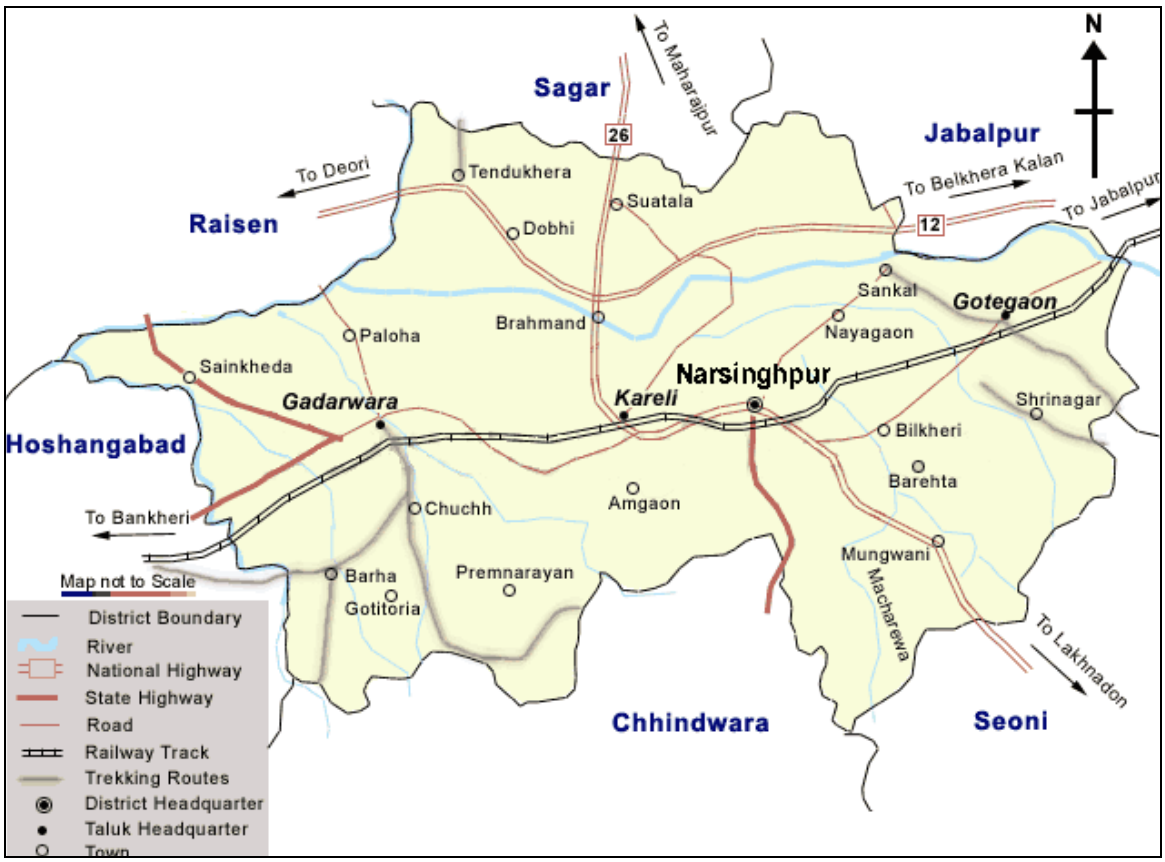


Fig. 2.3 : Map of Narsinghpur District of Madhya Pradesh

It attracts special attention because of its natural situation as well. On the Northern ends Vindhyachal & on the southern ends through out the lengths are Satpura ranges of Mountains. In the Northern part river Narmada flows from East to West. Which is a sacred as holy as river Ganga.Narsinghpur district has received many natural gifts as Narmada Kachhar. In the ancient period, this area was ruled by many Rajvansh including great historical worrier Rani Durgawati which was refured by various names in that period. In the Eighteenth Century Jat Sardars got constructed a large Temple, in which Idol of Lord Narsimha placed & worshiped & so in the name of Lord Narsimha. The villages Gadariya Kheda become "Narsinghpur" & later on it become headquarter of the district.

The total geographical area of the Narsinghpur district is of 5133 sq.km. District is situated at 251 m from Mean Sea Level and located at $22^{o}10'$ longitude and $78^{o}38'$ to $79^{o}38'$ East latitude in the global of the earth. Their are 4 tehsils namely, Narsinghpur , Kareli, Gotegaon, Gadarwara and 7 blocks namely Narsinghpur, Kareli, Gotegaon, Chavarpatha, Saikheda, Babaichichli, Tendukheda in the district. There are 1056 villages were found in the district, out of which 99 per cent are electrified in the district.

Table 2.31: Location of Narsinghpur Districts

S. No.	Particulars	Figures
1	Geographical Area (Sq. Km.)	5133
2	Height from Sea level (Meter)	251
3	North Longitude	$22^{0}.40'$ To$23^{0}.10'$
4	East Latitude	$78^{0}.38'$ To $79^{0}.38'$
5	Number of Tehsil	4
6	Number of Blocks	7
7	Number of Villages	1052
8	No. of Gram-panchayat	457
9	No. of Electrified Villages	1040
10	Percentage of Electrified Villages to Total Villages	98.86

As per the 2001 census of the district Narsinghpur had 95746 persons, which is comprises of 52.38 of male and 47.62 of female, denotes a having low male female ratio (1000:909). The district had rural environment as 84.01% of population residing in the villages and only 15.99% lives in rural areas. The majority of population belongs to non workers (57.87%) than workers (52.23%) reveals that employment opportunities are not available to the half of the population.

Table 2.32: Population parameters of Narsinghpur District (Census 2001)

S. No	Particulars	Numbers	Percentage
1	Total Population	957646	100.00
a	Male	501645	52.38
b	Female	456001	47.62
2	Sex ratio	909	
3	Rural Population	804536	84.01
a	Male	421247	52.36
b	Female	383289	47.64
4	Urban Population	153110	15.99
a	Male	80398	52.51
b	Female	72712	47.49
5	Population of Schedule Caste	154552	16.14
a	Male	81000	52.41
b	Female	73552	47.59
6	Population of Schedule Tribes	126139	13.17
a	Male	64514	51.15
b	Female	61625	48.85
7	Number of Literate Persons	624793	65.24
8	Number of Farmers	119313	12.46
a	Male	98397	82.47
b	Female	20916	17.53
9	Agriculture Labor	110777	11.57
a	Male	71725	64.75
b	Female	39052	35.25
10	Home Industry	11912	1.24
a	Male	8357	70.16
b	Female	3555	29.84
11	Other Workers	68071	7.11
a	Male	58723	86.27
b	Female	9348	13.73
12	Total Main Workers	310073	32.38
a	Male	237202	76.50
b	Female	72871	23.50
13	Marginal Workers	93390	9.75
a	Male	33417	35.78
b	Female	59973	64.22
14	Total Workers	403463	42.13
a	Male	270619	67.07
b	Female	132844	32.93
15	Non Workers	554183	57.87
a	Male	231026	41.69
b	Female	323157	58.31

In Narsinghpur district only 59.09% of the total geographical area was found under net cultivation. The 26.42% of the land is found under forest. The 5% and 4.68% of the land were respectively found under land not available for cultivation and under other non agril. land. Area under cultivable waste land and fallow land are respectively 2.92% and 1.78% to the total geographical area. The cropping intensity of the district is 128.74 per cent reveals that was only 28.74% cultivated area, used twice in a year by the cultivators.

Table 2.33 : Land use Classification of Narsinghpur District 2005-06

S. No.	**Particulars**	**Area (ha)**	**Percentage to Geographical area**
1	Geographical Area	513651	100
2	Area under forest	136207	26.52
3	Area not available for cultivation	25683	5
4	Area under other non agricultural land (excluding fallow land)	24044	4.68
5	Area under Cultivable Waste land	14978	2.92
6	Fallow land	9120	1.78
7	Net area sown	303533	59.09
8	Double cropped Area	87248	
9	Gross Area sown	390781	
10	**Cropping Intensity (%)**	**128.74**	

The 57 per cent of the net cultivated area of the district was found under irrigation by the different sources of irrigation. The tube wells (43.24%) and wells (52.88%) plays an important role in irrigation of crops. The 57% net cultivated area was in irrigation, but the cropping intensity of the area only 128.74% reveals that these sources not efficiently used by the cultivators.

Table 2.34 : Irrigation Status of Narsinghpur District

S. No.	Particulars	Number	Area (ha)	Percentage to total
1	Canal Govt /Private	13	1095	0.63
2	Tube well	4706	75366	43.24
3	Well	25815	92164	52.88
4	Tank	1	8	0
5	Other Sources (Area)	-	6894	3.96
6	Net Irrigated Area By All Sources	-	174297	100
7	% of Net Irrigated Area to Net Cultivated Area	-	57	

Cropping pattern of the district was found a pulse based as the 58.20% of the total cropped area was found under this group, while 19.29% and 14.09% area cultivated by the farmers to cultivate cereals and oilseeds respectively. In pulses, chickpea, was found the dominant crop cultivated by farmers in rabi season. Tur and urad were the other major pulses grown by the farmers. Wheat was a major cereals crop of the area, in which farmers devoted their 13.95% of total cropped area in the district. Paddy (3.34%), Jowar (1.17%), and maize (0.17%) are the other cereals grown by the cultivators in the district. Soybean is the major oilseed crop grown by the cultivators in the area. Some of the farmers also cultivate seasamum, linseed, groundnut and mustard in the district. As regards to yield of the different crops, cultivators harvested maximum yield of wheat (2850 kg/ha) as compared to paddy (2000 kg/ha), maize (2100 kg/ha) and jowar (1350 kg/ha)in cereals groups. In pulses the farmers harvested a yield of 1050 kg./ha and 1150 kg./ha respectively of gram and arhar.

Table 2.35 : Cropping Pattern of Narsinghpur District Year 2005-06

S. No.	Crops	Area (ha)	Percentage
1	Wheat	54522	13.95
2	Paddy	13053	3.34
3	Jowar	4563	1.17
4	Maize	656	0.17
5	Other cereals	2577	0.66
6	Total cereals	75371	19.29
7	Gram	139117	35.60
8	Tur	25607	6.55
9	Urad	14093	3.61
10	Other Pulses	48631	12.44
11	Total Pulses	227448	58.20
12	Sugarcane	25627	6.56
13	Total Fruits	35	0.01
14	Total Vegetables	3713	0.95
15	Total Spices	1582	0.40
16	Total Food grains	333787	85.41
17	Cotton	0	0
18	Other Fibers	39	0.01
19	Total Fibers	39	0.01
20	Sesamum	891	0.23
21	Linseed	13	0.00
22	Groundnut	91	0.02
23	Rapeseed & Mustard	206	0.05
24	Soybean	53153	13.60
25	Other Oilseed	1928	0.49
26	Total Oilseed	55081	14.09
27	Total Food Crops	388868	99.51
28	Tobacco	0	0
29	Other Medicinal & Narcotics	55	0.01
30	Total Medicinal & Narcotics	55	0.01
31	Fodder Crops	1819	0.47
32	Other Miscellaneous Crops	0	0
33	Total Non Food Crops	1929	0.49
34	Total Food & Non Food Crops	390797	100

The district contributed 185.6 thousand t of wheat, 139.10 thousand t of chick pea 139.10 thousand t of soybean and 126.5 thousand t of sugar cane in Madhya Pradesh basket of food grains.

Table 2.36: Area of Food and Non Food Crops in Narsinghpur District

S. No	Particulars	Area (in ha)	Percentage to total
1	Total cereals	75371	19.29
2	Total Pulses	227448	58.20
3	Total Oilseed	55081	14.09
4	Total Food Crops	388868	99.51
5	Total Non Food Crops	1929	0.49
6	**Total**	**390797**	**100**

There were 119313 numbers of holdings of the cultivators in the district covers 303533 ha of land reveals that the average size of holding of the district is of .....ha.

The number of holding were found more in marginal (32.99%) category followed by small (31.89%), and semi medium (22.19%) categories, while the area of holding was found more in semi medium (24.55%), followed by small (18.48%) and marginal (6.46%).

Table 2.37 : Size of Holdings in Narsinghpur District

S. No.	Particulars	Number	Area	Size of holding
1	Marginal Farmers(Below 1 Hect)	38171	19637	0.51
2	Percentage to total	32.99	6.46	
3	Small Farmers (1.01 To2.00 Hect)	38059	56104	1.47
4	Percentage to total	31.89	18.48	
5	Semi Medium Farmers(2.01 To 4.00 Hect)	26470	74516	2.81
6	Percentage to total	22.19	24.55	
7	Medium Farmers(4.01 To 10.00Hect)			
8	Large Farmers(10.1&Above)			
9	Total	119313	303533	2.54

There were 435846 number of pet animals present in the district in which number of cows (63.85%) were found more as compared to buffaloes (19.36%), The sheep, goats,

horses, donkies and pigs were found other animals domesticated by the cultivators in the district.

Table 2.39: Live Stock Population of Narsinghpur District

S. No	Particulars	Number	Percentage to total
1	**Cow**	278306	63.85
2	Male	87658	***31.50***
3	Female	84176	***30.25***
4	Caves	106492	***38.26***
5	**Buffalo**	84364	19.36
6	Male	1933	***2.29***
7	Female	37631	***44.61***
8	Caves	44800	***53.10***
9	Ship	1585	0.36
10	Total Goat	64508	14.80
11	Total Horse	1475	0.34
12	Ass	0	0.00
13	Donkey	1339	0.31
14	Camel	0	0.00
15	Pig	4303	0.99
16	Total Livestock	435846	**100.00**
17	Birds	59920	

2.3.1 BLOCK : CHAVARPATHA

Chavapatha block situated at 333 meter above the Mean Sea Level and located at 23°10' North latitude and 78°50' East longitude. The total geographical area of the district is of 838 sq m comprise of 212 villages, 85 gram panchayat. (Table 2.40) The 93.30 per cent of the villages of the blocks are found electrified.

Table 2.40: Location of Block Chavapatha

S. No.	Particulars	Numbers
1	Geographical Area (Sq. Km.)	838
2	Height from Sea level (Meter)	333
3	North Longitude	23^0.10'
4	East Latitude	78^0.50'
5	Number of Villages	212
6	No. Of Grampanchayat	85
7	No. Of Electrified Villages	187
8	Percentage of Electrified Villages to total Villages	98.30

The total population of the block was of 158898 in which male (52.35%) were found more as compared to females (47.65%), reveals low male female ratio. The cent per cent of the total population belongs to rural environment. (Table 2.41)

Table 2.41: Population parameters Chavarpatha Block

S. No.	Particulars	Figures	Percentage
1	**Total Population**	**158898**	**100**
a	Male	83190	52.35
b	Female	75708	47.65
2	**Rural Population**	**158898**	100
a	Male	83190	52.35
b	Female	75708	47.65

The block had 6.06% of total geographical area under forest. The 5.71% and 4.01% of the total geographical land found respectively in no available for cultivators and nor agricultural land. The 4.01% and 2.46% of land found under cultural waste land and fallow land. The cropping intensity of the block is of 118.24 % reveals that only 79235 ha of land used twice in a year by the cultivators. (Table 2.42**)**

Table 2.42 : Land use Classification of Chavarpatha Block 2005-06

S. No.	Particulars	Area (ha)	Percentage to Geographical area
1	Geographical Area	83852	100
2	Forest	5084	**6.06**
3	Area not available for cultivation	4790	**5.71**
4	Other non agricultural land (excluding fallow land)	3362	**4.01**
5	Culturable Waste lansd	2066	**2.46**
6	Fallow land	1512	**1.80**
7	Net area sown	67013	**79.92**
8	Double cropped Area	12222	
9	Gross Area sown	79235	
10	**Cropping Intensity (%)**	**118.24**	

The net irrigated area to total net cultivated area is found 47 per cent. The tube wells (37.78%) and wells (37.09%) were found to be the major sources of irrigation in the block. Cultivators also used ponds and tanks as an other source of irrigation (5.58%) in the area.

Table 2.43: Irrigation Status of Chavarpatha Block 2005-06

S. No	Particulars	Number	Area (ha)	Percentage to total
1	Canal Govt. /Private		0	0
2	Tube well	736	12020	37.78
3	Well	5864	18164	57.09
4	Tank	1	8	0.03
5	Other Sources (Area)		1775	5.58
6	Net Irrigated Area By All Sources		31818	100
7	% of Net Irrigated Area to Net Cultivated Area		**47**	

Chick pea was found a major crop grown by the cultivators in the block, cultivator devoted their 40.82% of total cropped area to this particular crop. Soybean (11.94%) wheat (10.41%), Tur (8.91%), Urad (1.47%) and sugarcane (8.31%) were the other major crops grown by the farmers in the block. Soybean and Tur were the kharif crops grown by the farmers. The block was found pre dominantly pulse grown area as pulses 67.67% contributing the highest area to followed by oilseeds (12.23 %) and cereals (11.74%) to total cropped area.

Their were 74750 total number of animals domesticated by the cultivators in the block. In the total domesticated animals the number of cows (60.02%) were found none as compared its buffalos (22.05%) and goats (15.22%). The some of farmers also domesticated sheep (1.07%), horses (0.26%) donkies (0.19%) and pigs (1.19%) in the area.

Table 2.44 : Cropping Pattern of Chavarpatha Block Year 2005-06

S. No	Crops	Area(ha)	Percentage to total
1	Wheat	8253	10.41
2	Paddy	687	0.87
3	Jowar	348	0.44
4	Maize	8	0.01
5	Other cereals	9	0.01
6	**Total cereals**	9305	11.74
7	Gram	32351	40.82
8	Tur	7060	8.91
9	Urad	1166	1.47
10	Other Pulses	13052	16.47
11	**Total Pulses**	53629	67.67
12	Sugarcane	5002	6.31
13	Total Fruits	29	0.04
14	Total Vegetables	514	0.65
15	Total Spices	174	0.22
16	**Total Foodgrains**	68624	86.59
17	Cotton	0	0
18	Other Fibers	0	0
19	Total Fibers	0	0
20	Sesamum	222	0.28
21	Linseed	1	0.00
22	Groundnut	1	0.00
23	Rapeseed & Mustard	0	0
24	Soybeen	9466	11.94
25	Other Oilseed	224	0.28
26	**Total Oilseed**	9690	12.23
27	**Total Food Crops**	78314	98.81
28	Tobacco	0	0
29	Other Medicinal & Narcotics	19	0.02
30	Total Medicinal & Narcotics	19	0.02
31	Fodder Crops	902	1.14
32	Other Miscellaneous Crops	0	0
33	**Total Non Food Crops**	**940**	**1.19**
34	**Total Food & Non Food Crops**	**79254**	**100**

Table 2.45: Area of Food and Non Food Crops in Chavarpatha Block

S. No	Particulars	Area (in ha)	Percentage to total
1	Total cereals	9305	11.74
2	Total Pulses	53629	67.67
3	Total Oilseed	9690	12.23
4	Total Food Crops	78314	98.81
5	Total Non Food Crops	940	1.19
6	**Total**	**79254**	**100**

Table 2.46 : Live Stock Population of Chavarpatha Block

S. No.	Particulars	Number	Percentage to total
1	**Cow**	44868	60.02
2	Male	15695	**34.98**
3	Female	12741	**28.40**
4	Cattle	16432	**36.62**
5	**Buffalo**	16482	22.05
6	Male	354	**2.14**
7	Female	6373	**38.67**
8	Cattle	9755	**59.19**
9	Ship	801	1.07
10	Total Goat	11376	15.22
11	Total Horse	191	0.26
12	Ass	0	0.00
13	Donkey	144	0.19
14	Camel	0	0.00
15	Pig	888	1.19
16	Total Livestock	74750	100
17	Birds	12348	

2.3.2 Sample Respondents:

Sample respondents of *Chavarpatha* blocks were selected from the 3 villages namely *Chitapar, Madanpur and lolri and* in each villages. 40 chickpea growers were selected. In this section of the chapter the general information of on average sample respondents is given, which provide information about his land utilization pattern, cropping pattern and value of his farm assets in different levels of adoption. There were 120 chickpea growers selected for the study in which 89 had moderate level of adoption, while 17 and 14 chickpea growers had high and low level of adoption respectively.

The 15.45 % of the total respondents comes under general category, while 65.98 % were under other back ward classes. An average chickpea grower had 6 members in his family comprises of 2 male, 2 female and 2 children. His education status was of found of 9 standard. The farming was found the main occupation of the all the respondents, while 44.15% of the sample farmers also engaged in other subsidiary occupation like dairy, poultry etc.

Table 2.47 General information of the sample respondents of Narsinghpur district.

(Numbers)

Particulars	Level of adoption			
	Low	Moderate	High	Average
Numbers of sample farmers	14	89	17	120.00
General	3	8	2	13.00
	23.08	***8.99***	***14.29***	***15.45***
OBC	5	72	11	88.00
	38.46	***80.90***	***78.57***	***65.98***
S.C	0	1	1	2.00
	0.00	***1.12***	***7.14***	***2.76***
ST	6	8	3	17.00
	46.15	***8.99***	***21.43***	***25.52***
Average size of family	7	6	6	6
Male	3	2	2	2
Female	2	2	2	2
Children	2	2	2	2
Educational status of head of the family	8	10	9	9
Occupation				
Main (farming)	14	89	17	40.00
	100.00	***100.00***	***100.00***	***100.00***
Subsidiary (Dairy, poultry etc.)	12	23	2	12.33
	92.31	***25.84***	***14.29***	***44.15***

Figures denoted by bold italic show percentage to total

An average chickpea grower of the study area had 3.84 ha of land and he cultivated his 96.83 % of land. The 71.88 per cent area found to be under irrigation. The chickpea growers had low level of adoption had 2.07 ha. of cultivated land, while moderate had 3.89 ha of land and at high adoption the size of holding was of 5.55 ha. of land.

Table 2.48 : Land use pattern the sample respondents

Particulars	Level of adoption (Numbers)			
	Low	Moderate	High	Average
Size of holding	2.07	3.89	5.55	3.84
	100.00	***100.00***	***100.00***	***100.00***
Net Area Sown	2.00	3.81	5.31	3.71
	96.79	***97.99***	***95.71***	***96.83***
Leased in land	0.00	0.10	0.00	0.03
	0.00	***2.69***	***0.00***	***0.90***
Leased out land	0.00	0.02	0.00	0.01
	0.00	***0.58***	***0.00***	***0.19***
Fallow Land	*0.00*	*0.00*	*0.00*	0.00
	0.00	***0.00***	***0.00***	**0.00**
Irrigated Area	1.11	3.27	4.31	2.90
	53.79	***84.16***	***77.68***	***71.88***

Figures denoted by bold italic show percentage to total

Out of gross cropped area (5.83 ha), an average chickpea grower devoted there in 46.30% area in *Kharif*, while he cultivated his 53.70% area in *Rabi* . Hence, the *rabi* was found to be main cropping season of the study area Out of total *rabi* area chickpea occupied the maximum area (42.72%) followed by wheat (27.58 %) and lentil (22.74 %). Soybean (49.84%) was found to be main kharif crop of the season followed by, sugarcane (18.06%) Arhar (16.79%) , paddy (10.89%) and urid (3.23 %). The cropping intensity of moderate level of adoption was found to be the highest (176.50 %) followed by low (149.17%) and high (146.41 %) level of adoption . (Table 2.49).

