

# **Dynamics of Agriculture and Rural Development in Damoh District of Madhya Pradesh**

## **THESIS**

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Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur

In partial fulfilment of the requirements for  
the degree of

## **MASTER OF SCIENCE**

*In*

## **AGRICULTURE**

**(AGRICULTURAL ECONOMICS AND FARM MANAGEMENT)**

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## CERTIFICATE - I

This is to certify that the thesis entitled, "**Dynamics of Agriculture and Rural Development in Damoh district of Madhya Pradesh**" submitted in partial fulfilment of the requirement for the degree of **MASTER OF SCIENCE in Agricultural Economics and Farm Management** of the Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur is a record of the bonafide research work carried out by **Ms. Sudha Niranjana** under my guidance and supervision. The subject of the thesis has been approved by the Student's Advisory Committee and the Director of Instructions.

All the assistance and help received during the course of the investigation has been acknowledged by her.

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Place: Jabalpur

( **Sudha Niranjana**)

Date:



## **DECLARATION AND UNDERTAKING BY THE CANDIDATE**

I, Miss. Sudha Niranjana D/o Late Shri, L.R. Niranjana certify that the work embodied in thesis entitled, "Dynamics of Agriculture and Rural Development in Damoh District of Madhya Pradesh" is my own first hand bonafide work carried out by me under the guidance of Dr. A.K. Sarawgi at Department of Agricultural Economics and Farm Management, College of Agriculture, JNKVV, Jabalpur during 2014.

The matter embodied in the thesis has not been submitted for the award of any other degree / diploma. Due credit has been made to all the assistance and help.

I undertake the complete responsibility that any act of misinterpretation, mistakes, errors of fact are entirely of my own.

I also abide myself with the decision taken by my advisor for the publication of material extracted from the thesis work and subsequent improvement, on mutually beneficial basis, provided the due credit is given, thereof.

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# **CHAPTER – 1**

## **INTRODUCTION**

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## **INTRODUCTION**

Rural development has always been an important issue in all discussions pertaining to economic development, especially in developing countries, throughout the world. In the developing countries and some formerly communist societies, rural mass comprise a substantial majority of the population. Over 3.5 billion people live in the Asia and Pacific region out of which 63 percent people belong to rural areas. Although millions of rural people have escaped poverty as a result of rural development in many Asian countries, a large majority of rural people continue to suffer from persistent poverty. The socio-economic disparities between rural and urban areas are widening and creating tremendous pressure on the social and economic fabric of many developing Asian economies. These factors, among many others, tend to highlight the importance of rural development. The policy makers in most of the developing economies recognize this importance and have been implementing a host of programmes and measures to achieve rural development objectives. While some of these countries have achieved impressive results, others have failed to make a significant result in the problem of persistent rural underdevelopment.

Rural Development in India is one of the most important factors for the growth of the Indian economy. India is primarily an agriculture-based country. Agriculture contributes nearly one-fifth of the gross domestic product in India. The development of agriculture has much to do with the economic welfare of our country. So Government made plans for the development of agriculture, dams were constructed across many of the main rivers and canals were dug out to provide water for the irrigation of the land. Tube-wells and pump-sets were provided to the farmers to irrigate the fields, where canal water could not reach. The use of better seeds, fertilizers and new techniques in agriculture, has brought about a revolution called the Green Revolution in agriculture. Our agriculture produce has increased manifolds, but the progress is still not sufficient because population is growing at a fast rate.

Our farmers were using the primitive methods of agriculture, for years they have been sowing the seeds produced by themselves. These seeds were not quality seeds and the yield was low. Now high yielding varieties from Government farms are being supplied to the farmers. These improved and better seeds have considerably raised our farm produce. The area of the land under cultivation has been decreasing year after year. More and more land is required for building houses, factories, roads and other buildings. Therefore the area of the land under cultivation is decreasing. To meet this shortage more and more barren, waste and kullar land should be reclaimed and brought under plough. Our Government is reclaiming more waste land and it is being brought under cultivation, by using proper chemicals and irrigation facilities.