Table 2.49 : Cropping pattern of sample respondents

Particulars	Level of Adoption			
	Low	Moderate	High	Average
Kharif				
Soybean	0.43	2.10	1.95	1.49
	35.63	***61.66***	***52.23***	***49.84***
Urid	0.00	0.11	0.24	0.12
	0.00	***3.31***	***6.37***	***3.23***
Sugarcane	0.12	0.62	0.99	0.57
	9.63	***18.11***	***26.43***	***18.06***
Mung	0.00	0.05	0.00	0.02
	0.00	***1.47***	***0.00***	***0.49***
Arhar	0.38	0.28	0.40	0.35
	31.28	***8.25***	***10.83***	***16.79***
Paddy	0.27	0.21	0.15	0.21
	22.26	***6.26***	***4.14***	***10.89***
Others	0.01	0.03	0.00	0.02
	1.20	***0.94***	***0.00***	***0.71***
Total Kharif	1.20	3.40	3.74	2.78
	40.22	***50.59***	***48.09***	***46.30***
Rabi				
Gram	0.83	1.32	1.69	1.28
	46.54	***39.73***	***41.89***	***42.72***
Wheat	0.16	1.15	1.58	0.96
	8.90	***34.59***	***39.23***	***27.58***
Lentil	0.59	0.70	0.56	0.62
	33.22	***21.12***	***13.86***	***22.74***
Others	0.20	0.15	0.20	0.19
	11.33	***4.55***	***5.01***	***6.97***
Total Rabi	1.79	3.32	4.04	3.05
	59.78	***49.41***	***51.91***	***53.70***
Gross Cropped Area	2.99	6.72	7.78	5.83
	100.00	***100.00***	***100.00***	***100.00***
Cropping Intensity (%)	149.17	176.50	146.41	157.36

Figures denoted by bold italic show percentage to total

An average farmer had total asset of Rs.17.32 lacs in the area under study comprises of Rs.9.94 lacs (70.07 %) of land, 2.44 lacs (14.07 %) of total machine and implements and 0.73 lacs of irrigation structure. The value of farm assets were found to be similar all the levels of adoption with minor variations (Table 2.50).

Table 2.50: Value of Farm Assets of sample respondents

Particulars	**Level of adoption**			
	Low	**Moderate**	**High**	**Avearge**
Value of land	5.50	10.81	13.50	9.94
Value of Farm House	1.00	2.49	3.10	2.20
Total	**6.50**	**13.30**	**16.60**	**12.13**
	72.78	***69.82***	***69.26***	***70.07***
Well	0.18	0.21	0.32	0.24
Bore-well	0.00	0.04	0.00	0.01
Tube Well	0.16	0.51	0.75	0.47
Total irrigation structure	**0.34**	**0.76**	**1.07**	**0.73**
	3.85	***4.00***	***4.47***	***4.19***
Electric Pump & Pipe	0.10	0.53	0.80	0.48
Plough	0.04	0.05	0.06	0.05
Duffan	0.01	0.02	0.07	0.03
Pata	0.00	0.00	0.00	0.00
Bullock cart	0.07	0.03	0.03	0.04
Tractor	0.64	1.17	1.50	1.10
Cultivator	0.05	0.06	0.08	0.06
Seed drill	0.02	0.21	0.23	0.15
Trolley	0.09	0.16	0.25	0.16
Spade& Khurpi	0.01	0.03	0.03	0.02
Power Implement	0.00	0.03	0.05	0.03
Chaff Cutter	0.00	0.02	0.04	0.02
Sprayer	0.01	0.03	0.03	0.02
Thresher	0.02	0.05	0.07	0.05
Crusher	0.00	0.28	0.3	0.19
Others	0.01	0.03	0.01	0.02
Total Machines and implements	**1.07**	**2.70**	**3.55**	**2.44**
	11.95	***14.16***	***14.80***	***14.07***
Cow	0.04	0.35	0.5	0.30
Buffaloes	0.07	0.99	1	0.69
Bullocks	0.86	0.2	0.25	0.44
Others animals	0.05	0.75	1	0.60
Total Animals	**1.02**	**2.29**	**2.75**	**2.02**
	11.42	***12.02***	***11.47***	***11.67***
Total assets	**8.93**	**19.05**	**23.97**	**17.32**
	100.00	***100.00***	***100.00***	***100.00***

Figures denoted by bold italic show percentage to total

CHAPTER-III

RESEARCH METHODOLOGY

This chapter deals with the sampling techniques used, nature and type of data required ,tools of data collection , methods of classification, tabulation and analysis of collected data and concepts used while interpretation of data analyzed for the study.

3.1 Sampling Techniques:

The two districts i.e. Vidisha (16.71%) and Narsinghpur (12.01%) has been selected purposively for the study on the basis of highest area in chickpea under the districts were identified for AEZ for Pulses by the Government of M.P. (Table3.1)

Table 1: Percentage Area of Chickpea in different Districts under AEZ for Pulses (2004)

Districts under AEZ for Pulses	**Area of Chickpea (ha)**	**Percentage to M.P.**
Vidisha	206284	16.71
Narsinghpur	148291	12.01
Raisen	131939	10.69
Shivpuri	78139	6.33
Rajgarh	77851	6.31
Guna	66626	5.40
Hoshangabad	65803	5.33
Total AEZ	**774933**	**62.77**
Madhya Pradesh	**1234626**	**100.00**

A list of the all blocks in the each selected district (2) and production under chickpea was prepared in descending order and a Block having the highest production

under crop was selected for the investigation. Similarly, a list of the all villages in the each selected block and production under chickpea was prepared in descending order and categories them into 3 categories (Low, Medium and high chickpea production villages) by using cumulative frequency technique. A village under these three categories was randomly selected for the investigation.(Table 2)

Table 2: Selected Locations and Respondents of the Study

Name of the Districts	**Name of the Blocks**	**Name of the Villages**	**Total Numbers of Farmers**	**No. of Farmers Selected**	**Percentage to Total**
1.Vidisha	Ganjbasoda	1. Pachama		40	
		2. Gamakar		40	
		3.Madiyaponia		40	
Total		3		120	
2.Narsighpur	Chawarpath	1.Madanpura		40	
		2.Chitapar		40	
		3.Lolari		40	
Total		3		120	
Total	**2**	**6**		**240**	**100**

Further, a complete list of farmers of all the selected villages and area under the chickpea was prepared and 40 farmers from each selected village were randomly selected by using Random Table Number. Thus, 240 from 6 villages were considered for the investigation. The selected respondents were further classified in to 3 categories (Low, Moderate and High) by using Mean+/- 1 S.D of yield of chickpea at selected farms. The

primary data were also collected from about 25 different marketing intermediaries thus Village merchants of grains( ), Primary Whole sellers of grains( ), Secondary Whole sellers of grains( ), Secondary Processors of dal( ), Primary Whole sellers of dal( ), Secondary Whole sellers of dal( ), Tertiary Processors of Chickpea Flour( ), Primary Whole sellers of Chickpea Flour( ), Secondary Whole sellers of Chickpea Flour( ) and Retailers chickpea grains, dal and Chickpea Flour( ) were selected for the study those were functioning in different stages of marketing process of chickpea.

3.2 Nature & Sources of Data:

The study is bases on both primary and secondary data. The primary data of the study were collected from the selected respondents of different locations of the study. The required secondary data were collected on the different aspects of the study from the all the institutions (Department of Agril. Statistics, Government of M.P., Indian Institute of Pluses Research and Development, Kanpur (U.P.), All India Coordinated Research Project on Improvement of Chickpea, Jabalpur & Sehore (M.P.) etc.) from their published and unpublished records. The secondary data were collected from different Internet websites.

3.3 Tools of Data Collection:

A pre tested interview schedule was prepared for collection of required data from the respondents. (Appendix 1) This interview schedule having all the information about the sample farmer viz.; land utilization pattern, cropping pattern, farm assets and house hold assets, and expenses on input used, high yielding variety seeds, seed treatment fungicides, fertilizer & manures, micronutrients, bio fertilizer, insect pest control, disease control, labour used (human labour, bullock labour, machine labour), and output (yield of main product and by product) expected constraints related to crop production, processing and marketing etc. The primary data were collected from the individual sample respondents using this pre tested interview schedule through survey method by personal contact. The primary data pertained to the agricultural year 2007-2008.

3.4 Classification, Tabulation and Analysis of Data:

The primary data were classified and tabulated in light of stated objectives of the study. The SPSS (Statistical Package for Social Science) was used for classification, analysis and tabulation of collected data. The collected data were analyzed with compare means, coefficient of variance, chi square, correlation, regression analysis etc. A Multiple cobb douglus regression model will also be used for analyzing resource use efficiency of chickpea.

3.5Concepts Used:

The different concepts related to production and marketing of farm products were used in this study and are presented in this sub head.

3.5.1 Concept related to Production:

(i) Total variable cost: It includes operational cost as well as input cost per hectare

(ii) Operational cost: The per hectare expenses on human labour, bullock labour and machine hours were considered as operational cost of soybean.

(iii) Input cost: The per hectare expenses on material cost i.e. seed, seed treatment, micro nutrients, bio-fertilizers, fertilizer & manures, insecticides, pesticides fungicide were considered as input cost.

(iv) Fixed cost: Calculated as 25 per cent of total variable cost and it includes, rental value of owned land, interest on fixed capital, land revenue etc.

(v) Depreciation: It is calculated as 10% for fixed farm assets used in production of Chickpea.

(vi) Interest on working capital: It is calculated as 12% per annum for three month's on total variable cost.

(vii) Total cost of cultivation: Includes all the expenses on operational cost, input cost, fixed cost, depreciation and interest on working capital.

(vii) Gross income: Gross income includes cash received on account of the sale of produce (grain) and their by products (Bussa).
Gross Income = (Main product x price + Byproduct x price)

(viii) Net farm income at total variable Cost : Gross income – Total variable Cost

(ix) Net Farm Income at Total Cost: Gross Income –Total Cost of Cultivation

(x) Per Rupee return at Total variable Cost : Gross income / Total Variable Cost

(xi) Per Rupee return at Total Cost of Cultivation: Gross income / Total Cost of Cultivation

(xii) Cost of Production at Total Variable Cost : (Total variable cost –returns from by product/yield

(xiii) Cost of Production at Total Cost of Cultivation : (Total Cost of Cultivationt – returns from by product/yield

(xiv) Resource use efficiency:

Cobb-Douglas production function of following form will be used for the estimation of resource use efficiency in cultivation, since it is most widely used by the research worker for studying resource use efficiency.

$$y = a\ X_1b^1\ .\ X_2b^2\ .\ X_3b^3\ \ .....\ X_9b^9$$

This function is linear in log

$$\text{Log } y = \log a + b_1 \log X_1 + b_2 \log X^2 + ...+ b_9 \log X^9$$

Where,

y	=	Yield (q/ha) (Dependent variable)
x_1	=	Expenses on human labour . (Rs.)
x_2	=	Expenses on bullock labour . (Rs.)
x_3	=	Expenses on machine hrs. (Rs.)
x_4	=	Expenses on seed (Rs.)
x_5	=	Expenses on fertilizer & manures and bio fertilizer (Rs.)
x_6	=	Expenses on weedicides (Rs.)
x_7	=	Expenses on insecticides pesticides and fungicides (Rs.)
x_8	=	Expenses on irrigation (Rs.)
x_9	=	Expenses on misc, items (Rs.)

b_1 to b_9	=	Regression coefficient
a	=	Constant or intercept value
x_1 to x_9	=	Independent variables

3.5.2 Concepts related to Marketing

(i) Marketing cost- Marketing cost includes all the marketing charges from local assembling to reeling in the marketing process.

(ii) Marketing margin- Marketing margin covers all the expenses and profits of the marketing agencies and of functionaries.

(iii) Marketable surplus- It is the left out product available with the farmer after meeting his family and farm needs. It is calculated as-

(iv) Marketable surplus = Total production – (produce held for family consumption + wages payment in kind + social and religious function + cattle feed + seed)

(v) Marketed surplus – It is the actual quantity of produce sold in the market during the year.

(vi) Price Spread: Consumer Price- Producer Price

(vii) Producer share in the consumer rupee –

$$P = \frac{C - M}{C} \times 100$$

Where,

P = Producer share in the consumer rupee

C = Price paid by ultimate consumer

M = Marketing cost and margin

(viii) Marketing efficiency –Marketing efficiency will be estimated by using Shepherds formula

$$ME = \frac{V}{\text{——}} - 1$$

I

Where

ME – Marketing efficiency

V- Value of goods or consumers price

I – Total marketing cost and marketing margin

(ix) **Primary Processing:** Primary processing status has been identified by the cost and return incurred in different activities that an average farmer was taken up with his own level / resources for adding value in his product. viz. cleaning, grading, packing and packaging.

(x) Secondary Processing: Secondary processing status of chickpea has been identified by the cost and return incurred in the different activities that an average processor taken up for preparation of dal with his own level / resources for adding value in his product. Viz. Cleaning, grading, packing and packaging.

(xi) Tertiary Processing: Tertiary Processing Status will be identified by the cost and return incurred in the different activities that an average processor taken up for preparation of chickpea flour with his own level / resources for adding value in his product. Viz. Cleaning, grading, packing and packaging.

OOO

CHAPTER IV

RESULTS AND DISCUSSION

This chapter deals with the finding of the study based on the analysis of the collected data. The chapter is divided into 6 subheads according to the objectives of the study i.e. 1. Growth of the chickpea production in the AEZ districts for pulses, 2. Yield and adoption gap, 3. Post Harvest Losses in Chickpea, 4. Marketing of the chickpea ,5. Processing of the chickpea, 6. Constraints in Production & marketing of Chickpea.

4.1 Growth of Chickpea Production in M.P.:

Chick pea is the most important pulse crop of the state occupied nearly 60 per cent of total pulse area of the state (Table…)The growth of production of chickpea was observed by analyzed its intensity, absolute change, relative change, fluctuation and linear as well compound growth in area and productivity in different districts of AEZ for pulses in M.P. by considering the time series data of last 15 years i.e. from 1992-2006.

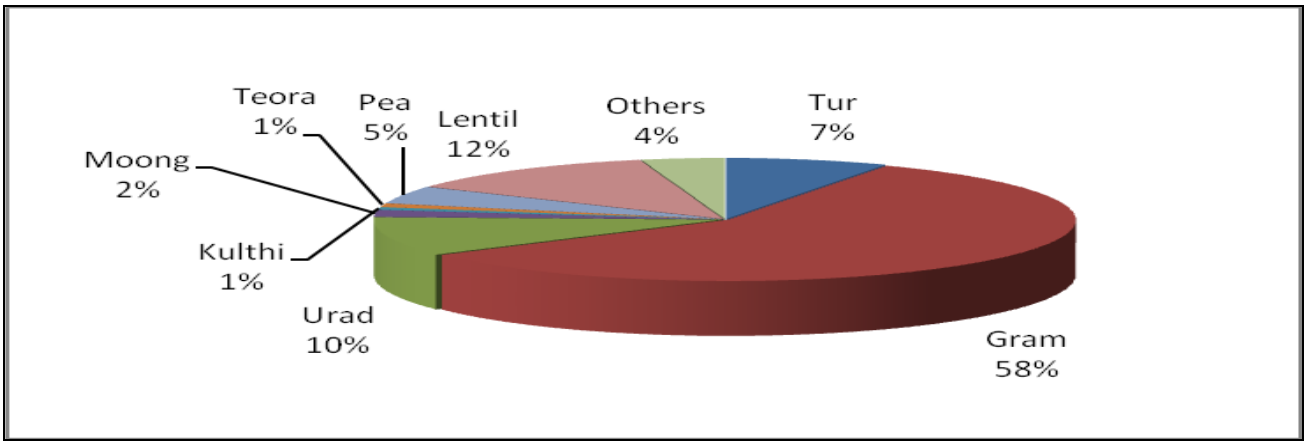


Fig ….: Percentage Share of different Pulses in M.P. (Total : 4267 thousand ha)

4.1 Intensity of Chickpea Production in M.P.:

The intensity of production of chickpea was observed in area, production and productivity in different districts of M.P.

4.1.1 Area & Production:

Chickpea was found to be grown by the cultivators almost in all the districts of the state, although its intensity was found different in different districts. The classification of these districts was done according to its area under different districts; the districts where the area of chickpea was found below 50 thousand ha were considered under low, where as the districts, where the area of chickpea between 50 thousand to 1.0 lacs ha and above 1 lacs ha were respectively considered under moderate and high intensity chickpea areas.(Table 4.1) In the state there were found 28 districts in low intensity area and covers about 20 percent of chickpea area and production of the state while 12 districts, and 8 districts were respectively found in moderate and high intensity areas and covers about 80 per cent (32% in moderate and 48% in high). It is surprising to note that Rajgarh, Shivpuri, Guna and Hosangabad district s comes in moderate intensity area and were listed in the AEZ for pulses, while the districts namely; Rewa, Datia, Satna, Ujjain, Shajapur, Jabalpur, Panna and Sehore (Moderate intensity areas) , & Dewas, Chatterpur,Damoh, Sagar (High intensity area) fallen respectively in moderate high intensity chickpea areas were not listed in the AEZ districts for pulses by the Government. Although, the production of chickpea, infrastructural and other facilities are found to be similar in all these districts of the state.

Table 4.1 : Area (000'ha) and Production (000't)of Chickpea in different districts on M.P.

Particulars	Districts	Area	Pc to total	Production	Pc to total
LOW	Barwani	1.20	0.05	2.40	0.09
	Anuppur	1.50	0.06	2.60	0.10
	Burhanpur	2.70	0.11	3.40	0.13
	Umaria	2.70	0.11	4.20	0.17
	Khargone	3.10	0.13	5.4	0.21
	Dindori	3.10	0.13	5.40	0.21
	Mandla	3.70	0.16	5.80	0.23
	Shahdol	4.95	0.21	6.00	0.24
	Balaghat	5.90	0.25	6.30	0.25
	Sheopur Kalan	6.70	0.28	7.50	0.30
	Morena	11.20	0.47	8.8	0.35
	Khandwa	12.10	0.51	14.1	0.56
	Jhabua	13.30	0.56	20.1	0.79
	Katni	16.20	0.68	20.5	0.81
	Mandsour	16.30	0.69	21.5	0.85
	Sidhi	16.50	0.69	23.3	0.92
	Betul	18.30	0.77	26.7	1.05
	Ratlam	20.70	0.87	26.7	1.05
	Indore	24.30	1.02	26.8	1.06
	Dhar	28.40	1.19	27.1	1.07
	Gwalior	30.20	1.27	29.7	1.17
	Harda	30.70	1.29	32.6	1.29
	Neeemuch	31.60	1.33	33.1	1.31
	Seoni	32.40	1.36	34.3	1.35
	Tikamgarh	33.60	1.41	35.1	1.38
	Bhind	35.90	1.51	36.7	1.45
	Bhopal	37.50	1.58	37.4	1.48
	Chhindwara	38.30	1.61	38.7	1.53
MODERATE	Rajgarh	52.00	2.19	45.5	1.80
	Rewa	53.40	2.25	50.1	1.98
	Datia	53.80	2.26	55.4	2.19
	Shivpuri	59.20	2.49	57.8	2.28
	Guna	59.90	2.52	63	2.49
	Hoshangabad	60.00	2.52	65.2	2.57
	Satana	62.00	2.61	66.6	2.63
	Ujjain	62.80	2.64	80.2	3.16
	Shajapur	70.60	2.97	81.1	3.20
	Jabalpur	74.40	3.13	82.5	3.25
	Panna	75.80	3.19	87.2	3.44
	Sehore	79.30	3.34	97.6	3.85
HIGH	Dewas	103.30	4.34	97.8	3.86
	Chhaterpur	108.70	4.57	102.5	4.04
	Ashok Nagar	112.30	4.72	124.9	4.93
	Damoh	143.10	6.02	133	5.25
	Nasinghpur	143.80	6.05	139.1	5.49
	Raisen	147.70	6.21	166.7	6.58
	Sagar	166.70	7.01	194.6	7.68
	Vidisha	205.80	8.66	201.6	7.95
	Madhya Pradesh	**2377.65**	**100.00**	**2534.60**	**100.00**

4.1.2 Productivity:

The average productivity of chickpea in M.P. was found to be 938 q/ha. There were 48 distrcits in the state in which in 26 districts the productivity was observed to be below the state productivity (Table 1.2) including the Guna districts which came under the AEZ for pulses districts, while the data of others 22 districts reported productivity above the state average. (Table 1.2) The districts namely ; Tikamgarh (20.60%), Jabalpur (24.30%), Shahdol (25.64%), Dewas (26.28%), Hosangabad (27.67%), Sheopur (32.26%), Morena (35.67%), Gwalior (38.17%), Datia (56.27%) ,and Harda (62.02%) showed 20 per cent and above average yield than the state average. Obliviously, in these, Tikamgarh, Jabalpur, Shahdol, Dewas, Sheopur, Morena, Gwalior, Datia are not in the list of AEZ districts for pulses in M.P.

Table : Productivity of Chickpea in Different Districts of M.P. (Kg/ha)

Anuppur	441	-52.97
Sidhi	441	-52.97
Umaria	450	-52.03
Dindori	492	-47.55
Barwani	500	-46.70
Khargone	534	-43.02
Ratlam	535	-42.98
Mandsour	610	-34.92
Jhabua	619	-34.06
Satana	635	-32.28
Mandla	685	-26.96
Betul	685	-26.94
Seoni	712	-24.09
Ujjain	761	-18.85
Panna	775	-17.38
Balaghat	787	-16.14
Katni	790	-15.76
Sagar	827	-11.85
Rewa	848	-9.64
Khandwa	858	-8.52
Damoh	858	-8.49
Dhar	871	-7.13
Shajapur	880	-6.16
Ashok Nagar	899	-4.15
Guna	899	-4.12
Indore	907	-3.34
Madhya Pradesh	**938**	**0.00**
Rajgarh	939	0.06
Sehore	978	4.24
Shivpuri	1024	9.18
Nasinghpur	1034	10.20
Burhanpur	1038	10.70
Bhind	1047	11.57
Vidisha	1058	12.74
Chhaterpur	1060	13.05
Bhopal	1068	13.89
Raisen	1111	18.38
Tikamgarh	1131	20.60
Jabalpur	1141	21.64
Chhindwara	1157	23.35
Neeemuch	1166	24.30
Shahdol	1179	25.64
Dewas	1185	26.28
Hoshangabad	1198	27.67
Sheopur Kalan	1241	32.26
Morena	1273	35.67
Gwalior	1296	38.17
Datia	1466	56.27
Harda	1527	62.82

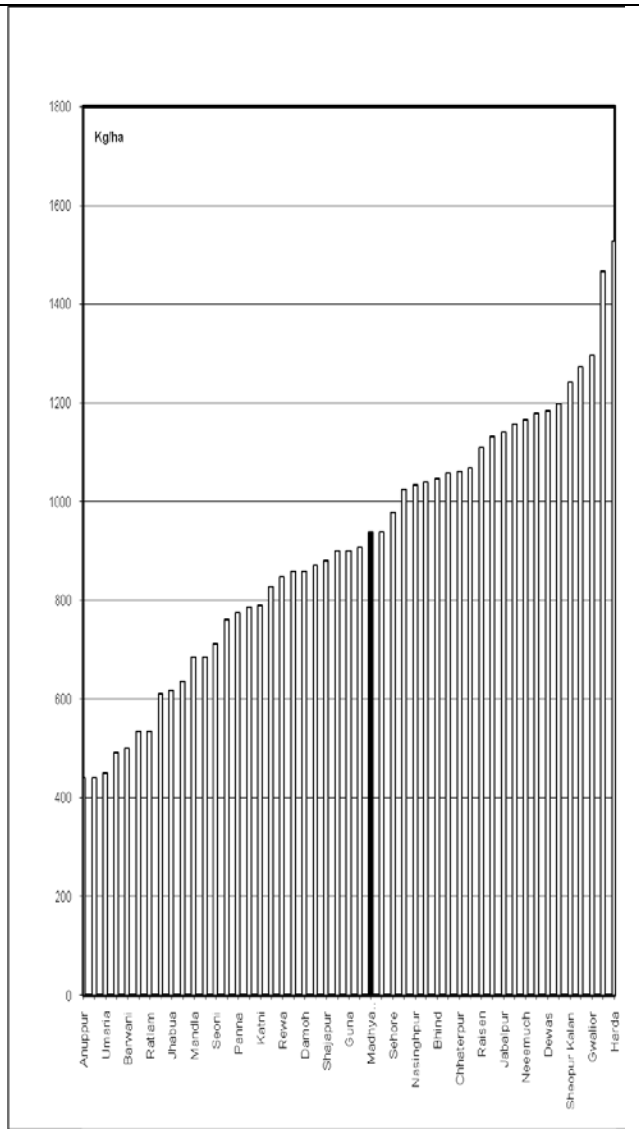


Fig : Productivity of Chickpea in different districts of M.P.

1.3 Area, Production & Productivity of Chickpea in AEZ Districts for Pulses in M.P.:

Rajgarh, Vidisha, Raisen, Hosangabad, Harda, Narsinghpur, Guna , Ashoknagar Shivpuri are listed by the government in the AEZ for pulses in the state. The districts Harda and Ashoknagar were came in to existence in the year 2004 , Therefoe , time series data related to these 2 districts are not available Hence, the district in which they exist before the bifurcation (Harda is the part of Hosangabad and Ashoknagar is the part of Guna) i.e. Hosangabad and Guna were taken in to consideration while analyzing the data.

1.3.1. Rajgarh:

In Rajgarh district the area of chickpea increased from 53.70 thousand ha (the base year) to 62.57 thousand ha showed an relative change of 16.51 per cent (8.87 thousand ha) with the fluctuation of 19.07 thousand ha (28.79%) during the period under study (1992-2006).(Table 1.3.1.).The area of chickpea in the district was found to be increased with a linear and compound growth respectively of only 0.65 and 0.06 per cent per annum. The production of chickpea also showed positive linear and compound growth of 2.07 and 1.14 per cent per annum respectively during the last 15 years. The production of chickpea found to be increased from 46.20 thousand t(the base year) to 67.77 thousand t showed an relative change of 46.68 per cent (21.57 thousand t) with the fluctuation of 25.85 thousand t (39.70%) during the period under study, revealed that the production was found to increased more than the area. (Fig. 1.1) This is the effect of increased in productivity in the district, as the productivity data showed that the productivity of chickpea increased by 14.21 per cent (183.12 kg/ha) from 860.19 kg/ha (base year) to 1043.30 kg/ha with a fluctuation of 136.05 kg/ha during the period under study (Fig. 1.2)

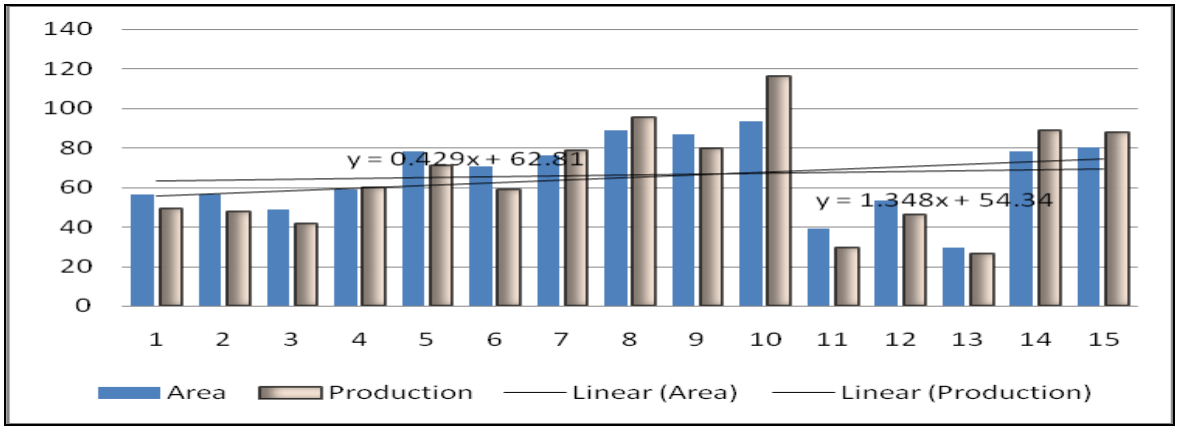


Fig. 1.1: Area and Production of Chickpea in Rajgarh District of AEZ for Pulses in M.P during 1992-2006

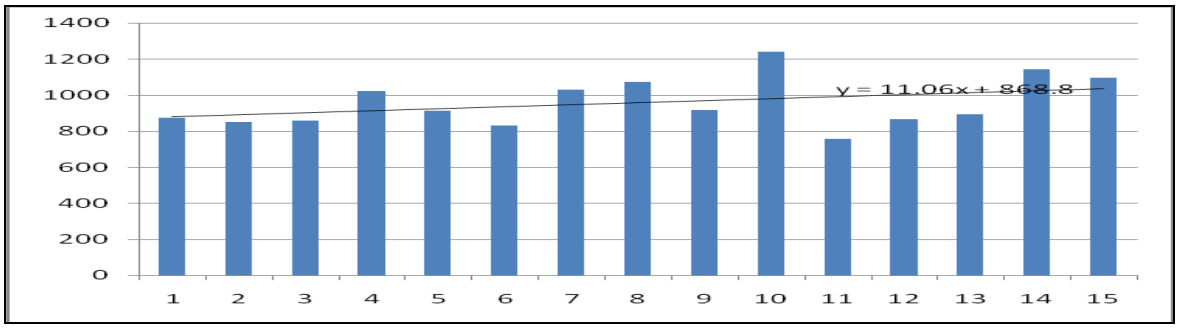


Fig. 1.2 : Productivity (Kg/ha) of Chickpea in Rajgarh District of AEZ for Pulses in M.P. during 1992-2006

Table1.1 : Growth of Area,Production & Productivity of Chickpea in Rajgarh District of M.P.

Particulars	Base year*	Current year**	Absolute Change	Relative Change	Standard Deviation	C.V (%)	Linear Growth Rate	Compound Growth rate	Calculated t-value
Area (000'ha)	53.70	62.57	8.87	16.51	19.07	28.79	0.65	0.06	0.36
Production (000't)	107.30	172.07	64.77	60.36	40.64	25.60	4.22	4.55	3.94
Productivity (Kg/ha)	860.19	1043.30	183.12	21.29	136.05	14.21	1.16	1.08	1.41

1.3.2 Vidisha:

In Vidisha district the area of chickpea increased from 152.70 thousand ha (the base year) to 200.93 thousand ha showed an relative change of 31.59 per cent (48.23 thousand ha) with the fluctuation of 23.65 thousand ha (13.72 %) during the period under study (1992-2006).(Table 1.3.2).The area of chickpea in the district was found to be increased with a linear and compound growth respectively of 2.50 and 2.53 per cent per annum. The production of chickpea also showed positive linear and compound growth of 4.22 and 4.55 per cent per annum respectively during the last 15 years. The production of chickpea found to be increased from 107.30 thousand t(the base year) to 172.07 thousand t showed an relative change of 60.36 per cent (64.77 thousand t) with the fluctuation of 40.64 thousand t (25.60 %) during the period under study, revealed that the production was found to increased more than the area. (Fig. 1.3) This is the effect of increased in productivity in the district, as the productivity data showed that the productivity of chickpea increased by 22.34 per cent (156.82 kg/ha) from 701.97 kg/ha (base year) to 858.79 kg/ha with a fluctuation of 191.52 kg/ha(20.84%) during the period under study (Fig. 1.4)

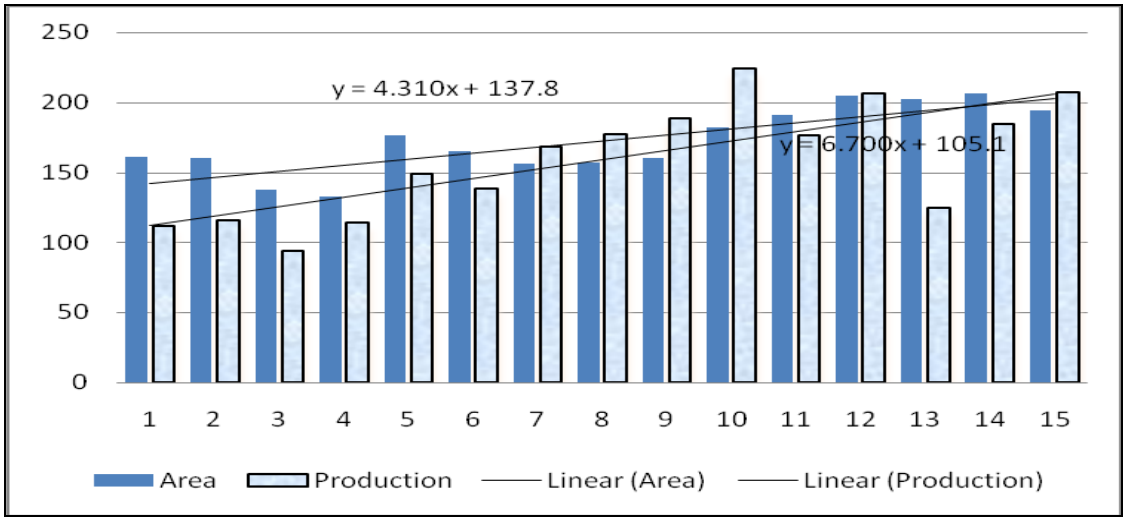


Fig. 1.1: Area and Production of Chickpea in Vidisha District of AEZ for Pulses in M.P during 1992-2006.

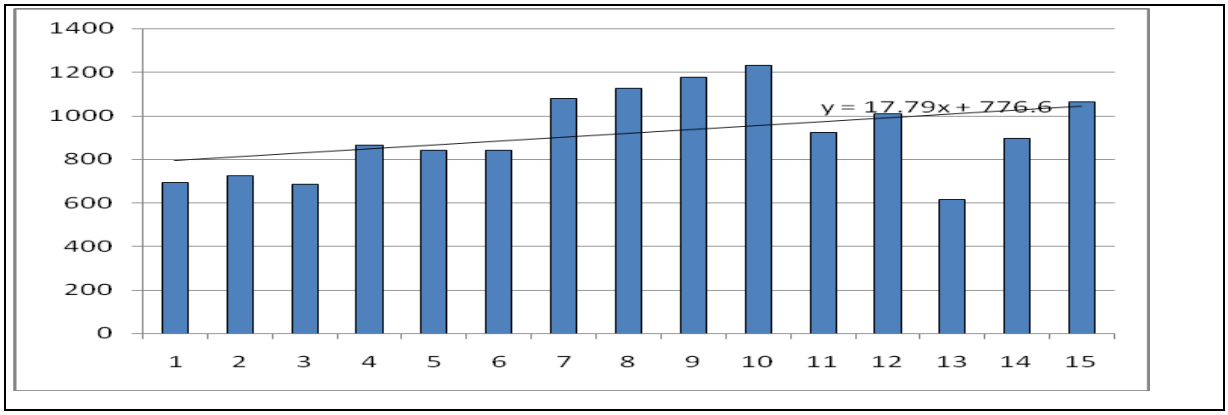


Fig. 1.1: Productivity (Kg/ha) of Chickpea in Vidisha District of AEZ for Pulses in M.P. during 1992-2006.

Table1.1 : Area,Production & Productivity of Chickpea Vidisha District of M.P.

Particulars	Base year*	Current year**	Absolute Change	Relative Change	Standard Deviation	C.V (%)	Linear Growth Rate	Compound Growth rate	Calculated t-value
Area (000'ha)	152.70	200.93	48.23	31.59	23.65	13.72	2.50	2.53	5.07
Production (000't)	107.30	172.07	64.77	60.36	40.64	25.60	4.22	4.55	3.94
Productivity (Kg/ha)	701.97	858.79	156.82	22.34	191.52	20.84	1.94	1.98	1.65

1.3.3 Raisen:

In Raisen district, the area of chickpea increased from 93.13 thousand ha (the base year) to 132.17 thousand ha showed an relative change of 41.91 per cent (39.03 thousand ha) with the fluctuation of 14.98 thousand ha (13.92 %) during the period under study (1992-2006).(Table 1.3.3).The area of chickpea in the district was found to be increased with a linear and compound growth respectively of 2.78 and 2.76 per cent per annum. The production of chickpea also showed positive linear and compound growth of 4.65 and 4.83 per cent per annum respectively during the last 15 years. The production of chickpea found to be increased from 75.60 thousand t(the base year) to 133.70 thousand t showed an relative change of 76.85 per cent (58.10 thousand t) with the fluctuation of 24.02 thousand t (24.02%) during the period under

study, revealed that the production was found to increased more than the area. (Fig. 1.3) This is the effect of increased in productivity in the district, as the productivity data showed that the productivity of chickpea increased by 24.62 per cent (199.83 kg/ha) from 811.75 kg/ha (base year) to 1011.57 kg/ha with a fluctuation of 126.99 kg/ha(13.50 %) during the period under study (Fig. 1.4)

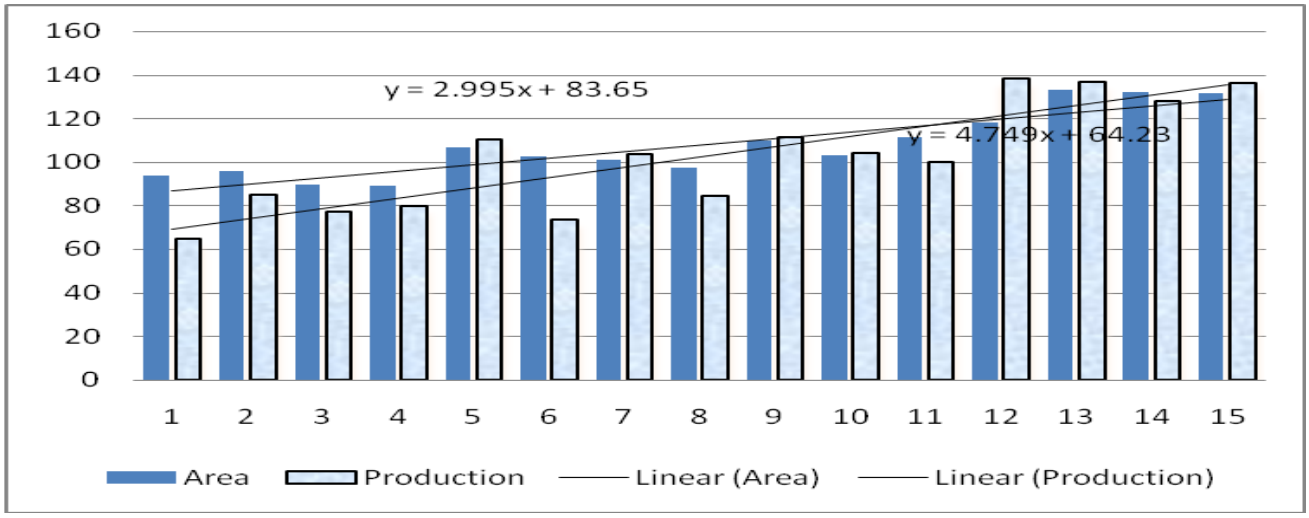


Fig. 1.1: Area and Production of Chickpea in Raisen District of AEZ for Pulses in M.P during 1992-2006.

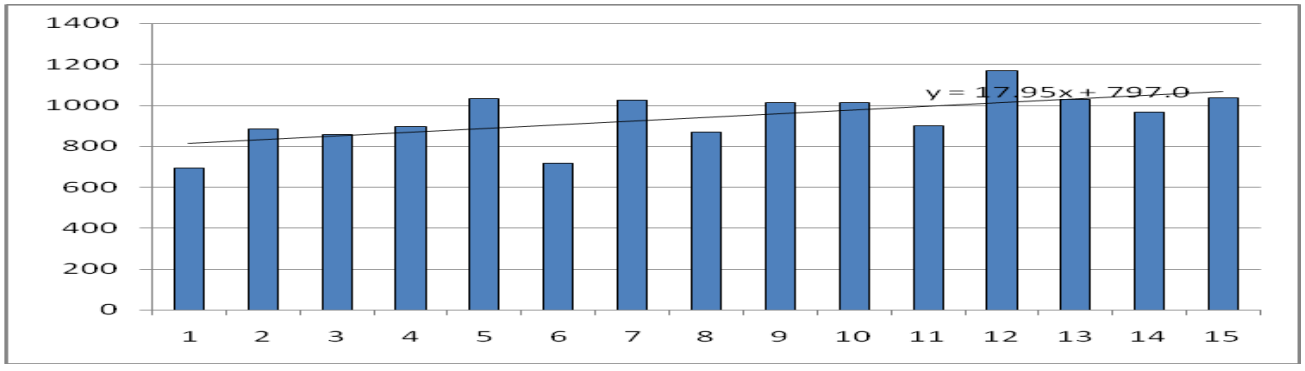


Fig. 1.1: Productivity (Kg/ha) of Chickpea in Raisen District of AEZ for Pulses in M.P. during 1992-2006

Table1.1 : Area,Production & Productivity of Chickpea Raisen District of M.P.

Particulars	Base year*	Current year**	Absolute Cange	Relative Change	Standard Deviation	C.V (%)	Iinear Growth Rate	Compound Growth rate	Calculated t-value
Area	93.13	132.17	39.03	41.91	14.98	13.92	2.78	2.76	7.20
Production	75.60	133.70	58.10	76.85	24.56	24.02	4.65	4.83	6.21
Prpductivity	811.75	1011.57	199.83	24.62	126.99	13.50	1.91	2.02	2.94

1.3.4 Hosangabad:

In Hosangabad district the area of chickpea decreased from 110.53 thousand ha (the base year) to 90.70 thousand ha showed an relative change of -17.94 per cent (-19.83 thousand ha) with the fluctuation of 17.88 thousand ha (17.36 %) during the period under study (1992-2006).(Table 1.3.2).The area of chickpea in the district was found to be decreased with a linear and compound growth respectively of -2.36 and -2.34 per cent per annum. The production of chickpea also showed negative linear and compound growth of -0.98 and -0.88 per cent per annum respectively during the last 15 years. The production of chickpea found to be decreased from 111.17 thousand t(the base year) to 108.37 thousand t showed an relative change of -2.52 per cent (-2.80 thousand t) with the fluctuation of 26.27 thousand t (23.31 %) during the period under study, revealed that the production was found to decreased less than the area. (Fig. 1.3) This is the effect of increased in productivity in the district, as the productivity data showed that the productivity of chickpea increased by 19.44 per cent (195.08 kg/ha) from 1003.72 kg/ha (base year) to1198.80 kg/ha with a fluctuation of 160.25 kg/ha(14.62 %) during the period under study (Fig. 1.4)

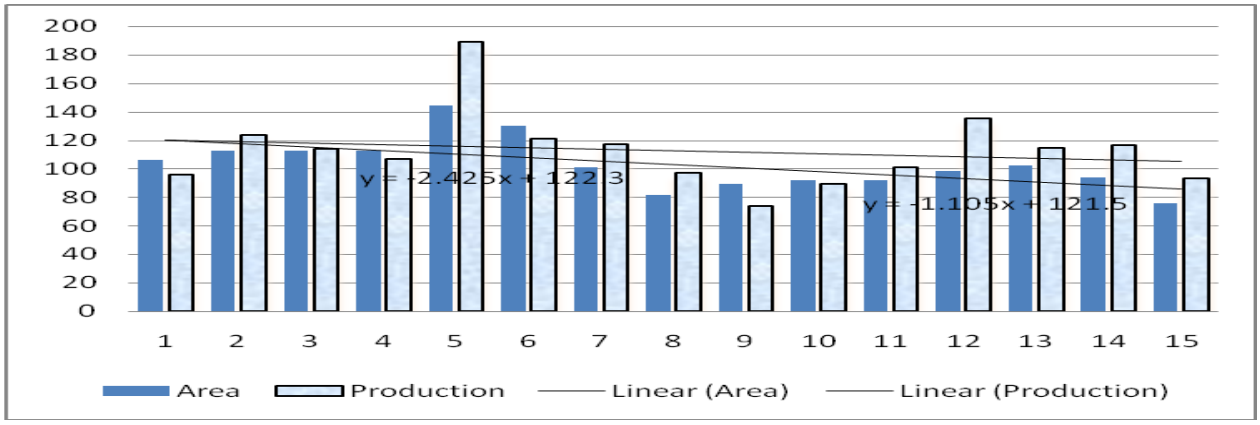


Fig. 1.1: Area and production of Chickpea in Hosangabad District of AEZ for Pulses in M.P. during 1992-2006

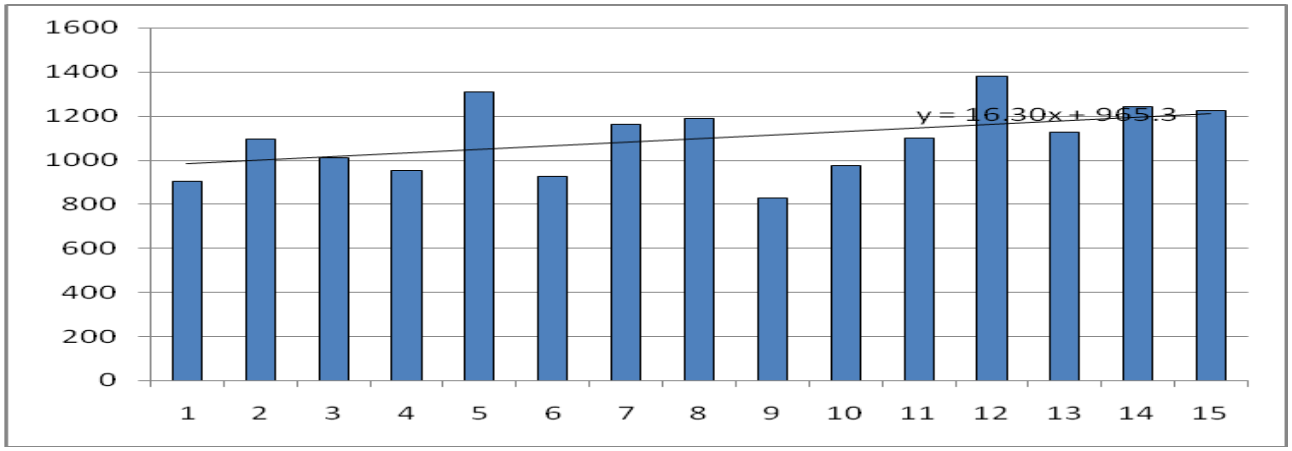


Fig. 1.1: Productivity (Kg/ha) of Chickpea in Hosangabad District of AEZ for Pulses in M.P. during 1992-2006

Table1.1 : Area,Production & Productivity of Chickpea Hosangabad District of M.P.