Farmers have been using old methods and old implements for farming. They have been using wooden plough for centuries. It could not plough the land quite deep. Now iron ploughs are being used. These ploughs can till the land deeper and prepare the field for sowing in lesser time. Banks and cooperative societies have given loans to farmers at low rate of interest. The farmers have bought new implements, fertilizers, improved seeds and farm machinery with these loans. A large number of farmers now use tractors for ploughing, sowing and reaping the crops. They have bought new implements for farming. The farming has become more easy and convenient. This has given a forward push to the agriculture production in our country.

In order to increase the growth of agriculture, the Government has planned several programmes pertaining to Agril. in the rural areas. The Ministry of Rural Development in India is the apex body for formulating policies, regulations and acts pertaining to the development of the rural sector. Rural development has assumed global attention especially among the developing nations. It has great significance for a country like India where majority of the population, around percent of the people, live in rural areas. The present strategy of rural development in India mainly focuses on Agril. Development, poverty alleviation, better livelihood opportunities, provision of basic amenities and infrastructure facilities through innovative programmes of wage and self-employment.

As we know that nearly half of the country's national income is derived from agriculture, which is major occupation of rural India. Around seventy per cent of Indian population gets employment through agriculture. Bulks of raw materials for industries come from agriculture and rural sector. Increase in industrial population can be justified only in rural population's motivation and increasing the purchasing power to buy industrial goods. Growing disparity between the urban elite and the rural poor can lead to political instability.

The main objective of the rural development programme is to raise the economic and social level of the rural people. The number of problems faced by the policy makers/ government in the rural areas and these problems may be categories in to three viz people related, agricultural related, infrastructure related and social, economic and cultural problems . So with the consideration of all these problems government have taken some steps for development of agriculture and rural areas towards the improvement in infrastructure and standard of living of rural communities and started number of government sponsored scheme or programmes in the rural areas. Lot of efforts done by state government through these programmes or schemes to improve the economic condition of farming communities. Hence it is the proper time to know the present status of agriculture and rural development in the study area and on the basis of present status, further efforts can be made to improve it.

The present study was carried out with the following specific objectives.

1. To study the trend and growth rate of land use pattern, cropping pattern and irrigation structure under different block of Damoh district.
2. To assess the population and infrastructure development in the study area .
3. To study the impact of selected government sponsored schemes/ programmes towards the development of agriculture and rural development in the study area.
4. To suggest the policy implementation on the basis of findings.

## REVIEW OF LITERATURE

Review of literature is an essential part of the thesis. The main objective of review of literature is to determine what work(both theoretical and empirical ) has been done before. It assists in the delineation of problem area provides a basis for conceptual framework , provides insight into the methods and procedures and provides basis for generalization of findings. Thus, it was thought appropriate to review the literature on Dynamics of agriculture and rural development.

Goswami et al. (2001) examined the growth and trend of area, production and productivity of important crops in Maharashtra, India, over a span of 36 years (1960-61 to 1996-97). Results showed that both the area and productivity contributed to the enhancement of the production of the principal crops. The highest increase in area was noticed in sugarcane (232.90%), followed by cereals (86.32%). Significant increase in productivity of all the principal crops was also noted. Area under some crops like 'kharif jowar', wheat, and 'rabi jowar', have declined, despite the increase in productivity. Local seeds, infertile soil, poor agricultural technology, shortage of labour, uncertain rainfall, lack of irrigation facilities, and constraint in the availability of suitable markets might have caused the decrease in area under these crops. It is suggested that suitable marketing infrastructure and other facilities are essential for awarding remunerative prices to the farmers to make agriculture more attractive for bringing people into the agricultural profession.

Hazra (2001) studied the changes in cropping pattern at the all India level by considering the area share of crops and crop groups at four time points, respectively the triennium ending average of areas at 1966-67, 1976-77, 1986-87 and 1996-97. The study revealed that there was a shift from traditionally grown less remunerative crops to more remunerative crops. The crop shift took place due to government policies and thrust on some crops in a given time. Market infrastructure development and certain other price related support also induced the changes in cropping pattern.