Particulars	Base year*	Current year**	Absolute Change	Relative Change	Standard Deviation	C.V (%)	Linear Growth Rate	Compound Growth rate	Calculated t-value
Area	110.53	90.70	-19.83	-17.94	17.88	17.36	-2.36	-2.34	-2.75
Production	111.17	108.37	-2.80	-2.52	26.27	23.31	-0.98	-0.88	-0.69
Productivity	1003.72	1198.80	195.08	19.44	160.25	14.62	1.49	1.50	1.84

1.3.5 Narsinghpur:

In Narsinghpur district the area of chickpea increased from 124.53 thousand ha (the base year) to 145.10 thousand ha showed an relative change of 16.51 per cent (20.57 thousand ha) with the fluctuation of 11.84 thousand ha (9.25 %) during the period under study (1992-2006).(Table 1.3.2).The area of chickpea in the district was found to be increased with a linear and compound growth respectively of 1.40 and 0.98 per cent per annum. The production of chickpea also showed positive linear and compound growth of 1.53 and 1.47 per cent per annum respectively during the last 15 years. The production of chickpea found to be increased from 122.47 thousand t(the base year) to 134.10 thousand t showed an relative change of 9.59 per cent (11.63 thousand t) with the fluctuation of 32.08 thousand t (25.20 %) during the period under study, revealed that the area was found to increased more than the production. (Fig. 1.3) This is the effect of decreased in productivity in the district, as the productivity data showed that the productivity of chickpea decreased by -5.95 per cent (-58.47 kg/ha) from 983.42 kg/ha (base year) to 924.96 kg/ha with a fluctuation of 247.91 kg/ha(24.95 %) during the period under study (Fig. 1.4)

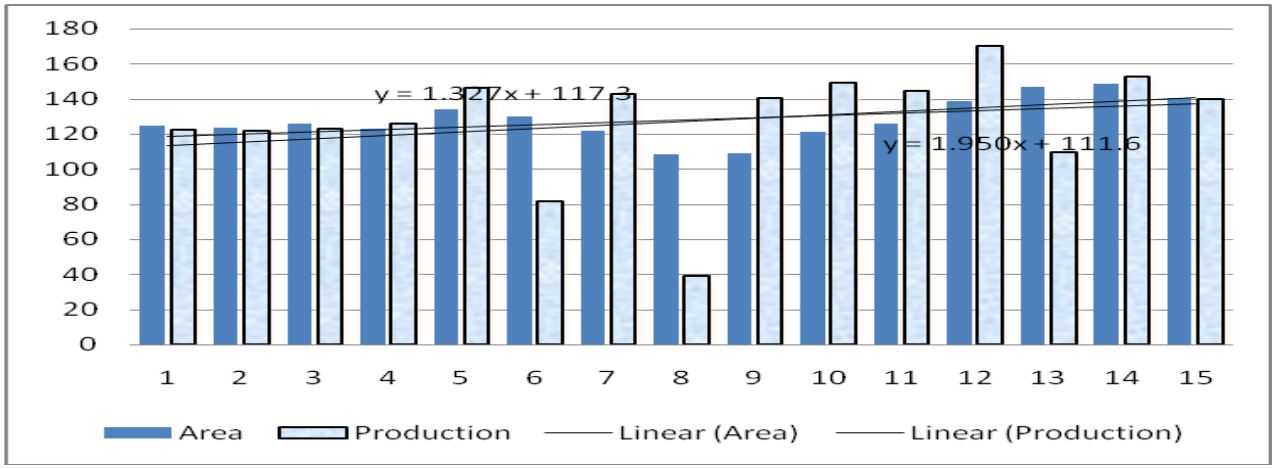


Fig. 1.1: Area and production of Chickpea in Narsinghpur District of AEZ for Pulses in M.P. during 1992-2006

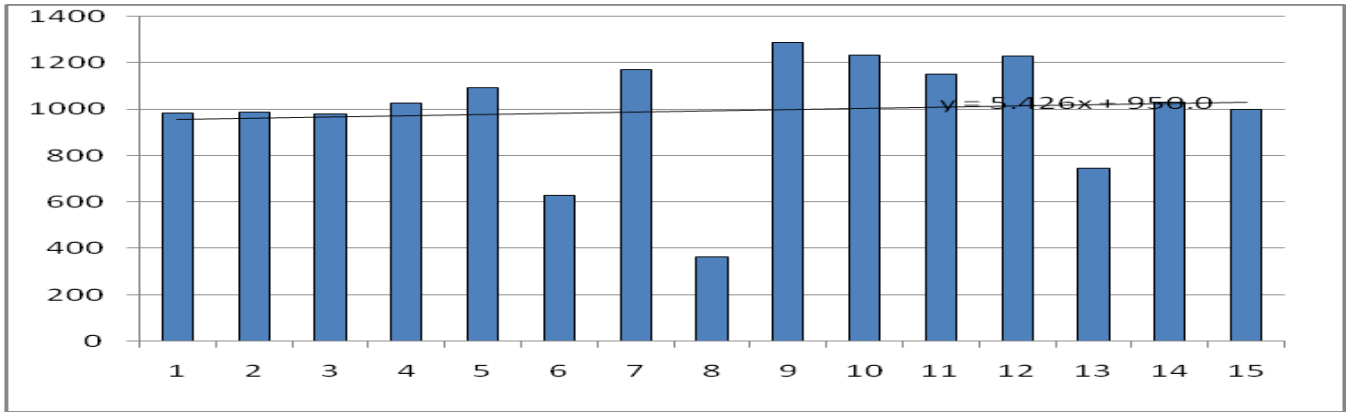


Fig. 1.1: Productivity of Chickpea in Hosangabad District of AEZ for Pulses in M.P. during 1992-2006

Table1.1 : Area,Production & Productivity of Chickpea in Narsinghpur District of M.P.

Particulars	Base year*	Current year**	Absolute Change	Relative Change	Standard Deviation	C.V (%)	Linear Growth Rate	Compound Growth rate	Calculated t-value
Area	124.53	145.10	20.57	16.51	11.84	9.25	1.04	0.98	2.09
Production	122.47	134.10	11.63	9.50	32.08	25.20	1.53	1.47	1.02
Productivity	983.42	924.96	-58.47	-5.95	247.91	24.95	0.55	0.48	0.35

1.3.2 Guna:

In Guna district the area of chickpea decreased from 148.67 thousand ha (the base year) to 108.63 thousand ha showed an relative change of -26.93 per cent (-40.03 thousand ha) with the fluctuation of 44.95 thousand ha (27.56 %) during the period under study (1992-2006).(Table 1.3.2).The area of chickpea in the district was found to be decreased with a linear and compound growth respectively of -1.14 and -2.47 per cent per annum. The production of chickpea also showed negative linear and compound growth of -0.56 and -2.01 per cent per

annum respectively during the last 15 years. The production of chickpea found to be decreased from 101.30 thousand t(the base year) to 63.80 thousand t showed an relative change of -37.02 per cent (37.50 thousand t) with the fluctuation of 57.66 thousand t (42.89 %) during the period under study, revealed that the production was found to decreased less than the area. (Fig. 1.3) This is the effect of increased in productivity in the district, as the productivity data showed that the productivity of chickpea increased by 0.85 per cent (5.85 kg/ha) from 686.19 kg/ha (base year) to 692.03 kg/ha with a fluctuation of 245.58 kg/ha(29.82 %) during the period under study (Fig. 1.4)

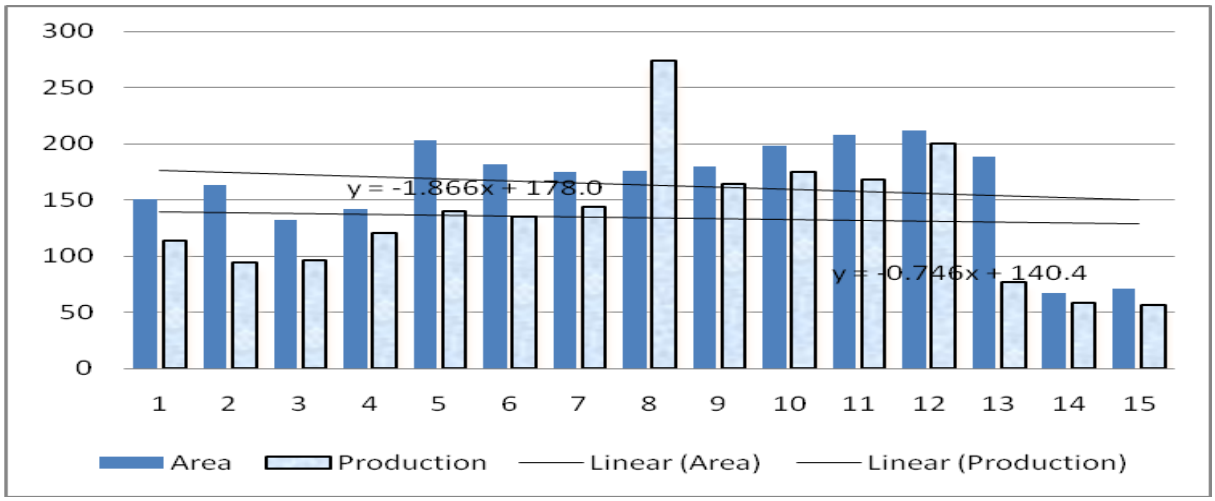
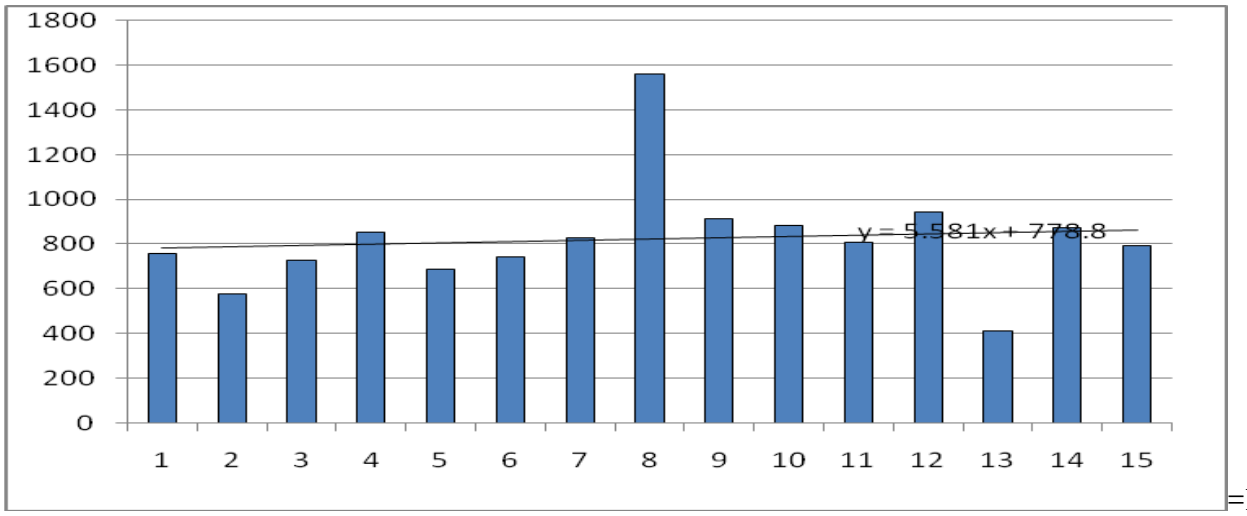


Fig. 1.1: Area and production of Chickpea Guna District of AEZ for Pulses in M.P. during 1992-2006



=Fig. 1.1: Productivity (Kg/ha) of Chickpea in Hosangabad District of AEZ for Pulses in M.P. during 1992-2006

Table1.1 : Area,Production & Productivity of Chickpea in Guna District of M.P.

Particulars	Base year*	Current year**	Absolute Change	Relative Change	Standard Deviation	C.V (%)	Linear Growth Rate	Compound Growth rate
Area	148.67	108.63	-40.03	-26.93	44.95	27.56	-1.14	-2.47
Production	101.30	63.80	-37.50	-37.02	57.66	42.89	-0.56	-2.01
Productivity	686.19	692.03	5.85	0.85	245.58	29.82	0.68	0.47

1.3.2 Shivpuri:

In Shivpuri district the area of chickpea increased from 57.63 thousand ha (the base year) to 66.47 thousand ha showed an relative change of 15.33 per cent (8.83 thousand ha) with the fluctuation of 16.13 thousand ha (21.21 %) during the period under study (1992-2006).(Table 1.3.2).The area of chickpea in the district was found to be increased with a linear and compound growth respectively of 0.77 and 0.80 per cent per annum. The production of chickpea also showed positive linear and compound growth of 2.61 and 2.56 per cent per annum respectively during the last 15 years. The production of chickpea found to be increased from 49.00

thousand t(the base year) to 64.17 thousand t showed an relative change of 30.65 per cent (15.17 thousand t) with the fluctuation of 23.31 thousand t (30.67 %) during the period under study, revealed that the production was found to increased more than the area. (Fig. 1.3) This is the effect of increased in productivity in the district, as the productivity data showed that the productivity of chickpea increased by 9.66 per cent (82.27 kg/ha) from 851.66 kg/ha (base year) to 933.94 kg/ha with a fluctuation of 143.96 kg/ha(14.67 %) during the period under study (Fig. 1.4)

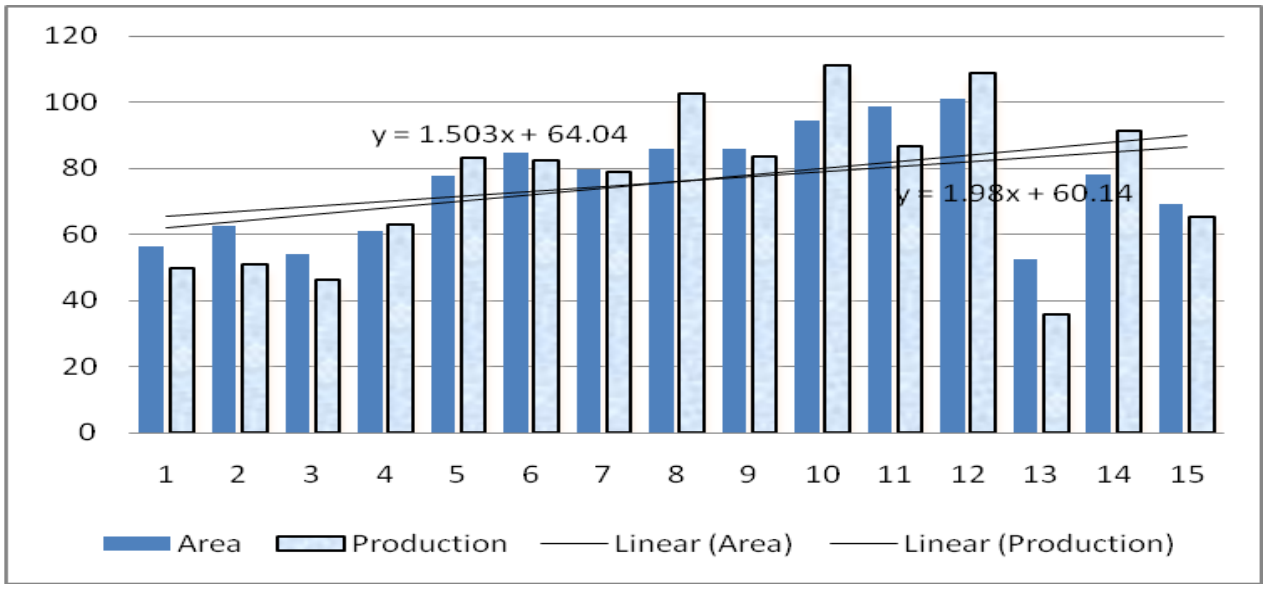


Fig. 1.1: Area and production of Chickpea in Narsinghpur District of AEZ for Pulses in M.P. during 1992-2006

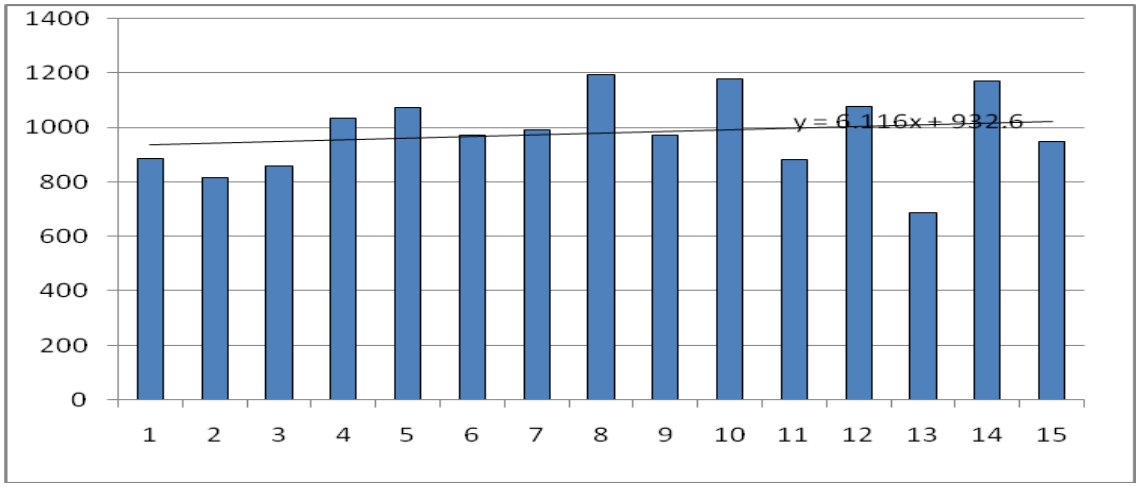


Fig. 1.1: Productivity (Kg/ha)of Chickpea in Shivpuri District of AEZ for Pulses in M.P. during 1992-2006

Table1.1 : Area,Production & Productivity of Chickpea in Shivpuri District of M.P.

Particulars	Base year*	Current year**	Absolute Cange	Relative Change	Standard Deviation	C.V (%)	Iinear Growth Rate	Compound Growth rate	Calculated t-value
Area	57.63	66.47	8.83	15.33	16.13	21.21	1.98	2.02	1.65
Production	49.00	64.17	15.17	30.95	23.31	30.67	2.61	2.56	1.48
Productivity	851.66	933.94	82.27	9.66	143.96	14.67	0.62	0.53	0.70

1.3.2 Total AEZ:

In all the AEZ districts for the pulses, the area of chickpea increased from 740.90 thousand ha (the base year) to 806.57 thousand ha showed an relative change of 18.97 per cent (402.64 thousand ha) with the fluctuation of 217.07 thousand ha (9.18 %) during the period under study (1992-2006).(Table 1.3.2).The area of chickpea in the AEZ districts was found to be increased with a linear and compound growth respectively of 0.80 and 1.60 per cent per annum. The production of chickpea also showed positive linear and compound growth of 2.02 and 2.10 per cent per annum respectively during the last 15 years. The production of chickpea found to be increased from 613.03 thousand t(the base year) to 743.97 thousand t showed an relative change of 21.36 per cent (130.93 thousand t) with the fluctuation of348.30 thousand t (16.83

%) during the period under study, revealed that the production was found to increased more than the area. (Fig. 1.3) This is the effect of increased in productivity in these districts, as the productivity data showed that the productivity of chickpea increased by 12.65 per cent (100.48 kg/ha) from 827.84 kg/ha (base year) to 928.33 kg/ha(current year) with a fluctuation of 93.27 kg/ha(10.69%) during the period under study (Fig. 1.4)

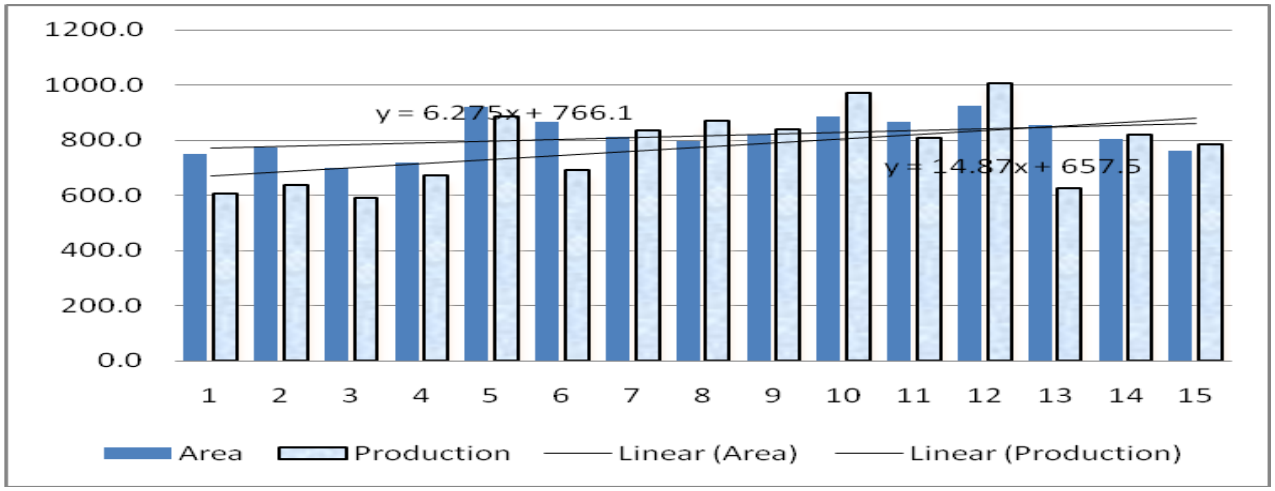


Fig. 1.1: Area and production of Chickpea in AEZ District s for Pulses in M.P. during 1992-2006

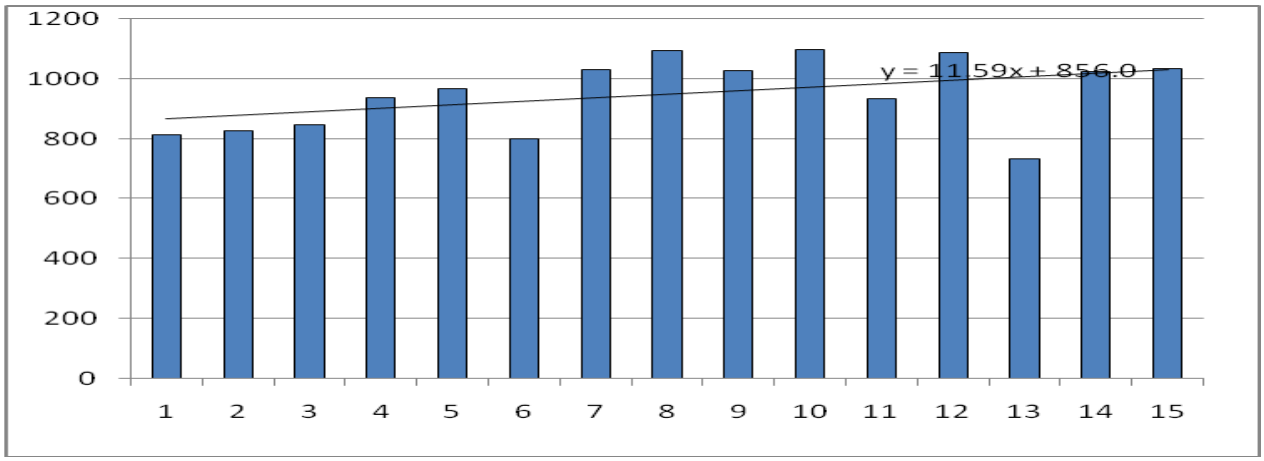


Fig. 1.1: Production of Chickpea in AEZ Districts for Pulses in M.P. during 1992-2006

Table1.1 : Area,Production & Productivity of Chickpea in Guna District of M.P.

Particulars	Base year*	Current year**	Absolute Change	Relative Change	Standard Deviation	C.V (%)	Linear Growth Rate	Compound Growth rate	Calculated t-value
Area	740.90	806.57	65.67	8.86	69.04	8.46	0.77	0.80	1.60
Production	613.03	743.97	130.93	21.36	132.10	17.01	1.92	2.02	2.10
Productivity	827.84	928.33	100.48	12.14	120.03	12.65	1.22	1.21	1.73

1.3.2 Madhya Pradesh:

In the state M.P. the area of chickpea increased from 2122.42 thousand ha (the base year) to 2525.07 thousand ha showed an relative change of 18.97 per cent (402.64 thousand ha) with the fluctuation of 217.07 thousand ha (9.18 %) during the period under study (1992-2006).(Table 1.3.2).The area of chickpea in the state was found to be increased with a linear and compound growth respectively of 1.10 and 1.12 per cent per annum. The production of chickpea also showed positive linear and compound growth of 1.92 and 1.94 per cent per annum respectively during the last 15 years. The production of chickpea found to be increased from 1679.53 thousand t(the base year) to 2185.50 thousand t showed an relative change of 30.13 per cent (505.97 thousand t) with the fluctuation of 348.30 thousand t (16.83 %) during the period under study, revealed that the production was found to increased more than the area. (Fig. 1.3) This is the cumulative effect of increased in productivity in the state, as the productivity data showed that the productivity of chickpea increased by 9.02 per cent (71.42 kg/ha) from 792.00 kg/ha (base year) to 928.33 kg/ha with a fluctuation of 93.27 kg/ha(10.69 %) during the period under study in the state. (Fig. 1.4)

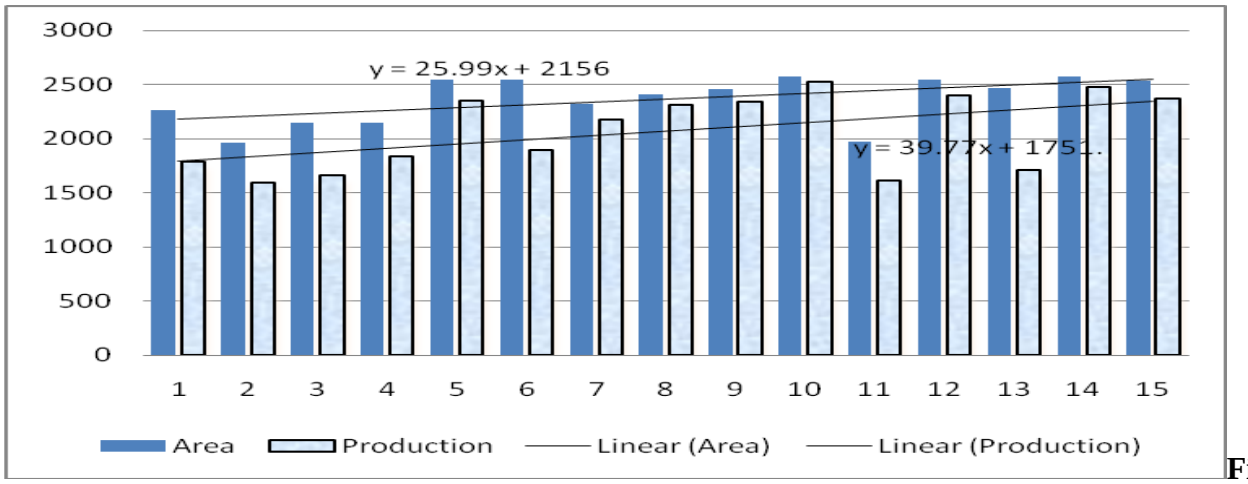


Fig. 1.1: Area and production of Chickpea in M.P. during 1992-2006

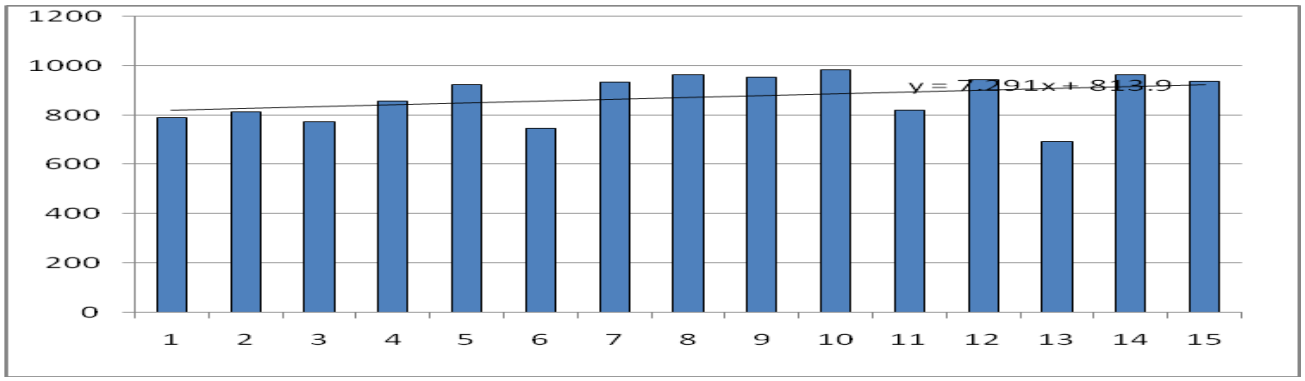


Fig. 1.1: Productivity of Chickpea in M.P. during 1992-2006

Table1.1 : Area,Production & Productivity of Chickpea in M.P.

Particulars	Base year*	Current year**	Absolute Change	Relative Change	Standard Deviation	C.V (%)	Linear Growth Rate	Compound Growth rate
Area	2122.42	2525.07	402.64	18.97	217.07	9.18	1.10	1.12
Production	1679.53	2185.50	505.97	30.13	348.30	16.83	1.92	1.94
Productivity	792.00	863.42	71.42	9.02	93.27	10.69	0.84	0.81

1.3.2 Others Districts :

In others districts of M.P. which are not listed in the AEZ for pulses in M.P. by the Government the area of chickpea increased from 1381.52 thousand ha (the base year) to 1718.50 thousand ha showed an relative change of 24.39 per cent (336.98 thousand ha) with the fluctuation of 192.22 thousand ha (12.42 %) during the period under study (1992-2006).(Table 1.3.2).The area of chickpea in these districts was found to be increased with a linear and compound growth respectively of 1.27 and 1.26 per cent per annum. The production of chickpea also showed positive linear and compound growth of 1.92 and 1.81 per cent per annum respectively during the last 15 years. The production of chickpea found to be increased from 1066.50thousand t(the base year) to 1441.53 thousand t showed an relative change of 35.16 per cent (375.03 thousand t) with the fluctuation of 250.21 thousand t (19.34 %) during the period under study, revealed that the production was found to increased more than the area. (Fig. 1.3)

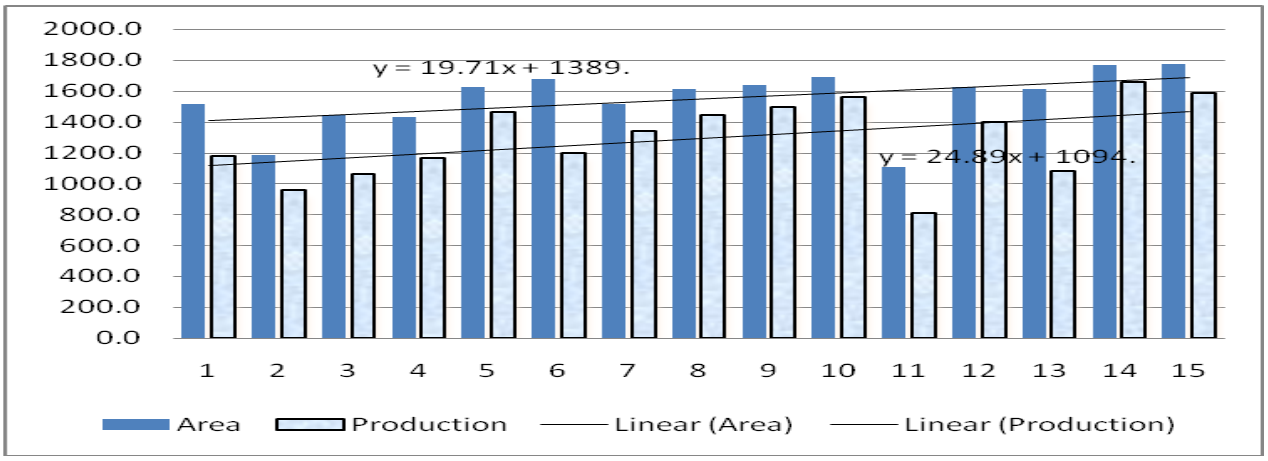


Fig. 1.1: Area and production of Chickpea in Other Districts than of AEZ Districts for Pulses in M.P. during 1992-2006

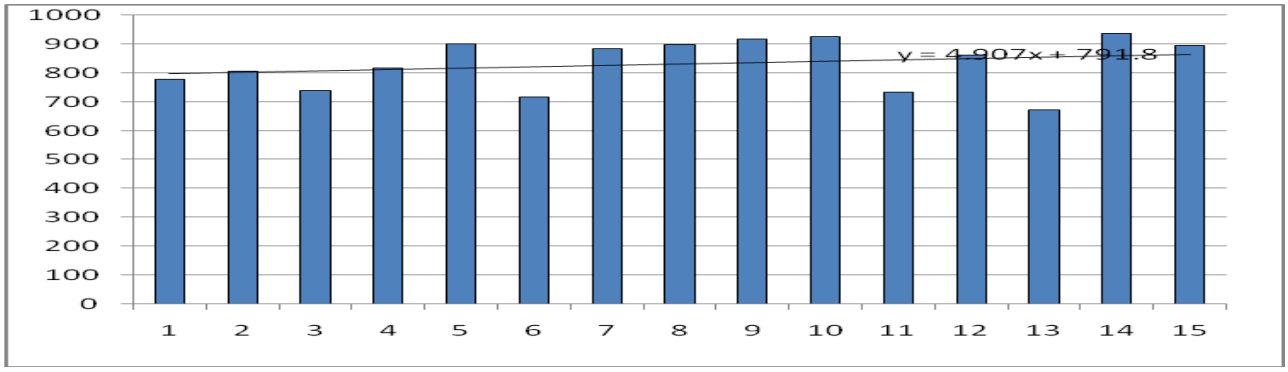


Fig. 1.1: Productivity of Chickpea in Other Districts than of AEZ Districts for Pulses in M.P. during 1992-2006

Table1.1 : Area,Production & Productivity of Chickpea in Other Districts than of AEZ Districts for Pulses

Particulars	Base year*	Current year**	Absolute Change	Relative Change	Standard Deviation	C.V (%)	Linear Growth Rate	Compound Growth rate	Calculated t-value
Area	1381.52	1718.50	336.98	24.39	192.22	12.42	1.27	1.26	1.86
Production	1066.50	1441.53	375.03	35.16	250.21	19.34	1.92	1.81	1.79
Productivity									

1.4 Comparative Picture of Dynamics of Chickpea Production in M.P.:

1.4.1 Area of chickpea:

In Madhya Pradesh, the area of chickpea increased by 18.97 per cent (402.64 thousand ha) with the fluctuation of 12.42 per cent (217.07 thousand ha) of during the period under study . The increased in area was found more in others districts (24.39 %) as compared to AEZ districts. (Table 1).

Table 1 : Dynamics of Chickpea production in Agri-Export Zones of M.P.(Area)

Particulars	Base year*	Current year**	Absolute Change	Relative Change	Standard Deviation	C.V (%)	Iinear Growth Rate	Compound Growth rate	Calculated t-value
Rajgarh	53.70	62.57	8.87	16.51	19.07	28.79	0.65	0.06	0.36
Vidisha	152.70	200.93	48.23	31.59	23.65	13.72	2.50	2.53	5.07
Raisen	93.13	132.17	39.03	41.91	14.98	13.92	2.78	2.76	7.20
Hosangabad	110.53	90.70	-19.83	-17.94	17.88	17.36	-2.36	-2.34	-2.75
Narsinghpur	124.53	145.10	20.57	16.51	11.84	9.25	1.04	0.98	2.09
Guna	148.67	108.63	-40.03	-26.93	44.95	27.56	-1.14	-2.47	-0.68
Shivpuri	57.63	66.47	8.83	15.33	16.13	21.21	1.98	2.02	1.65
Total	740.90	806.57	65.67	8.86	69.04	8.46	0.77	0.80	1.60
M.P.	**2122.42**	**2525.07**	**402.64**	**18.97**	**217.07**	**9.18**	**1.10**	**1.12**	**2.30**
Others	**1381.52**	**1718.50**	**336.98**	**24.39**	**192.22**	**12.42**	**1.27**	**1.26**	**1.86**
	(*Triennium average Ending 1993)				(**Triennium average Ending 2006)				

Amongst the different AEZ districts, the Raisen (41.91 %) , Vidisha(31.59%), Rajgarh (16.51%),Narsinghpur (16.51%) and Shivpuri (15.33 %) showed positive per cent change, while Hosangabad (-17.94%) and Guna (-26.93 %) showed negative percentage change. The area of chickpea fluctuated more in Rajgarh district (28.79%) followed by Guna (27.56%), Shivpuri (21.21%), Hosangabad (17.36%), Raisen (13.92%), Vidisha (13.72%) and Narsinghpur (9.25%) districts of AEZ for pulses in M.P. during the period under study. As regards to growth of area of chickpea in M.P. ,it was increased with the linear and compound growth of 1.10% and 2.30 % per annum . The growth of area of chickpea was also found more in other districts (1.27% &1.26% per annum) as compared to AEZ districts (0.77% & 0.80 % per annum).The highest positive linear and compound growth in area was observed in Raisen district (2.78% & 2.76% per annum) followed by Vidisha(2.50% & 2.53 % per annum),,Shivpuri (1.98% & 2.02% per annum), Narsinghpur (1.04 % & 0.98 % per annum) and Rajgarh (0.65 % & 0.06 % per annum) , while negative and linear and compound growth was observed in Hosangabad (-2.36 % & 2.34 % per annum) and Guna (-1.14 & -2.47 % per annum) districts in AEZ districts of M.P.

1.4.2 Production:

In Madhya Pradesh, the production of chickpea increased by 505.97 thousand t (30.13 %) from 1679.53 thousand t (base year) to 2185.50 thousand t (current year) with the fluctuation of 16.83 per cent (348.30 thousand t) of during the period under study . The increased in production was found more in others districts (35.16 %) as compared to AEZ districts.(21.36%) (Table 1). Amongst the different AEZ districts, the Raisen (76.85 %) showed highest positive per cent change followed by Vidisha(60.36%), Rajgarh (46.68 %), Shivpuri (30.95 %) and Narsinghpur (9.50%), while Hosangabad (-2.52%) and Guna (-37.02 %) showed negative percentage change during the period under study.

Table 1 : Dynamics of Chickpea production in Agri-Export Zones of M.P.(Production)

Particulars	Base year*	Current year**	Absolute Cange	Relative Change	Standard Deviation	C.V (%)	Iinear Growth Rate	Compound Growth rate	Calculated t-value
Rajgarh	46.20	67.77	21.57	46.68	25.85	39.70	2.07	1.14	0.87
Vidisha	107.30	172.07	64.77	60.36	40.64	25.60	4.22	4.55	3.94
Raisen	75.60	133.70	58.10	76.85	24.56	24.02	4.65	4.83	6.21
Hosangabad	111.17	108.37	-2.80	-2.52	26.27	23.31	-0.98	-0.88	-0.69
Narsinghpur	122.47	134.10	11.63	9.50	32.08	25.20	1.53	1.47	1.02
Guna	101.30	63.80	-37.50	-37.02	57.66	42.89	-0.56	-2.01	-0.21
Shivpuri	49.00	64.17	15.17	30.95	23.31	30.67	2.61	2.56	1.48
Total	613.03	743.97	130.93	21.36	132.10	17.01	1.92	2.02	2.10
M.P.	**1679.53**	**2185.50**	**505.97**	**30.13**	**348.30**	**16.83**	**1.92**	**1.94**	**2.14**
Others	**1066.50**	**1441.53**	**375.03**	**35.16**	**250.21**	**19.34**	**1.92**	**1.81**	**1.79**

The production of chickpea fluctuated between 23.31 per cent (Shivpuri) to 57.66 per cent (Guna) district AEZ for pulses in M.P. during the period under study. As regards to growth of production of chickpea is concerned in M.P., it was increased with the linear and compound growth of 1.92 % and 1.94 % per annum respectively. The growth of area of chickpea was also found more in AEZ districts (1.92% &1.94 % per annum) as compared to other districts (1.92% & 1.81 % per annum). The highest positive linear and compound growth in production was observed in Raisen district (4.65 % & 4.83% per annum) followed by Vidisha(4.22 % & 4.55 % per annum), Shivpuri (2.61 % & 2.56 % per annum), Rajgarh (2.07 % & 1.14 % per annum)and

Narsighpur (1.53 % & 1.47 % per annum) districts, while negative and linear and compound growth was observed in Hosangabad (-0.98 % & -0.88 % per annum) and Guna (-0.56 % & -2.01 % per annum) districts in AEZ districts of M.P.

1.4.3 Productivity:

In Madhya Pradesh, the productivity of chickpea increased by 71.42 kg/ha (9.02 %) from 792.00 kg/ha (base year) to 863.42 kg/ha (current year) with the fluctuation of 10.69 per cent (93.27 Kg/ha) of during the period under study . The increased in productivity was found highest in AEZ districts (12.14 %) as compared to M.P.(9.02 %) (Table 1). Amongst the different AEZ districts, the Raisen (24.62 %) showed highest positive per cent change in productivity followed by Vidisha(22.34 %), Rajgarh (21.29 %), Hosangabad (19.44 %) , Shivpuri (9.66 %) and Guna (0.65 %). Only Narsinghpur (-5.95 %) district of AEZ showed a negative percentage change during the period under study.

Table 1 : Dynamics of Chickpea production in Agri-Export Zones of M.P.(Productivity)

Particulars	Base year*	Current year**	Absolute Change	Relative Change	Standard Deviation	C.V (%)	Linear Growth Rate	Compound Growth rate	Calculated t-value
Rajgarh	860.19	1043.30	183.12	21.29	136.05	14.21	1.16	1.08	1.41
Vidisha	701.97	858.79	156.82	22.34	191.52	20.84	1.94	1.98	1.65
Raisen	811.75	1011.57	199.83	24.62	126.99	13.50	1.91	2.02	2.94
Hoshangabad	1003.72	1198.80	195.08	19.44	160.25	14.62	1.49	1.50	1.84
Nasinghpur	983.42	924.96	-58.47	-5.95	247.91	24.95	0.55	0.48	0.35
Guna	686.19	692.03	5.85	0.85	245.58	29.82	0.68	0.47	0.37
Shivpuri	851.66	933.94	82.27	9.66	143.96	14.67	0.62	0.53	0.70
Total	827.84	928.33	100.48	12.14	120.03	12.65	1.22	1.21	1.73
M.P.	**792.00**	**863.42**	**71.42**	**9.02**	**93.27**	**10.69**	**0.84**	**0.81**	**1.35**

The productivity of chickpea fluctuated between 13.50 per cent (Raisen) to 29.82 per cent (Guna) in different districts AEZ for pulses in M.P. during the period under study. As regards to growth of productivity of chickpea is concerned for M.P., it was increased with the linear and compound growth of 0.84 % and 0.81 % per annum respectively. The growth of area of chickpea

was also found more in AEZ districts (1.22% &1.21 % per annum) as compared to M.P. The highest positive linear and compound growth in productivity was observed in Vidisha district (1.94 % & 1.98 % per annum) followed by Raisen (1.91 % & 2.02 % per annum), Hosangabad (1.49 % & 1.50 % per annum), Rajgarh (1.16 % & 1.08 % per annum),Guna (0.68 & 0.47 %), Shivpuri (0.62 % & 0.53 % per annum) and Narsinghpur (0.55 % & 0.48 % per annum) districts. The growth rate of productivity of chickpea in all the AEZ districts was found positive.

2 Yield Gap:

There was a considerable yield gap of 8.20 q/ha (48.61%) was observed between the potential yield (30.00q/ha) and average farm yield (12.36 q/ha) on an average chickpea grower farm. (Table)This gap was due to soil and climate variations, non-transferable to production technology and other constraints present in the study area. Out of this total gap (yield gap III) , a gap of 13.46 q/ha (yield gap I) and 4.18 q/ha (yield gap II) was found respectively between the potential yield and average farm yield, and maximum farm yield (16.54 q/ha) and average farm yield . The yield gap I denoted that the chickpea production technology (Recommended Package of Practices) is not transferred fully to an average chickpea grower from lab to land, and there is difference in soil and climatic of the experimental field and farmer's field, while the yield gap II was found due to the socio –economic constraints present in study area. The yield gap I was found more than the yield gap II revealed that lacuna in transfer of technology is more than the socio economic constraints. The farmers are not able to adopt the RPP due to lack of knowledge rather than the socio economic constraints present in the study area. It is also observed the data that as the level of adoption increases from low to high the yield gap decreases from 138.28 per cent to 15.92 per cent (yield gap I), 35.67 per cent to 35.46 per cent (yield gap II), and 86.98 per cent to 25.69 per cent (yield gap III).

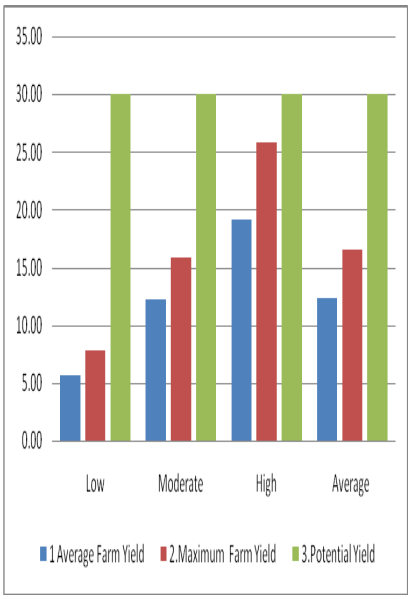


Fig. : Yield gap (q/ha) in different level of adoption

Table : Yield gap at different level of adoption

Particulars	Over All Average			
	Low	Moderate	High	Average
1 Average Farm Yield	5.72	12.26	19.11	12.36
2.Maximum Farm Yield	7.84	15.91	25.88	16.54
3.Potential Yield	30.00	30.00	30.00	30.00
Yield Gap I (3-1)	-22.16	-14.09	-4.12	-13.46
Per cent gap	**-282.65**	**-88.56**	**-15.92**	**-81.34**
Yield Gap II (1-2)	-2.13	-3.65	-6.78	-4.18
Per cent gap	**-37.18**	**-29.77**	**-35.46**	**-33.85**
Yield Gap III (4+5)/2	24.29	17.74	10.90	17.64
Per cent gap	**424.93**	**144.70**	**57.03**	**142.72**

3. Adoption Gap:

Adoption gap in different levels of technological adoption was observed by analyzing the data collected from the selected farmers and from the chickpea agronomist /scientists related to the cost incurred and returns obtained in cultivation of chickpea respectively in their fields and the experimental plots by using the Recommended Package of Practices (RPP) . Adoption gap was analyzed in input used, labour employed, indirect variable cost, fixed cost, total cost of cultivation and finally in gross income, net income and per rupee return obtained in cultivation of chickpea production .