Wasim (2001) Studies the analysis of growth and variability in area, production and yield of major crops for two different periods in China: period 1<sup>st</sup> (1976-77 to 1987-88) and period 2<sup>nd</sup> (1988-89 to 1999-2000). The study reveals that the high yield growth rate of rice, maize, groundnuts, and rapeseed was mainly due to favorable price incentives, expanded irrigation system, use of HYVs, application of rising level of chemical fertilizer and implementation of the production responsibility system in period 1<sup>st</sup>. The study also confirms that in period 2<sup>nd</sup> not only production of wheat, soybean, groundnuts and rapeseed declined significantly but instability in their production also declined. The study also concludes that changes in production which cause instability are due to a number of factors including availability of irrigation water, prices of competing crops and availability of agricultural inputs.

Khem Chand Jangid, and Gajja (2003) to assess the forest growth and land utilization pattern in the arid region of Rajasthan, India, over the period 1960-1961 to 1997-1998. Rajasthan has around 7.44 percent (1997-98) of the total geographical area under forest but in the arid region of the State only 2.0 percent area (4174 km<sup>2</sup>, 1997-1998) comes under forest. Based on agroclimate, the arid region of Rajasthan was classified into four zones viz. Arid Western Plain (Zone-IA), Irrigated North Western Plain (Zone-IB), Transitional Plain of Inland Drainage (Zone-IIA) and Transitional Plain of Luni Basin (Zone-IIB). The data on the land use pattern and forest area indicates that in the past 37 years arid region recorded an increase in area under forest as well as that under non agricultural uses and net area sown, whereas that under barren land, old fallow, and culturable waste declined considerably. The forest area increased from 0.81 percent in 1960-1961 to 2.01 percent in 1997-1998 recording an ACGR of 3.66 percent as compared to the State as a whole (3.04%). After witnessing an insignificant ACGR of the forest area in the 1960s, the arid region witnessed the highest ACGR of 7.47 percent in the 1970s. Similar trend was also observed for the different zones and the State. The human as well as livestock population density of the region has increased from 37 (1961) to 84 (1991) and 66 (1961) to 132 (1997), respectively. Considering the increasing biotic pressure on the land in arid

Rajasthan and the trend of more intensive land cultivation on larger area there is need to accelerate the growth of forest in this region so that the natural base here could be improved to sustain the vital life support systems and also to help in bringing about favourable changes in the harsh climate of the region.

Goswami and Challa (2004) studied the land use pattern in India for the period 1950-51 to 1997-98. The results indicated that forest area had increased from 40.08 million ha in 1950-51 to 68.65 million ha in 1997-98. There was a significant increase in area under non-agricultural uses showing increase from 9.36 million ha in 1950-51 to 12.3 million ha in 1997-98. It also revealed that the net area sown increased during the study period.

Shankar et al. (2004) examined the Land Utilization in the state of Bihar, India, over the period from 1970-71 to 1990-2000. The temporal and spatial variation in the land use pattern of Bihar showed that reduced in net area sown during the period under study. The area under forest slowly increased, due to the Government of Bihar launched afforestation programme to achieve the objectives of the National Forest Policy. The area under non-agricultural use and miscellaneous tree showed an increasing trend. While the areas under barren cultivable waste, permanent pastures, grazing and fallow lands, gradually decreased.

Sreeja (2004) studied the dynamics of land use pattern in Kollam district of Kerala. The results indicated that there was a substantial growth in the current fallow, which was the consequence of year to year rainfall variations. Thus there was an inverse relationship between rainfall and current fallow. Barren and uncultivated land, permanent pastures, land under miscellaneous tree crops and groves and cultivable waste recorded a significant negative growth.

Rao and Shahid (2005) studied the dynamics of cropping pattern in sorghum growing states of India. They revealed that at the district level, Dharwad had set of competing crops like groundnut and cotton to sorghum while the Belgaum district had another set of competing crops like pearl millet

and maize to sorghum. The Transition Probability Matrix clearly demonstrated that Karnataka had sorghum area retention of 31 per cent in 1970-73.

Raghuwanshi et al. (2005) Studies the status of pigeonpea of Madhya Pradesh data for area, production and productivity for the year 1991-2002 were collected as a secondary data and found that among the districts only Shahdol districts showed positive change in area, production and productivity while the rest the selected districts show negative performance. At the state level, stability in area, production and productivity of pigeonpea were exhibited. Production of pigeonpea show more instability than area and yield across the selected districts.