3.1 Input Used: The total input cost of chickpea at RPP was estimated to rs.6952.57/ha , in which expenditure on seed (48.90%) was found to be the major input followed by the expenditure on manures and fertilizers (26,45%), irrigation (18.00%), soil treatment (7.91%) , plant protection

chemicals (5.03%) and seed treatment materials (3.38%). (Table), while an average farmer invested only Rs.4495.78/ha to cultivate chickpea in their field. Here also cost incurred in seed (47.82 %) was found major input followed by manures and fertilizer (27.97 %), plant protection chemicals (12.45%), irrigation (10.85%), and seed treatment materials (4.50%).It is also observed from the data presented in table … that none of the chickpea growers done soil treatment with monocrotophas @ 25 kg/ha to control soil borne diseases, while there was exist a gap of 58.14%, 46.19%,10.92%,and 16.26% with RPP respectively in expenditure on seed, manures and fertilizers, irrigation and seed treatment materials .Although, the chickpea growers used more plant chemicals (37.40%),hormones etc. in their chickpea crop, which are not to be found in recommended developed by the scientists of the V.V. The private/ multinational companies plays their role in promoting their products which are not being found to be tested by the state government/V.V.

Table : Expenditure gap in input used in cultivation of Chickpea at different levels of adoption (Rs/ha)

Particulars	Recommended Package of Practices (RPP)	Levels of Adoption							
		Low		Moderate		High		Average	
		Actual	Gap to RPP	Actual	Gap to RPP	Actual	Gap to RPP	Actual	Gap to RPP
Soil Treatment	**550.00**	**0**	-550.00	**0**	-550.00	**0**	-550.00	**0**	-550.00
	7.91	**0.00**		**0.00**		**0.00**		**0**	
Seed	**3400.00**	1643.14	-1756.86	2326.00	-1074.00	2481.00	-919.00	**2150.05**	-1249.95
	48.90	**48.03**	**(-106.92)**	**51.00**	**(-46.17)**	**43.76**	**(-37.04)**	**46.69**	**(-58.14)**
Seed Treatment	**235.00**	169.12	-65.88	203.75	-31.25	233.51	-1.49	**202.13**	-32.87
	3.38	**4.94**	**(-38.95)**	**4.47**	**(-15.34)**	**4.12**	**(-0.64)**	**4.39**	**(-16.26)**
Manures & Fertilizers	**1839.00**	795.02	-1043.61	1168.53	-670.11	1809.46	-29.18	**1257.67**	-580.97
	26.45	**23.24**	**(-131.27)**	**25.62**	**(-57.35)**	**31.91**	**(-1.61)**	**27.31**	**(-46.19)**
Hormones	**0.00**	**15.04**	15.04	17.40	17.40	131.82	131.82	54.75	54.75
	0.00	**0.44**	**(100.00)**	**0.38**	**(100.00)**	**2.32**	**(100.00)**	**1.19**	**(100.00)**
Plant Protection	**350.00**	342.61	-7.39	535.33	185.33	801.50	451.50	**559.81**	209.81
	5.03	**10.01**	**(-2.16)**	**11.74**	**(34.62)**	**14.14**	**(56.33)**	**12.16**	**(37.48)**
Irrigation	**578.93**	318.40	-260.53	463.34	-115.60	681.16	102.23	**487.63**	-91.30
	8.00	**9.31**	**(-81.82)**	**10.16**	**(-24.95)**	**12.01**	**(15.01)**	**10.59**	**(-18.72)**
Total Input Cost	**6952.57**	3421.08	-3531.49	4560.83	-2391.74	5669.68	-1282.89	**4605.03**	-2347.54
	100.00	**100.00**	**(-103.23)**	**100.00**	**(-52.44)**	**100.00**	**(-22.63)**	**100.00**	**(-50.98)**

Figures in bold and italic shows percentage to total and brackets show percentage gap with RPP

3.2 Labour Used:

The various type of labours were found to be used by the chickpea growers in different operations cultivation of chickpea in their field i.e. human labour, bullock labour and machine labour. The cost incurred in these and gap with RPP has been analyzed and discusses in this sub head.

Human labour: Human labour (hired and family) has been found to be used by the chickpea growrrs in almost al the operations of cultivation of the crop. An average chickpea grower found to be used more human labour in harvesting (54.15%)operation followed by irrigation (24.20%),, threshing (12.18%),, land preparation(6.34%), sowing (5.15%), plant protection measures (4.59%), manuring (3.14 %) and others (0.18%).An average chickpea grower found to be 12.87 per cent expenditure more in human labour than the RPP (Rs. 2340.00/ha). The expenditure on human labour was found to be decreased with the level of adoption from low (RS. 2810.90/ha) to high(Rs. 2603.22/ha), which ultimately reduces the adoption gap with RPP.

Table : Expenditure gap in human labour used in cultivation of Chickpea at different levels of adoption (Rs/ha)

Particulars	Recommended Package of Practices (RPP)	Levels of Adoption							
		Low		Moderate		High		Average	
		Actual	Gap to RPP	Actual	Gap to RPP	Actual	Gap to RPP	Actual	Gap to RPP
Land Preparation	**120.00**	213.95	93.95	119.76	-0.24	110.76	-9.24	**148.16**	28.16
	4.88	**7.84**	**(43.91)**	**4.63**	**(-0.20)**	**4.32**	**(-8.34)**	**6.34**	**(19.00)**
Sowing	**120.00**	166.29	46.29	101.91	-18.09	96.11	-23.89	**121.44**	1.44
	4.88	**6.03**	**(27.84)**	**3.94**	**(-17.75)**	**3.75**	**(-24.85)**	**5.15**	**(1.18)**
Manuring	**0.00**	42.46	42.46	58.74	58.74	110.19	110.19	**70.46**	70.46
	0.00	**1.57**	**(100.00)**	**2.29**	**(100.00)**	**4.41**	**(100.00)**	**3.14**	**(100.00)**
Plant Protection	**240.00**	100.46	-139.54	116.59	-123.41	127.70	-112.30	**114.92**	-125.08
	9.76	**3.53**	**(-138.90)**	**4.40**	**(-105.85)**	**4.80**	**(-87.94)**	**4.59**	**(-108.85)**
Irrigation	**120.00**	736.66	616.66	637.89	517.89	487.69	367.69	**620.74**	500.74
	4.88	**25.60**	**(83.710**	**23.61**	**(81.19)**	**18.37**	**(75.39)**	**24.20**	**(80.67)**
Harvesting	**1500.00**	1248.18	-251.82	1312.50	-187.50	1364.07	-135.93	**1308.25**	-191.75
	60.98	**44.60**	**(-20.18)**	**49.95**	**(-14.29)**	**52.61**	**(-9.96)**	**54.15**	**(-14.66)**
Threshing & Winnowing	**240.00**	302.91	62.91	293.23	53.23	297.30	57.30	**297.81**	57.81
	9.76	**10.84**	**(20.77)**	**11.09**	**(18.15)**	**11.34**	**(19.27)**	**12.18**	**(19.41)**
Others	**120.00**	0.00	-120.00	1.79	-118.21	9.39	-110.61	**3.73**	-116.27
	4.88	**0.00**	**(100.00)**	**0.07**	**(-6613.94)**	**0.39**	**(-1177.55)**	**0.18**	**(-3119.95)**
Total	**2460.00**	**2810.90**	350.90	**2642.41**	182.41	**2603.22**	143.22	**2685.51**	225.51
	100.00	**100.00**	**(12.48)**	**100.00**	**(6.90)**	**100.00**	**(5.50)**	**100.00**	**(8.40)**

Figures in bold and italic shows percentage to total and brackets show percentage gap with RPP

3.3 Bullock Labour:

The chickpea growers of the study area found to be used bullock labour (hired & owned) only in field preparation and sowing operation . The total cost incurred in total bullock used by an average chickpea grower was found to be Rs. 128.76 /ha , in which ….per cent was incurred in field preparation ,while …. per cent in sowing operation. When compared it with RPP, there was found cent per cent gap in both the operations and in all the levels of adoption as the bullocks were not found to be used in experimental fields. It is also observed from the data presented in the table that as the levels of adoption increases from low to high the cost incurred in bullock labour found to be decrease.

Table Expenditure gap in bullock labour used in Cultivation of Chickpea at different levels of Adoption (Rs/ha)

Particulars	Recommended Package of Practices (RPP)	Levels of Adoption							
		Low		Moderate		High		Average	
		Actual	Gap to RPP	Actual	Gap to RPP	Actual	Gap to RPP	Actual	Gap to RPP
Field Preparation	0.00	195.55	195.55	51.88	51.88	18.62	18.62	88.68	88.68
	0.00	**43.74**	100.00	**27.20**	100.00	**17.70**	100.00	**35.81**	100.00
Sowing	0.00	103.12	103.12	10.17	10.17	0.12	0.12	37.80	37.80
	0.00	**23.06**	100.00	**5.33**	100.00	**0.12**	100.00	**15.26**	100.00
Others	0.00	148.45	148.45	128.67	128.67	86.43	86.43	121.18	121.18
	0.00	**33.20**	100.00	**67.47**	100.00	**82.18**	100.00	**48.93**	100.00
Total	0.00	447.12	447.12	190.72	190.72	105.17	105.17	247.67	247.67
	0.00	**100.00**	100.00	**100.00**	100.00	**100.00**	100.00	**100.00**	100.00

Figures in bold and italic shows percentage to total and brackets show percentage gap with RPP

Machine Labour:

An average chickpea grower found to be invested Rs. 3991.10 /ha on machine (owned and hired) hours used. In different operations the highest machine hours were found to be used in threshing (%) followed by field preparation (%) and sowing (%) operations. As the levels of adoption increases from low (Rs. 3866.37 /ha) to high (Rs. 4208.63/ha)the cost incurred in machine hours was found to be increases. (Table)

Table : Expenditure gap in Machine Hours incurred in Cultivation of Chickpea at different levels of Adoption (Rs/ha)

Particulars	Recommended Package of Practices (RPP)	Levels of Adoption							
		Low		Moderate		High		Average	
		Actual	Gap to RPP	Actual	Gap to RPP	Actual	Gap to RPP	Actual	Gap to RPP
Field Preparation	1500.00	547.80	-952.20	582.84	-917.17	682.09	-817.92	604.24	-895.76
	33.60	**34.00**	**-173.82**	**28.89**	**-157.36**	**30.58**	**-119.91**	**33.15**	**-148.25**
Sowing	1000.00	399.36	-600.64	467.40	-532.60	472.86	-527.15	446.54	-553.46
	22.40	**24.79**	**-150.40**	**23.17**	**-113.95**	**21.20**	**-111.48**	**24.50**	**-123.95**
Threshing & Winnowing	1750.00	599.08	-1150.92	842.28	-907.72	870.60	-879.40	770.65	-979.35
	39.19	**19.40**	**-192.12**	**41.75**	**-107.77**	**39.03**	**-101.01**	**42.27**	**-127.08**
Others	214.87	65.00	-149.87	124.89	-89.98	204.83	-10.04	1.54	-213.33
	4.81	**0.01**	**-230.57**	**6.19**	**-72.05**	**9.18**	**-4.90**	**0.08**	**-13855.97**
Total	4464.87	1611.23	-2853.64	2017.40	-2447.47	2230.37	-2234.50	1822.97	-2641.90
	100.00	**100.00**	**-177.11**	**100.00**	**-121.32**	**100.00**	**-100.18**	**100.00**	**-144.92**

Figures in bold and italic shows percentage to total and brackets show percentage gap with RPP

The total machine hours cost used in cultivation of chickpea at RPP was estimated to Rs4250.00/ha , in which expenditure on threshing (41.18%) was found to be the major operation by the expenditure on field operation (35.29%), and sowing (23.53%) operations.

Total Labour:

The total labour used in cultivation of chickpea at different levels of adoption and at full RPP was analyzed and presented in table …… It is observed from the table that an average chickpea grower of the study area invested Rs……./ha in total labour used , in which the cost incurred in harvesting (22.18%)was found to be maximum followed by therrshing and winnowing (18.12%), application of manures and fertilizers (16.32%), preparation of land for cultivation (14.26%) and sowing (10.27%) . Here also observed that as the levels of adoption increase the total cost in labour engagement increases from (low) to (high)

Table : Expenditure gap in bullock labour used in Cultivation of Chickpea at different levels of Adoption (Rs/ha)

Particulars	Recommended Package of Practices (RPP)	Levels of Adoption							
		Low		Moderate		High		Average	
		Actual	Gap to RPP	Actual	Gap to RPP	Actual	Gap to RPP	Actual	Gap to RPP
Land Preparation	**1620.00**	**957.29**	-662.71	**754.47**	-865.53	**811.47**	-808.53	**841.08**	-778.92
	18.22	**15.62**	**-69.23**	**12.29**	**-114.72**	**13.08**	**-99.64**	**14.26**	**-92.61**
Sowing	**1120.00**	**668.76**	-451.24	**579.48**	-540.52	**569.09**	-550.91	**605.78**	-514.22
	12.60	**10.91**	**-67.47**	**9.44**	**-93.28**	**9.17**	**-96.81**	**10.27**	**-84.89**
Manuring	**1750.00**	**789.98**	-960.02	**1029.69**	-720.31	**1067.23**	-682.77	**962.30**	-787.70
	19.69	**12.89**	**-121.52**	**16.78**	**-69.95**	**17.20**	**-63.98**	**16.32**	**-81.86**
Plant Protection	**454.87**	**612.58**	157.71	**432.19**	-22.68	**437.70**	-17.17	**364.13**	-90.74
	5.12	**9.99**	**25.75**	**7.04**	**-5.25**	**7.05**	**-3.92**	**6.17**	**-24.92**
Irrigation	**120.00**	**736.66**	616.66	**637.89**	517.89	**487.69**	367.69	**620.74**	500.74
	1.35	**12.02**	**83.71**	**10.39**	**81.19**	**7.86**	**75.39**	**10.53**	**80.67**
Harvesting	**1500.00**	**1248.18**	-251.82	**1312.50**	-187.50	**1364.07**	-135.93	**1308.25**	-191.75
	16.87	**20.37**	**-20.18**	**21.39**	**-14.29**	**21.98**	**-9.96**	**22.18**	**-14.66**
Threshing & Winnowing	**1990.00**	**901.99**	-1088.01	**1135.51**	-854.49	**1167.90**	-822.10	**1068.46**	-921.54
	22.39	**14.72**	**-120.62**	**18.50**	**-75.25**	**18.82**	**-70.39**	**18.12**	**-86.25**
Others	**334.87**	**213.45**	-121.42	**255.35**	-79.52	**300.65**	-34.22	**126.45**	-208.42
	3.77	**3.48**	**-56.88**	**4.16**	**-31.14**	**4.84**	**-11.38**	**2.14**	**-164.82**
Total	**8889.74**	**6128.90**	-2760.84	**6137.08**	-2752.66	**6205.80**	-2683.94	**5897.19**	-2992.55
	100.00	**100.00**	**-45.05**	**100.00**	**-44.85**	**100.00**	**-43.25**	**100.00**	**-50.75**

Indirect Variable Cost:

The indirect variable costs which were incurred in cultivation of crops were estimated to be Rs. 707.79/ha at RPP, where as these was found to be Rs. 525.42 /ha at average farmers field. The depreciation on machine and interest on working capital were the major items of the indirect variable cost. The percentage share of these two were found to be ……per cent and ….per cent respectively. Here also as the level of adoption increases the cost incurred in total indirect cost increases. There was found about 30-40 per cent gap in different levels of adoption with RPP.

Table : Expenditure gap in ndirect Variable Cost incurred in Cultivation of Chickpea at different levels of Adoption (Rs/ha)

Particulars	Recommended Package of Practices (RPP)	Levels of Adoption							
		Low		Moderate		High		Average	
		Actual	Gap to RPP	Actual	Gap to RPP	Actual	Gap to RPP	Actual	Gap to RPP
Interest on working capital	**255.03**	59.61	-195.42	79.51	-175.52	96.91	-158.12	78.68	-176.35
	36.35	**13.84**	**-327.86**	**16.54**	**-220.75**	**19.44**	**-163.15**	**16.74**	**-224.15**
Depreciation	**446.49**	371.04	-75.45	**401.14**	-45.35	401.53	-44.96	391.23	-55.25
	63.65	**86.16**	**-20.33**	**83.46**	**-11.30**	**80.56**	**-11.20**	**83.26**	**-14.12**
Indirect variable cost	**701.52**	**430.64**	-270.87	**480.65**	-220.87	**498.44**	-203.07	**469.91**	-231.60
	100.00	**100.00**	**-62.90**	**100.00**	**-45.95**	**100.00**	**-40.74**	**100.00**	**-49.29**

Fixed Cost:

Fixed cost is the major item of cost of cultivation but the crop scientists and farmers ignored it while the calculating cost of cultivation of any crop. A cost of Rs. 6906.12/ha was found to be incurred on an average farmer's field as a fixed cost. (Table)The rental value of land (78.00%) was found to be a major item of fixed cost followed by interest on fixed assets (20.00%) and land revenue (2.00%). There was found 136.63 per cent gap in an average farmer's field with RPP (Rs.16342.20/ha).The total fixed cost found to be increased with the level of adoption from Rs. 4403.35 / ha (low) to Rs.9380.91/ha (high).

Table : Expenditure gap in total Fixed Cost incurred in Cultivation of Chickpea at different levels of Adoption (Rs/ha)

Particulars	Recommended Package of Practices (RPP)	Levels of Adoption							
		Low		Moderate		High		Average	
		Actual	Gap to RPP	Actual	Gap to RPP	Actual	Gap to RPP	Actual	Gap to RPP
Interest on fixed capital	**3268.44**	880.67	-2387.77	1392.26	-1876.18	1870.74	-1397.70	1381.22	-1887.22
	20.00	**20.00**	**-271.13**	**20.00**	**-134.76**	**20.00**	**-74.71**	**20.00**	**-136.63**
Rental Value of owned land	**12936.00**	3384.92	-9551.08	5431.27	-7504.73	7345.22	-5590.78	5387.14	-7548.86
	79.16	**76.87**	**-282.17**	**78.00**	**-138.18**	**78.53**	**-76.11**	**78.00**	**-140.13**
Land revenue	**137.76**	137.76	0.00	137.76	0.00	137.76	0.00	137.76	0.00
	0.84	**3.13**	**0.00**	**2.00**	**0.00**	**1.47**	**0.00**	**2.00**	**0.00**
Total Fixed Cost	**16342.20**	**4403.35**	-11938.85	**6961.29**	-9380.91	**9353.72**	-6988.48	**6906.12**	-9436.08
	100.00	**100.00**	**-271.13**	**100.00**	**-134.76**	**100.00**	**-74.71**	**100.00**	**-136.63**

Total Cost of Cultivation:

The total cost of cultivation of chickpea at RPP was estimated to Rs. 32880.12 / ha , in which total variable cost (50.30%) was found to be highest followed by total fixed cost (49.30%). In the total variable cost the total input cost (Rs.6952.57 /ha) was found to be lesser than the total labour cost (Rs. 8889.74/ha) at RPP, while in average farmer's field the total labour cost (31.51%) was found to be highest than the total input cost (24.60%) . An average farmer found to be invested Rs. 18716.14/ha to cultivate chickpea in his field, in which he invested Rs. 4605.03 /ha as the input cost and Rs. 5897.19/ha as total lobour cost .There was found 75.68 of cultivation, per cent gap in average farmer's field than the RPP. It is also observed that the total input cost, total cost of cultivation, total fixed cost and total indirect variable cost found to be increases with levels of adoption, while the total labour decreases with levels of adoption.

Table : Expenditure gap in Total Cost incurred in Cultivation of Chickpea at different levels of Adoption (Rs/ha)

Particulars	Recommended Package of Practices (RPP)	Levels of Adoption							
		Low		Moderate		High		Average	
		Actual	Gap to RPP	Actual	Gap to RPP	Actual	Gap to RPP	Actual	Gap to RPP
Total Input Cost	**6952.57**	3421.08	-3531.49	4560.83	-2391.74	5669.68	-1282.89	**4605.03**	-2347.54
	21.15	**22.51**	-103.23	**24.25**	-52.44	**25.60**	-22.63	**24.60**	-50.98
Total labour cost	**8889.74**	**6128.90**	-2760.84	**6137.08**	-2752.66	**6205.80**	-2683.94	**5897.19**	-2992.55
	27.04	**40.34**	-45.05	**32.63**	-44.85	**28.03**	-43.25	**31.51**	-50.75
Indirect Variable Cost	**695.61**	**430.64**	-264.97	**480.65**	-214.96	**498.44**	-197.17	**469.91**	-225.70
	2.12	**2.83**	-61.53	**2.56**	-44.72	**2.25**	-39.56	**2.51**	-48.03
Total Variable Cost	**16537.92**	**9980.62**	-6557.30	**11178.56**	-5359.36	**12373.92**	-4164.00	**10972.13**	-5565.79
	50.30	**65.68**	-65.70	**59.43**	-47.94	**55.88**	-33.65	**58.62**	-50.73
Total Fixed Cost	**16342.2**	4403.35	-11938.85	6961.29	-9380.91	9353.72	-6988.48	6906.12	-9436.08
	49.70	**28.98**	-271.13	**37.01**	-134.76	**42.24**	-74.71	**36.90**	-136.63
Total Cost of Cultivation	**32880.12**	15194.90	-17685.22	18810.06	-14070.06	22143.46	-10736.67	18716.14	-14163.98
	100.00	**100.00**	-116.39	**100.00**	-74.80	**100.00**	-48.49	**100.00**	-75.68

Figures in bold and italic shows percentage to total and brackets show percentage gap with RPP

Returns obtained:

The gross income, net income, per rupee return on investment of Re. 1.00 and cost of production at different levels of adoption and its gap with RPP was analyzed and presented in table …….It is observed from the data that as the level of adoption increases from low to high the yield per ha, gross income per ha, net income per ha at total variable cost and at total cost of cultivation, per rupee return on investment of Re. 1.00 at total variable and total cost of cultivation increases. The gross income per ha at full RPP was estimated to be Rs.66885.00 /ha, while the net income at variable and at total cost of cultivation was estimated to be Rs. 50247.00/ha and Rs.34004.88 /ha respectively. On an investment of Re. 1.00 there was found a return of Rs. 4.04 and 2.03 at total variable cost and total cost respectively.

An average chickpea grower of the study area found to be received a gross income of Rs. 27452.87/ha. He got a net income of Rs. 16480.74/ha and Rs.8736.73 /ha respectively at total variable and total cost of cultivation respectively. On investment of Re. 1.00 an average chickpea grower got a return of Rs. 2.50 and Rs.1.47 revealed that the chickpea production was found to be a profitable enterprise in the study area. But it may be increased manifolds by adoption of RPP and by removal of constraints that came across in the adoption of RPP by the chickpea growers. The data also revealed that the cost of production also shows increasing trend with the level of adoption. An average farmer invested Rs.882.61 and 641.75 to produce 1.00 q of grains from his field.

Table: Returns obtains from cultivation of chickpea (Rs/ha)

Particulars	Recommended Package of Practices (RPP)	Levels of Adoption							
		Low		Moderate		High		Average	
		Actual	Gap to RPP	Actual	Gap to RPP	Actual	Gap to RPP	Actual	Gap to RPP
Yield									
Main Product	**30.00**	9.28	-20.72	12.26	-17.74	19.11	-10.89	12.36	-17.64
			-223.28		-144.70		-56.99		-142.72
By Product	**21.00**	3.99	-17.02	7.50	-13.50	11.51	-9.49	7.66	-13.34
			-426.98		-180.15		-82.44		-174.01
Gross Income									
Main product	**64680.00**	20007.68	-44672.32	26432.56	-38247.44	41201.16	-23478.84	26648.16	-38031.84
		97.59	-223.28	**97.13**	-144.70	**96.80**	-56.99	**97.11**	-142.72
By product	**2205.00**	418.43	-1786.58	787.08	-1417.92	1208.64	-996.36	804.71	-1400.29
		2.41	-426.98	**2.87**	-180.15	**3.20**	-82.44	**2.89**	-174.01
Gross Income	**66885.00**	20426.11	-46458.90	27219.64	-39665.36	42409.80	-24475.20	27452.87	-39432.13
		100.00	-227.45	**100.00**	-145.72	**100.00**	-57.71	**100.00**	-143.64
Cost of Cultivation									
at variable cost	**16537.92**	**9980.62**	-6557.30	**11178.56**	-5359.36	**12373.92**	-4164.00	**10972.13**	-5565.79
			-65.70		-47.94		-33.65		-50.73
at total Cost of Cultivation	**32880.12**	15194.90	-17685.22	18810.06	-14070.06	22143.46	-10736.67	18716.14	-14163.98
			-116.39		-74.80		-48.49		-75.68
Net Income									
at variable cost	**50347.08**	**10445.48**	-35929.09	**16041.08**	-29661.01	**30035.87**	-14558.13	**16480.74**	-29281.72
			-249.20		-143.39		-40.68		-139.00
at total Cost of Cultivation	**34004.88**	**5231.20**	-28773.68	**8409.58**	-25595.30	**20266.34**	-13738.54	**8736.73**	-25268.15
			-550.04		-304.36		-67.79		-289.22
Per Rupee Return									
at variable cost	**4.04**	**2.05**	-1.99	**2.43**	-1.61	**3.43**	-0.61	**2.50**	-1.54
at total Cost of Cultivation	**2.03**	**1.34**	-0.69	**1.45**	-0.58	**1.92**	-0.11	**1.47**	-0.56
Cost of Production (Rs./q)									
at variable cost	**477.76**	**1030.41**	552.65	**847.59**	369.83	**584.26**	106.50	**822.61**	344.84
			53.63		43.63		18.23		41.92
at total Cost of Cultivation	**1060.00**	**518.62**	-541.38	**621.74**	-438.26	**997.26**	-62.73	**641.75**	-418.25
			-104.39		-70.49		-6.29		-65.17

Figures in bold and italic shows percentage to total and brackets show percentage gap with RPP

Resource Use Efficiency of Chickpea Production:

The data on resource use efficiency of the chickpea growers of study area are presented in Table . It is clear from the data all the independent variable like expenses on field preparation, high yielding variety seed, fertilizer, bio-fertilizer, seed treatment, weed management, insect pest management and harvesting showed positive response over yield except expenses on sowing method .In these variable expenses on field preparation (0.323), on weed management (0.213), harvesting (0.34) gave positive and highly significant response on gross income, while expenses on fertilizer and high yielding variety seeds also gave positive and significant response over gross income. The expenses on sowing methods shows negative response over gross income, reveals that excessive used of this input reduces gross income of cultivators.

Table 3.8.3 Resource use efficiency of chickpea growers in M.P.

Particulars	Regression–coefficient (b)	Standard error	t Value of (b)
Constant	0.323	0.507	0.636
Expenses on field preparation	0.336**	0.099	3.384
Expenses on high yielding verities seed	0.39*	0.193	2.024
Expenses on sowing method	-0.04	0.096	-0.434
Expenses on fertilizer	0.03*	0.015	2.034
Expenses on bio-fertilizer	0.01	0.021	0.669
Expenses on seed treatment	0.024	0.022	1.059
Expenses on weed management	0.213**	0.076	2.808
Expenses on insect pest management	0.036*	0.017	2.173
Expenses on harvesting	0.34**	0.097	3.52
R square (%)	59.4		

Post Harvest losses:

The post harvest losses in chickpea during different operations were estimated by asking the information on threshold output and grains losses during these operations i.e. transportation of produce from field to threshing yard, threshing of produce, winnowing of grains to remove straw with them and storage of grains for creating time utility in the products and are presented in this sub head.

1. **Transportation Losses:**

The majority of chickpea growers transported their produce to threshing floor through bullock carts. On small farms ,all the produce harvested were transported to threshing yard through bullock carts and transportation losses per q. of grain were estimated to be 800 g per quintal (0.80%) of grain threshed, while on medium size of farms, the majority of chickpea producer (93%) were used bullock cart and only 7 % transported their produce through tractor trolley. The total losses during transportation of on medium farms were 0.90 per cent.

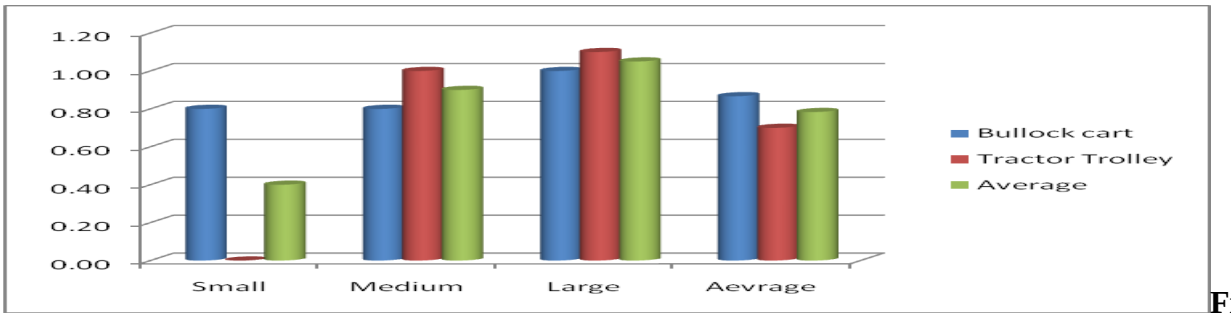


Fig .1: Transportation losses (g/q) in different Size of Farms

It was interesting to note that the losses were higher when produce was transported through tractor trolley. On large farms the losses(1.03%) were found to be higher than small and medium farms. Here also the losses were found higher when the produce was transported through tractor trolley as compared to when it was transported by bullock carts. On an average farm the transportation losses were to the tune of 0.88 % (880 g/q). The percentage transportation losses were increases with the farm size and might be due to mishandling of produce after harvesting.

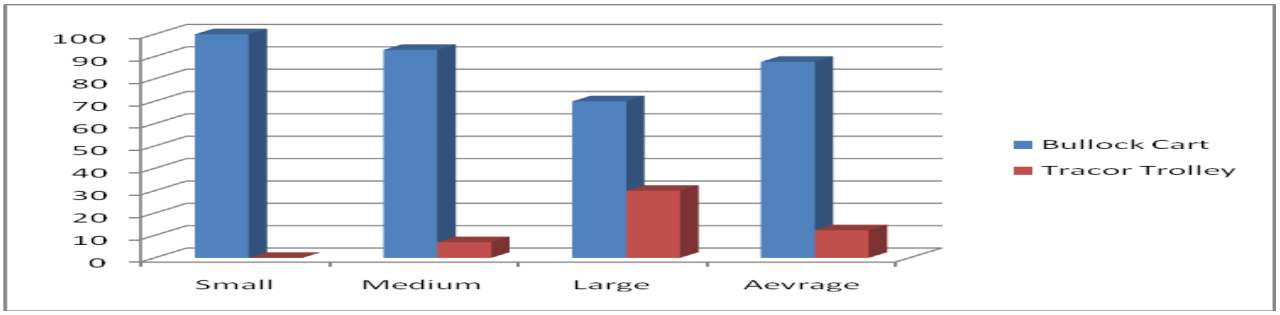


Fig .2: Mode of transportation in different size of farms

Threshing Losses:

The majority of chickpea growers use thresher and done threshing mechanically. The threshing losses were also found more when the produce threshed by machine (2.67kg/q) as compared to when this practices was done with the help of bullocks (0.12 kg/q). On an average farm the total losses during threshing were found to be 2.21 kg/q.

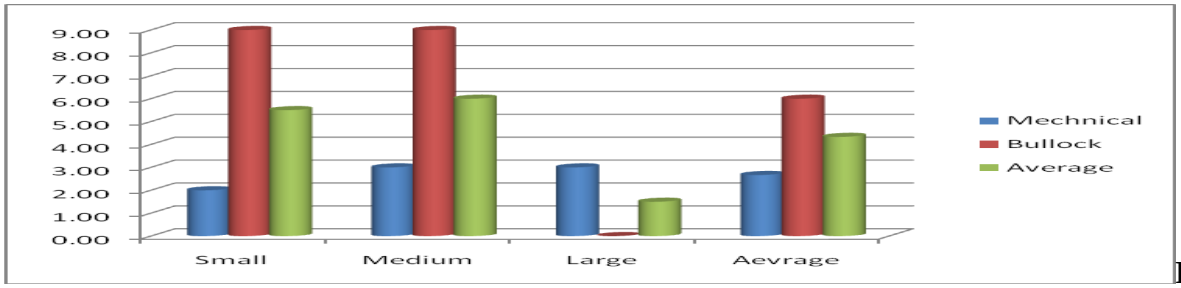


Fig . .3 : Threshing losses (Kg/q) in different Size of Farms

Again the total losses during threshing shows increasing trend with size of farms from Small (1.53kg/q) to large (3.00 kg/q) size of farms. It was also observed during the course of investigation that on small and medium size of farms, about 25 per cent of chickpea growers threshed their produce with the help of bullock power, while all the large farmers used power / diesel thresher in threshing of produce.

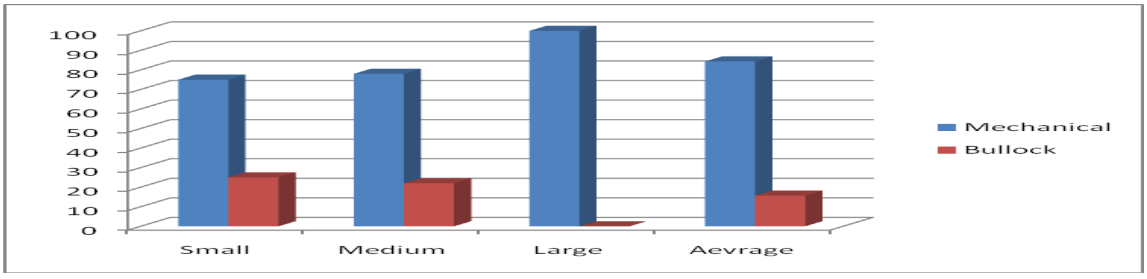


Fig .4 : Mechanical Vs Bullock Power(%) Used in Threshing Operation In different size of Farms

Thus, it can be concluded that even the threshing losses were found more , when grain is threshed by machine but due to cost and time advantage the majority of chickpea producers found it proper to thresh their grains by power thresher . The higher losses were compensated through reduction in lobour cost and at the same time the threshing is preformed in shorter period.

Winnowing Losses:

The winnowing of threshed grains is generally performed by use of fans (winnowers) or through natural wind blows. The majority of chickpea growers of the study area used mechanical devices (82%) for winnowing of threshed grains.

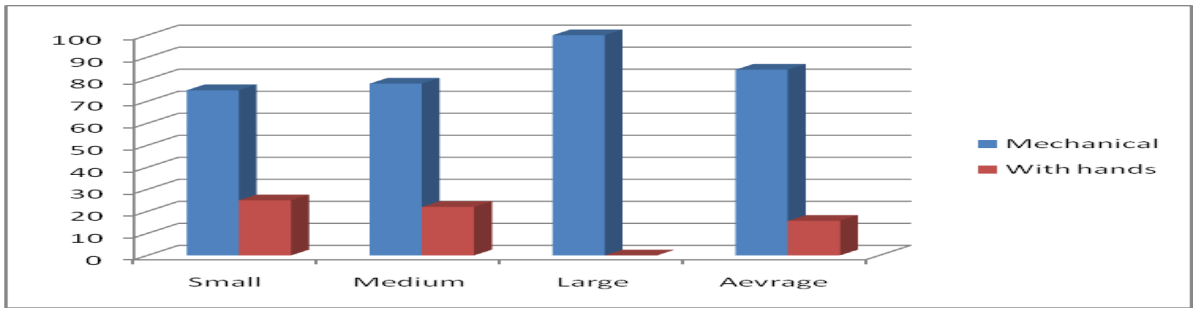


Fig . : Mode of Winnowing operations used by Chickpea growers (%)

The data on losses of chickpea grains specially the grains mixed with straw were estimated and observed that the losses were found higher (2.84kg/q), when winnowing is done through machine as compared to losses (0.15kg/q) occurred when the practices is done through natural wind power. On an average winnowing losses were found to be estimated 2.35 kg/q in different size of farms. The losses were observed more in large farms () as compared to small farms (), which was mainly due the relationship between scale of production and machine dependency.

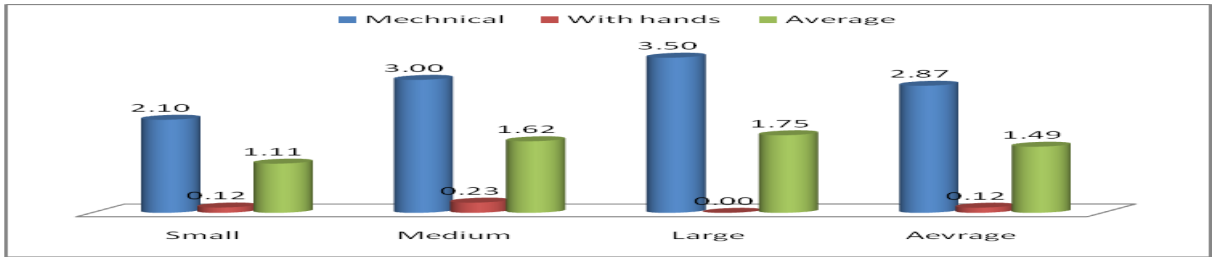


Fig. : Winnowing Losses (Kg/q) in different size of Farms through different modes of operations

Storage Losses:

An average chickpea grower stored their produce for the period of 6-12 months and hence, affects the length of storage of produce. The sample farmers stored their produce in bags (36%), in bulks (43%) and both in bags &bulks (21%). Not a single chickpea grower was found to use improved methods of storage in the study area. Although the losses were found to be minimum when the produce was stored in bags (0.5okg/q)as compared to when it was stored in bulks (2.41 kg/q), when the grains stored both in bags and bulks the loses were estimated to be 1.52 kg/q, which was found between when stored in bags and bulks.

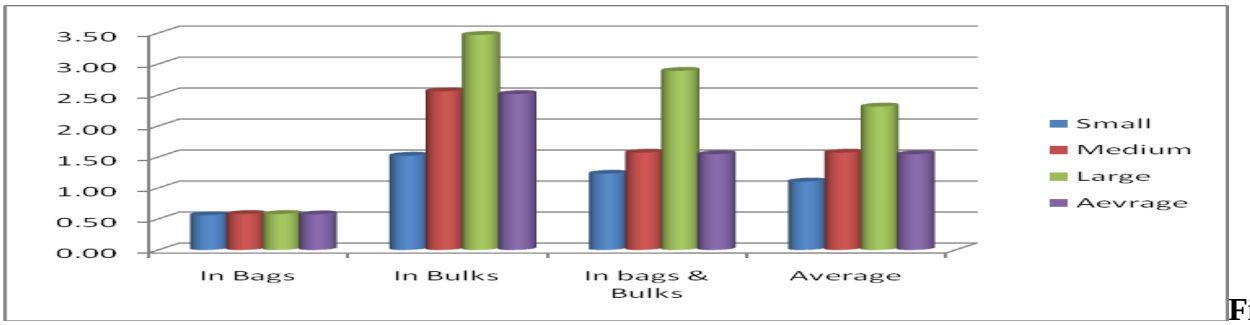


Fig . : Storage losses in different Size of Farms

On an average size of farm the total storage losses were found to be 1.53 kg/q., which also showed increasing trend with the size of farms from 0.94 kg/q (small) to 2.35 kg/q (large). It is also observed that majority of small farmers (50%) stored their produce in bags, while majority of medium () and large () farmers stored their produce in bulks.

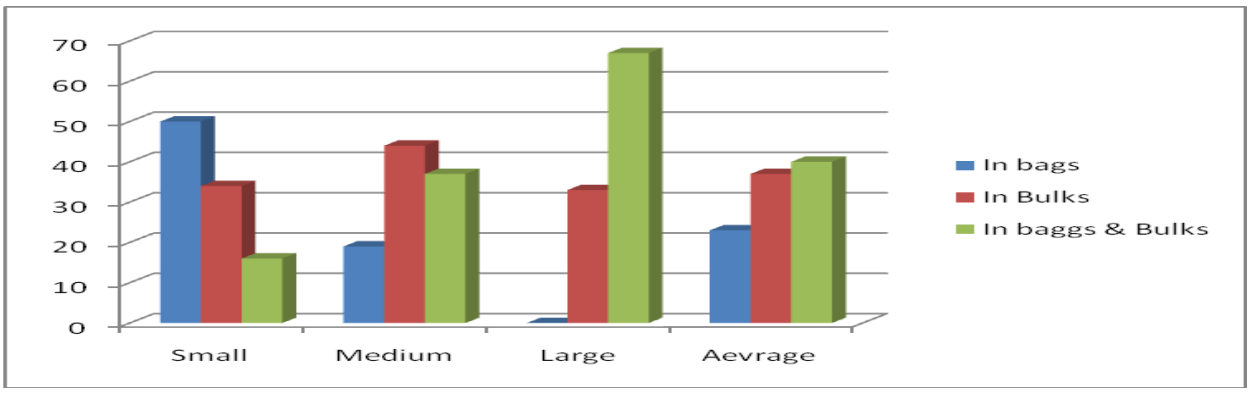


Fig . : Type of Storage done by chickpea growers in different size of Farms

Total Post Harvest Losses:

The total losses on average size of farm was estimated to be 6.97 kg/q, which was found more in large (9.88 kg/q)followed by medium (7.16 kg/q) and small (4.86kg/q)size of farm.

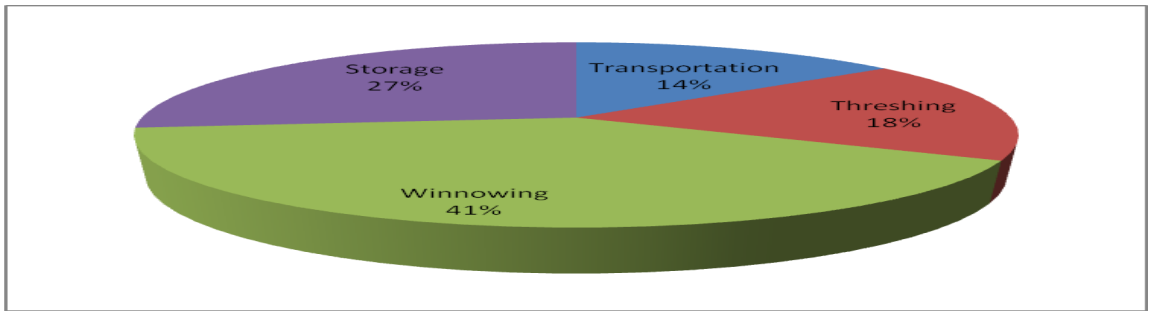


Fig . :Percentage Post Harvest Losses in different Operation

Out of this total post harvest losses the maximum losses were estimated during winnowing (33.71%), followed by threshing (31.70%), storage (21.95%) and transportation up to threshing floor (12.62%). Thus it can be concluded that the over all post harvest losses was around 7.0 kg /q and the maximum losses were occurred during threshing, winnowing and storage of produce.

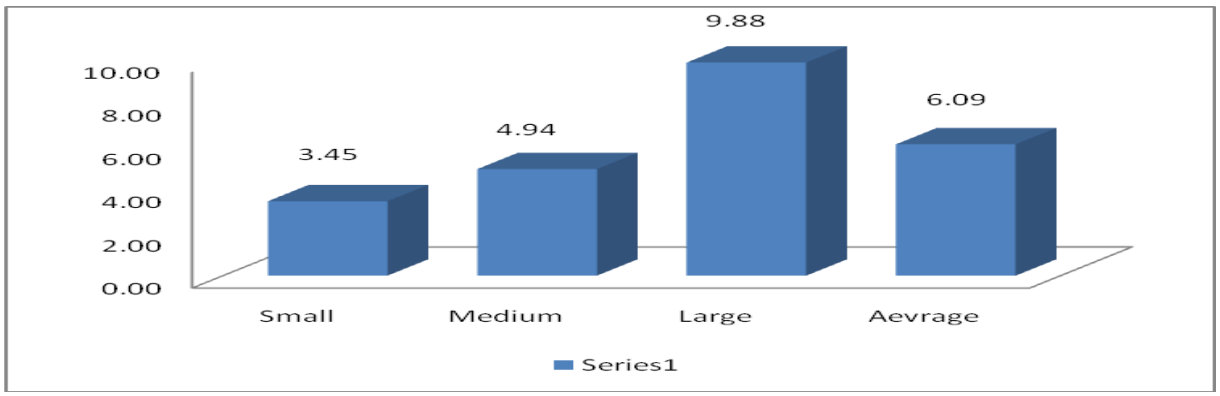


Fig . : Post Harvest Losses (kg/q) in Different size of Farms

Factors Affection Post Harvest Losses:

The fitted regression equation (y= a+b1X1+……..+B7X7)explains nearly 69 per cent variation in dependent factor i.e.post harvest losses due to inclusion of 7 independent variables i.e. area under chickpea, production of chickpea, time of storage, marketed surpluses, type of storage, methods of storage. The F-ratio was found significant thereby showed the good fit of function. Most of the variables showed significant and positive effect on post harvest losses expect coefficient for production of chickpea and marketed surplus.

Table : Factors affecting Post harvest Losses in Chickpea

Variables	Notations	Unit	b	b of SE	t-value
Constant	a		4.68	1.48	3.162
Area under Chickpea	X1	Ha	0.057**	0.017	3.352
Production of Chickpea	X2	Q	0.098	0.062	1.58
Time of Storage	X3	Months	0.003**	0.001	3
Marketted Surplus	X4	Q	-0.077	0.071	1.084
Type of Storage	X5	Kachha=1,Pacca=2	-0.249	0.021	11.857
Method of Storage	X6	Bag=1,Bulk=2, Bag & Bulk=3	-0.244	0.013	18.769**
Literacy Level	X7	No. of schooling	0.011	0.003	3.666**
R2	69.19				
F-ratio	18.57**				

The coefficient of marketed surplus found negative showed that with the increase in marketed surplus the post harvest losses decreases. The post harvest losses increases with increase area under chickpea crop and time of storage. Only in case of literacy for which coefficient of positive and significant indicated that years under education effect on increase in post harvest losses ,But it is not true actually literacy is highly dependent on size of farms and with the increase in size of holding, the use of mechanical powers increases, which ultimately increases post harvest losses. The result of regression equation indicated that with increase in marketed surplus ,improvement in type of storage and methods of storage, the post harvest losses decreases, while with increase in time of storage, and production of chickpea the post harvest losses increases. This might be due to managerial incompetency, and use of traditional machine with unskilled labourers, for most of the post harvest operations.