Alagh (2006) Studies the recent poor performance of the Indian agriculture and explores the possibility of rural development. The paper focuses on the suppliers of seeds, fertilizers, credit and support facilities, policies and performance in land and water markets in the primary value chain, and also on the recent attempts in supporting diversification of agricultural incomes in the value chain to the buyer. It also explores the possibility of generating income based on the knowledge economy and the linking of local economies in rural areas and small towns with the national and global economy. Finally, the potential of a dynamic social sector in areas like education and health, providing a focus for growth, is also investigated.

Reddy (2006) carried out a study on growth and instability in chickpea production in India and found that the production of chickpea is stagnating and its variability is increased in the past three decades. An attempt has been made to examine the pattern of growth, variability and the sources of growth and instability in production of chickpea at state level. The time series data for the period 1971-2000 regarding production, area and yield of chickpea has been used to compute compound growth rates, coefficient of variation, Cockpock's Instability Index and for performing decomposition analysis to attain the objectives. As a result, most of the states fall in low growth-high-risk category in chickpea production. Only Madhya Pradesh, Andhra Pradesh and Orissa fall under high growth-low risk category. Yield contributed positively and area contributed negatively to increase in chickpea production between the periods.

Harish (2006) studied land use dynamics in Mandya district of Karnataka. The study revealed that area under fallow, current fallow, cultivable wasteland under miscellaneous tree crops showed positive growth rate. The land under non-agricultural uses showed a marginal increase in area, this was mainly because of less infrastructural development. The results of dynamics of land use pattern showed that majority of the categories of land use showed stability in period I (1980-81).

Yadav et al. (2006) study on analysis of growth in pulse production in India with special reference to Maharashtra based on the secondary data for the span of 54 years since 1950-51 and found declining, however, due to improvement in productivity, there has been an increase in the production of pulses in the country since 1980-81. The area, production and productivity of major pulses in the state of Maharashtra have increased over a period of time. The productivity of gram has increased significantly at the rate of 1.86 percent annum since 1960 and the total pulse production has increased at the rate of 1.48 percent per annum in the state.

Ahirwar et al. (2007) Studies the variability & growth of pigeon pea production in India in which secondary data were collected for area, production and productivity of pigeon pea pertain to 14 years i.e. 1991-92 to 2004-05 from various issue of government publication. Result showed that the compound growth rate of pigeon pea was 0.17%, 0.03% and 0.206% of area, production and productivity in India respectively. The highest and highly significant growth rate of area, production and productivity were 4.17 and 5.19 percent in Andhra Pradesh. The percent variation in area, production and productivity of pigeon pea were 3.04, 10.84 and 10.61 percent respectively in India. Moreover, they showed that pigeon pea as a slow growth crops needs special attention by the research for ensuring the livelihood and nutritional security of increasing population.

Jain (2007) Influence of watershed technologies as managed by the Research Organization, Government Department and Non-governmental Organization on the outcomes in agriculture and related sectors was assessed through census survey of farmers before and after situations in three watersheds in Kurnool District viz Chinnatekuru watershed developed



by Central Soil and Water Conservation Research and Training Institute, a Research Organization, S.Rangapuram watershed developed by Weaker Communities. Upliftment Service Society, an NGO and Gundala watershed developed by District Rural Development Agency, a Government Organization. The soils and agro-climatic conditions prevailing in the watersheds are largely similar with hilly terrain, red soils and semi arid conditions. The yields of all major crops viz., groundnut, redgram, setaria, sorghum, vegetables, onion and cut flowers etc., have increased due to implementation of watershed based technologies irrespective of implementing agency, varying from 14% to 90%. However, the yield levels of major crops were similar in Research Organisation and NGO managed watersheds and lower in Government Organisation managed watershed indicating inadequate persuasion of the farmers. All categories of farmers harvested higher yields in Research Organisation and Government Organisation managed watersheds whereas large and medium farmers recorded lower yields when compared to other categories in NGO managed watershed. Major changes in cropping pattern for better incomes were noticed in Government Organisation and Research Organisation managed watersheds when compared to NGO managed watershed due to high technical skills combined with better extension net work. The increased employment opportunities and assured employment days per adult has resulted in the reduction of number of idle days by 55.9 percent, 12 percent and 39.5 percent in Research Organisation, Government Organisation and NGO managed watersheds indicating increased agricultural activities in scientifically managed watersheds. This has resulted in reducing the migration from watershed areas to almost nil in Research Organisation managed watershed whereas it reduced by 17 to 25 percent in other watersheds. The watersheds when developed on scientific basis lead to resource conservation and their efficient utilization, impacting productivity, employment generation and reduced migration.