AN ECONOMIC ANALYSIS OF CHICKPEA AND ITS VALUE ADDED PRODUCTS IN AGRI EXPORT ZONE FOR PULSES IN MADHYA PRADESH

Value addition technology includes all post harvest practices and marketing technology, which creates the time, place, form and possession utilities in a particular product. These includes, winnowing, threshing, grading, standardization, quality control, storage, processing, packaging, transportation, brand name, publicity, selling of produce through suitable market channel etc. This value addition for sustainability also gave the answers of all these questions that (i) what will the best alternative channel of product marketing? (ii) What will be the best alternative technology for grading/ standardization/ storage/ processing/ packaging/ transportation/ publicity of their products? (iii) What are the factors that affect the post harvest losses? (iv) How the farmers get sustainable income from marketing of a particular product became entrepreneur? and lastly how the traders /processors became entrepreneurs? Chickpea has all prominent properties of value addition. All the people known these qualities even before 10000 B.C. but can't harvest them properly. Due the result of this they are not getting remunerative price of the product that they produce and fight from poverty.

The world's total production of chickpeas is around 8.5 million metric t annually and is grown over 10 million hectares of land approximately. The Desi type chickpea contribute to around 80% and the Kabuli type around 20% of the total production. India is the largest producer of chickpea contributing to around 70% (around 6 million t) of the world's total production. A part from India , Turkey (7%), Pakistan (5%), Iran (3%), Mexico (3%), Australia (2%) Canada (2%) and Ethiopia (2%) are the other major chickpea producing countries of the world.

In India Chickpea is grown in the rain-fed areas as there are best suited for its production. Chickpea producing states in India are Madhya Pradesh, Uttar Pradesh, Rajasthan, Maharashtra and Andhra Pradesh. Madhya Pradesh produces the major share of 42% in the Indian production of around 6 million t. Andhra Pradesh Uttar Pradesh, Maharashtra and Rajasthan follow Madhya Pradesh with contributing around 11%, 12%, 13% and 9% of production respectively.

In Madhya Pradesh chickpea it cultivated in 2692.6 thousand ha with a production of 2474.6 thousand t. But an average farmer harvested its yield only up to 926 kg/ha (2006). The districts Vidisha, Raisen, Hasangabad, Rajgarh, Chhindwara, Narsighpur, Shivpuri, and Guna identified as Agri-Export Zone for Pulses in the state. These districts contributed about 33.94 per cent of area of chickpea of the state. The area and production of this particular crop in the state

showed increasing trend but the yield showed a constant trend from last 10 to 15 years The productivity levels of these districts (1082kg/ha) is found more than 155.4 kg/ha than the state (927 kg/ha) but, it is found less than the potential/recommended yield (3000 kg/ha) of the chickpea in the state. This might be due to the low adoption of the recommended crop production and marketing technologies and various constraints associated with thereof. Hence, in order to analyse the cost and return structure of chickpea and its value added products and marketing aspects related to these, this study is framed to find out the exact solution for increasing the production as well as income and employment of cultivators and market functionaries in AEZ for Pulses in the state. As the lower post harvest losses increases net income of the farmers hence an attempt will also be made to find out nature and types of losses in production and marketing of product.

Objective of the study:

1. To determine the growth of chickpea in last 15 years (1992-2006) in AEZ of pulses in M.P.
2. To analyze the yield and expenditure gap of chickpea in different levels of adoption.
3. To analyze the cost and return structure, and resource the efficiency in chickpea production in different level of adoption.
4. To identify types and extent of losses in different stages of production and marketing of Chickpea.
5. To examine the nature and extent of value addition (primary processing) and their profitability over grains.
6. To assess marketing pattern and trade related issue in chickpea products under AEZ for pulses.
7. To assess the cost of processing of chickpea at miller level.

The two districts i.e. Vidisha (7.96%) and Narsinghpur (5.75%) have been selected purposively for the study on the basis of the highest area in chickpea under the districts identified for AEZ for pulses by the Government. A list of the all blocks in the each selected district (2) and production under chickpea was prepared in descending order and a block having the highest production under crop was selected for the investigation. Similarly, a list of the all villages in the each selected block and production under chickpea was prepared in descending order and categorized them into 3 categories (low, medium and high chickpea producing villages) by using cumulative frequency technique. A village under these three categories was randomly selected for the investigation, Further, a complete list of farmers of all the selected villages and area under the chickpea was prepared and 40 farmers from each selected village were randomly selected by using Random Table Number. Thus, 240 from 6 villages were considered for the investigation.

The selected respondents were further classified in to 3 categories (Low, Moderate and High) by using Mean+/- 1 S.D of yield of chickpea at selected farms.

Table 5.1 : Number of selected chickpea growers in different levels of adoption

Level of Adoption	Yield Levels (q/ha)	No. of Chickpea Growers
1. Low (Mean – S.D.)	Below 9.37	27
2. Moderate	9.37 to 15.35	182
3. High (Mean + S.D.)	Above 15.35	31
Mean	12.36	
Standard Deviation (S..D.)	2.99	

A pre tested interview schedule was prepared for collection of required data from the respondents. This interview schedule having all the information about the sample farmer viz.; land utilization pattern, cropping pattern, farm assets and house hold assets, and expenses on input used, high yielding variety seeds, seed treatment fungicides, fertilizer & manures, micronutrients, bio fertilizer, insect pest control, disease control, labour used (human labour, bullock labour, machine labour), and output (yield of main product and by product) expected constraints related to crop production, processing and marketing etc. The primary data were collected from the individual sample respondents using this pre tested interview schedule through survey method by personal contact. The primary data pertained to the agricultural year 2007-2008The primary data were classified and tabulated in light of stated objectives of the study. The SPSS (Statistical Package for Social Science) was used for classification, analysis and tabulation of collected data. The collected data were analyzed with compare means, coefficient of variance, chi square, correlation, regression analysis etc. A multiple *cobb douglus* regression model will also be used for analyzing resource use efficiency and to identify factors affecting Post Harvest Losses of chickpea.

The following conclusions are drawn from the study:

1. Chickpea was found to be grown by the cultivators almost in all the districts of the state, although its intensity was found different in different districts.
2. In the state there were found 28 districts in low intensity area and covers about 20 percent of area and production of the state, while 12 districts, and 8 districts were respectively found in moderate and high intensity areas and covers about 80 per cent (32% in moderate and 48% in high) of total production. It is surprising to note that Chhindwara, Rajgarh,

Shivpuri, Guna and Hosangabad districts comes in low and moderate intensity area and were found to be list of the AEZ for pulses, while the districts namely; Rewa, Datia, Satna, Ujjain, Shajapur, Jabalpur, Panna and Sehore (Moderate intensity areas) , & Dewas, Chattarpur, Damoh, Sagar (high intensity area) were found to be fallen respectively in moderate and high intensity chickpea areas were not in the list of the AEZ districts for pulses declared by the Government. Although, the production of chickpea, infrastructural and other facilities were found to be similar in all these districts of the state.

3. Amongst the different AEZ districts, the Raisen (41.91 %), Vidisha(31.59%), Rajgarh (16.51%),Narsinghpur, (16.51%), Shivpuri (15.33 %) and Chhindwara (9.59%) showed positive per cent change, while Hosangabad (-17.94%) and Guna (-26.93 %) showed negative percentage change. The area of chickpea fluctuated more in Rajgarh district (28.79%) followed by Guna (27.56%), Shivpuri (21.21%), Hosangabad (17.36%), Raisen (13.92%), Vidisha (13.72%), Narsinghpur (9.25%) and Chhindwara (4.58%) districts of AEZ for pulses in M.P. during the period under study. As regards to growth of area of chickpea in M.P., it was increased with the linear and compound growth of 1.10% and 2.30 % per annum. The growth of area of chickpea was also found more in other districts (1.29% &1.25% per annum) as compared to AEZ districts (0.82% & 0.83% per annum).The highest positive linear and compound growth in area was observed in Raisen district (2.78% & 2.76% per annum) followed by Vidisha(2.50% & 2.53 % per annum), Shivpuri (1.98% & 2.02% per annum), Chhindwara (1.60 & 1.59% per annum), Narsinghpur (1.04 % & 0.98 % per annum), and Rajgarh (0.65 % & 0.06 % per annum), while negative and linear and compound growth was observed in Hosangabad (-2.36 % & 2.34 % per annum) and Guna (-1.14 & -2.47 % per annum) districts in AEZ districts of M.P.

4. In Madhya Pradesh, the production of chickpea increased by 505.97 thousand t (30.13 %) from 1679.53 thousand t (base year) to 2185.50 thousand t (current year) with the fluctuation of 16.83 per cent (348.30 thousand t) of during the period under study. The increased in production was found more in others districts (34.57%) as compared to AEZ districts. (22.84 %) (Table 4.14). Amongst the different AEZ districts, the Raisen (76.85 %) showed highest positive per cent change followed by Vidisha (60.36%), Rajgarh (46.68 %), Shivpuri (30.95 %), Chhindwara (17.79 %) and Narsinghpur (9.50%), while

Hosangabad (-2.52%) and Guna (-37.02 %) showed negative percentage change during the period under study.

5. The productivity of chickpea fluctuated between 13.50 per cent (Raisen) to 29.82 per cent (Guna) in different districts AEZ for pulses in M.P. during the period under study. As regards to growth of productivity of chickpea is concerned for M.P., it was increased with the linear and compound growth of 0.84 % and 0.81 % per annum respectively. The growth of area of chickpea was also found more in AEZ districts (1.21% & 1.19 % per annum) as compared to M.P and other districts (0.59 & 0.55 per annum). The highest positive linear and compound growth in productivity was observed in Vidisha district (1.94 % & 1.98 % per annum) followed by Raisen (1.91 % & 2.02 % per annum), Hosangabad (1.49 % & 1.50 % per annum), Rajgarh (1.16 % & 1.08 % per annum),Guna (0.68 & 0.47 %), Shivpuri (0.62 % & 0.53 % per annum) Narsinghpur (0.55 % & 0.48 % per annum) and Chhindwara (0.51 & 0.38 % per annum) districts. The growth rate of productivity of chickpea in all the AEZ districts was found positive.

6. There was a considerable yield gap of 17.64 q/ha (142.72%) was observed between the potential yield (30.00q/ha) and average farm yield (12.36 q/ha) on an average chickpea grower farm. This gap was due to soil and climate variations, non-transferable to production technology and other constraints present in the study area. Out of this total gap (yield gap III), a gap of 13.46 q/ha (yield gap I) and 4.18 q/ha (yield gap II) was found respectively between the potential yield and average farm yield, and maximum farm yield (16.54 q/ha) and average farm yield. The yield gap I denoted that the chickpea production technology (Recommended Package of Practices) is not transferred fully to an average chickpea grower from lab to land, and there is difference in soil and climatic of the experimental field and farmer's field, while the yield gap II was found due to the socio – economic constraints present in study area. The yield gap I was found more than the yield gap II revealed that lacuna in transfer of technology is more than the socio economic constraints. The farmers are not able to adopt the RPP due to lack of knowledge rather than the socio economic constraints present in the study area. It is also observed from the data that as the level of adoption increases from low to high the yield gap decreases from -138.28 per cent to -15.92 per cent (yield gap I), -35.67 per cent to -35.46 per cent (yield gap II), and -424.93 per cent to -142.72 per cent (yield gap III). An average chickpea grower of the study area found to be received a gross income of Rs. 27452.87/ha. He got a

net income of Rs. 16480.74/ha and Rs.8736.73 /ha respectively at total variable and total cost of cultivation respectively. On investment of Re. 1.00 an average chickpea grower got a return of Rs. 2.50 and Rs.1.47 revealed that the chickpea production was found to be a profitable enterprise in the study area. But it may be increased manifolds by adoption of RPP and by removal of constraints that came across in the adoption of RPP by the chickpea growers. The data also revealed that the cost of production shows increasing trend with the level of adoption. An average farmer invested Rs.882.61 and Rs.641.75 respectively in total variable cost and total cost of cultivation.

7. The expenses on field preparation, high yielding variety seed, fertilizer, bio-fertilizer, seed treatment, weed management, insect pest management and harvesting showed positive response over yield except expenses on sowing method .In these variable expenses on field preparation (0.323), on weed management (0.213), harvesting (0.34) gave positive and highly significant response on gross income, while expenses on fertilizer and high yielding variety seeds also gave positive and significant response over gross income. The expenses on sowing methods shows negative response over gross income, reveals that excessive used of this input reduces gross income of cultivators The coefficient of marketed surplus found negative showed that with the increase in marketed surplus the post harvest losses decreases. The post harvest losses increases with increase area under chickpea crop and time of storage. Only in case of literacy for which coefficient of positive and significant indicated that years under education effect on increase in post harvest losses, But it is not true actually literacy is highly dependent on size of farms and with the increase in size of holding, the use of mechanical powers increases, which ultimately increases post harvest losses. The result of regression equation indicated that with increase in marketed surplus ,improvement in type of storage and methods of storage, the post harvest losses decreases, while with increase in time of storage, and production of chickpea the post harvest losses increases. This might be due to managerial incompetence, and use of traditional machine with unskilled labourers, for most of the post harvest operations.

8. The majority of chickpea growers of the study area disposed of their produce through 3 marketing channels viz. Channel I : Producer-Village Merchant –Wholesaler at Regulated Market-Processor/Miller, Channel II: Producer- Wholesaler at Regulated Market-Processor/Miller and Channel III: Producer- Local Traders -Processor/Miller. Amongst all these channels, the channel II was found be more popular amounting chickpea growers.

The maximum (88.25 %) of the total produce were found to dispose off from this particular channel followed by channel III (10.69%) and Channel I (6.88%). The average marketing cost incurred in different marketing channels was found to be Rs.61.67 /q comprise of cost of bags (35.64%, loading /unloading (11.66%), storage (25.15%), transportation (12.55%),, market fee (7.67%), establishment charges (1.25%), weighing, filling and stacking (3.18%), commission (1.59%) and spoilage (2.58%). Amongst the different marketing channels the highest cost was found to be incurred in Channel lI (Rs.86.09/q) followed by the Channel II (52.69 q/ha) and channel III (Rs.46.24/q). The average price spread was found to be Rs.209.33/q (9.71 %) in the marketing of chickpea and producer got 91.15 % share in the processor's rupee. The maximum price spread was found to be channel III (18.26%) followed by channel I (13.23%) and channel II (7.44%), while the highest producer share in processor's rupee was found to be in Channel II (93.08%) followed by channel I (88.32%) and channel III (84.56%). The channel II (14.45 %) was found to be more efficient followed by channel I (8.56%) and channel III (6.48%) in the study area,

9. The non availability of quality input specially HYVs seeds, fertilizers (specially murate of potash , zinc sulphate), insecticides , fungicides (92.92%), lack of demonstrations/ field trails in farmers' fields (90.00%), lack of knowledge about the composition of different nutrients in chemicals and the preparation of required concentration of the chemical through the branded chemicals and fertilizers (87.92%), high cost of inputs including labours (82.50%), high wages of labour at peak operation period viz. sowing, harvesting, threshing etc., (82.92%) Lack of knowledge Soil testing facilities (77.50%), non availability of input in time (75.00%), irregular power supply /power cut at peak operation period (74.58%), Lack of Irrigation facilities / low water table (51.70%), lack of Knowledge about recommended package of practices viz. soil treatment, seed treatment, rhizobium & PSB culture treatment, Integrated Plant Nutrients Management, Integrated Pest Management technologies, application of fertilizers and micro nutrients (Zn & S), plant protection chemicals etc. (55.00%) and Inadequate scale of crop loan (34.17%) were found be major constraints in production of chickpea in the area under study.
10. The lack of market intelligence services (90.00%), lack of knowledge about ware-housing facilities present in the regulated markets (87.92%), lack of knowledge about value addition technologies of chickpea (82.92%), lack of market news at village level

(82.50%), lack of market credit facilities (92.92%), low price of grain (77.50%), lack of storage facilities (75.00%), lack of knowledge about proper grading technology (74.58%), and lack of all weather roads (55.00%), were identified as major constraint in efficient marketing of soybean, the total processing cost incurred to processed 1.00 q of grain was found to be Rs.63.20 per q, in which the share of fixed and variable cost was respectively of 6.96 and 93.04 per cent. The cost of bags was found to be the main item of total variable cost (42.20%) followed by filling of bags i.e. (*palledari*) (12.66%) expenditure on labour (9.22%) commission (7.91%), interest or working capital (9.59 %), electricity charges (5.81%), operating of machine (3.69%) .

11. As per the value addition technologies preformed by the chickpea growers in the area under study, the majority of chickpea growers preformed various value added activities such as picking of green leaves(96.67%), and green pods sale in the local market, preparation of *dal* (35.83%), roasted grains (17.92%), chickpea flour (97.08%), *namkeen* (97.92%), and sweet (97.50%), Amongst all these activities, the preparation of dal was found to be more economical viable as an average chickpea grower got an additional return of Rs.9.08 on investment of Re.1.00, followed by preparation of *namkeen* (Rs. 7.39), sweet (Rs. 7.20), roasted *dal* (Rs.7.60), roated dal (Rs. 7.20), selling of green pods (Rs.2.30) and green leaves (Rs. 2.24). The value addition activities i.e. cleaning / grading of grains and packing of grains in small packets were not to be found preformed in the area under study.

12. The total processing cost incurred to processed 1.00 q of grain to dal was found to be Rs.63.20 per q, in which the share of fixed and variable cost was respectively of 6.96 and 93.04 per cent. The cost of bags was found to be the main item of total variable cost (42.20%) followed by filling of bags i.e. (palledari) (12.66%) expenditure on labour (9.22%) commission (7.91%), interest or working capital (9.59 %), electricity charges (5.81%), operating of machine (3.69%) The main item of the total fixed cost (Rs.4.40/q) or was found to be sent on buildings (Rs. 3.67/q) followed by depreciation on machine (Rs. 0.33/q) and interest on fixed capital (Rs. 0.40/q) It is interesting to note that the by product of *dal* i.e. *chuni*, which is the main ingredient of milch cattle was not only found to recovered the total cost of processing of dal, but the miller also comes in profit by selling this to cattle owners (Rs. 140/q). An average processor got a net profit of Rs.88.32 /q from the processing of grains.

From the above conclusions the following suggestions are made:

1. During the course of investigation it was found that after the declaration of the districts under AEZ for pulses in Madhya Pradesh, the farmers, traders, processors and the general people thought that the developmental activities, employment opportunities etc. will be increases manifolds in these districts. But, it is surprising to note there were not found any change in this regards, even the traders of the districts not known that their district was came under the AEZ for pulses by the government. The government just announced that these districts were now in the AEZ districts for pulses without proving any extra benefit or development of infrastructure in this regards expect extension of regulated market (*Krishi Uppaj Mandi)*in Ganjbasoda block of Vidisha district of M.P.

2. As yield instability was found to be major source of instability in chickpea production in the districts under AEZ for pulses and the spread of improved technology was found to be associated with decline variability in production. Hence, there is need to pay extra special attention to production and distribution of improved package recommended package of practices to bridge sustainability in production. Expansion of area under irrigation, development of water-shed, development of varieties resistance to insect pest and climatic stress and other major factors for reducing the variability in area production and yield of chickpea in the area under study.

3. An effective channel for transfer of production and marketing technology in the farmers' field is needed as their was found a wide yield and expenditure gap with recommended package of practices of chickpea viz. improved varieties , balance use of fertilizer , bio fertilizer , micro –nutrients, weedicides, pesticides etc. in the area. The transfer of technology may be effectively done by the processors' by providing extra incentives and motivation to them. As, it is clear that the ultimate profit marker in the production and marketing of chickpea was found to be processor. What ever the cultivator harvested in their field the major portion of this was found to be reached in the hands of the processors. Hence, it is the duty of the processors to provide the full package of the quality input to farmers at subsidized rate. If government provide special motivation and facilities to the processors' they will be came forward to doing so. This will become effective measures for removal of production as well as marketing constraints prevailed in the area under study.

4. It is observed that the resources were not been found to be fully utilized by the chickpea growers and processors. Hence, there is found tremendous scope for increasing the income and employment of chickpea growers and traders / processors by adoption of modern technology and by removing the constraints present in the production and marketing of chickpea in the area under study. It is also observed during the course of investigation that chickpea growers found to be used chemicals specially hormones, which were not been recommended by the agricultural universities or department of Agriculture. Hence efforts should be made to stop these activities as early as possible. made
5. At present there were not found involvement of cooperate sector in the production and marketing of chickpea in the area under study. But, in near future the possibilities of them will not be ignored though the market of value added product will be increased in near future. Hence, in order to accelerate the pace of chickpea marketing the state government came forward to facilitate the processors, traders, regulated markets etc. to meet the global challenges of forward marketing.
6. As chickpea is a miracle crop, a number of value added products were found prepared by the farm women for their home consumption and saved lot of money. Hence, there is a possibility to convert into a cottage industry though creation of Self Help Groups performing economic activities. The Self Help Group will easily be formed by providing training and motivation of farm women for creation of SHGs, A visit of an excellent SHGs performing in these lines will also became a catalytic agent for the development of SHGs.
7. As the majority of processors found to be processed the chickpea with out dated old machines. This will also be changed with modern ones. The exposures to traders and processors will also be require to know the world market, trade centers of chickpea and other AEZs of the country. As the majority of them reported that, if the facilities will be provide to them by the government, they have not loose any opportunity to became entrepreneur of the modern- age and fights against the challenges of global world. Hence, orientation programme for the development of processors will be launches by the state government for the development processing sector of the state.

RESEARCH PAPER PUBLISHED DURING THE YEAR 2008-09

S. No.	*Particulars*	*Encl. No.*
1.	*Fulley V.B.,* ***Sharma, H. O.*** *and Nahatkar S.B. (2006) Harvest and Post Harvest Losses of Soybean Production as perceived by the producers of M.P .****Agricultural Marketing*** *49(3): 1-12* ***Journal Published in Jan 2009***	
2.	*Ahirwar, R. F.,* ***Sharma, H.O.****, and* ***Nahatkar*** *S.B. (2007) Use of information technology for increasing marketing efficiency of soybean in India. Paper presented in* **International Conference on Sustainable Agriculture for Food, Bio-energy and livelihood Security** *held at JNKVV, Jabalpur from 14th to 16 Feb.2007 Abstracts pp.295*	
3.	***Sharma, H.O.****, Nahatkar S.B and Mishra P.K. (2007) Strategies for increasing soybean production for increasing soybean production. Paper presented in* **International Conference on Sustainable Agriculture for Food, Bio-energy and livelihood Security** *held at JNKVV, Jabalpur from 14th to 16 Feb.2007 Abstracts pp.292-293*	
4.	*Patidar, M., Nahatkar S.B., and* ***Sharma, H.O.*** *(2007) Adoption, yield gap and constraints of soybean production technology in M.P. Paper presented in* **International Conference on Sustainable Agriculture for Food, Bio-energy and livelihood Security** *held at JNKVV, Jabalpur from 14th to 16 Feb.2007 Abstracts pp.258*	
5.	***Sharma H.O****. , Khan N. and Mishra P.K. (2008) Profitability and Problems of Isabgol (* Plantago Ovata Forsk*) Cultivation in M.P.* **Indian Journal of Agricultural Economics** *63(3):373-374*	
6.	***Sharma H.O.*** *and Khan N. Cultivation of Medicinal and Aromatic Crops as a Means of Diversification in Agriculture.* **Agriculture situation in India** *64(9): 443-445*	

7.	***Sharma H.O**. and Nahatkar S.B. (2009) Patterns of Soybean Marketing in India. Paper accepted for publication in forthcoming* **World Soybean Research Conference to be held at Beijing (China)** *from 10th Aug. to 17th Aug.2009*	