Marothia et al. (2007) studied the crop diversification in Chattisgarh and observed that the pattern of land use and cropping pattern has changed during pre-reform, reform and post-reform periods. The area under forest had increased in Chattisgarh plains and Northern hills, while it has decreased in

Bastar plateau. Land put to non-agricultural uses and cultivable waste land had increased in Chattisgarh plains while it has decreased in Northern hill. The permanent pasture in plains and plateau were depleting very fast. On the other hand, paddy area has been continuously increasing in last threedecades. The increase was occurred at the expense of coarse cereals and minor millets area. Wheat area was diverted to gram in post rainy season.

Batla (2008) studied the regional dimensions of inter-crop diversification in India and observed that inter-crop area shifted in favour of high yielding crops like wheat, paddy, oilseeds, cotton and sugarcane, up to eighties and towards paddy, sugarcane, fruits-vegetables, fibres, plantations, condiments and spices during the nineties and early 2000. The area under wheat and paddy had expanded solely at the cost of low yield growth crops like coarse cereals and pulses due to price support and HYV programme. The high value commercial crops have benefited both from area shifts as well as fresh land brought under cultivation.

Meenakshi and Indumathy (2009) studied the land utilization and cropping pattern in Tamil Nadu. The study revealed that there was a considerable reduction in the cultivated area and hence output was affected to a great extent. The cropping pattern in the state had a high degree for maladjustment for crops. Roughly 53 percent of the cultivated area was being used for growing unsuitable crops.

Upadhaya and Sexana (2009) to examined the pattern of growth of coarse rainfed cereal crops in central part of Rajasthan in India. The secondary data from 1960-61 to 2005-06 were used. The study period was visualized as a whole as well as a subdivision into equal periods (i.e. 1960-81 and 1981-2006). The growth rate of the area of all the crops indicated a mixed trend, i.e. the growth rate of the area under bajra and maize was higher during period-I compared to period-II. In the case of jowar, it showed a mixed response. Similarly, production of all the crops was higher during period-II in most of the districts. A similar observation was seen in the case of productivity of all the crops. The mean area under bajra and jowar crops was greater during period-II in Ajmer and Tonk and Ajmer and Bhilwara, respectively. In the remaining districts, it was the reverse. A similar pattern was seen in

productivity of the crops. The area, production and productivity under maize were increased during period-II in Bhilwara and Bundi districts only. Instability index indicated a mixed response in all the crops, i.e. either it is around the trend or mean.

Bera and Nandi (2010) to examine the present status of pulses in West Bengal. Over the years, area and production of pulses has declined grossly in both the state as well as country level. Exponential growth rate of area, production and productivity of pulses of West Bengal were estimated to be - 3.49, -2.47 and 1.02 respectively as against -0.12, 0.37 and 0.87 respectively at the country level during period 1975-76 to 2005-06. Pulses area as a percentage of Gross cropped area has come down from 12.86 in 1960-61 to 2.31 in 2004-05 in West Bengal. Due to Low productivity, low net return, pulses have been marginalized by highly remunerative competing crops.

Mahir and Abdelaziz (2010) estimated the growth rate of area, production and productivity and measure the contribution of different component to the growth rate of main crops grown in Gezira scheme . The study used secondary data covering the period before the adoption of liberalization policy (1971-70 to 1991-92) and the period after the adoption of the liberalization policy (1992-93 to 2007-08). The crops concerned in the study were sorghum, wheat, cotton and groundnuts. The result of the study showed that there were variations in growth rates of area and productivity for crops during the two periods. The growth rate was positive and increasing during the two periods for, sorghum, positive and decreasing for cotton and negative and decreasing for groundnuts.

Acharya et al. (2012) studies the trend of a particular variable over a period of time and used for making policy decisions. The growth in the area, production and productivity of different crops in Karnataka was estimated using the compound growth function. The necessary secondary data were collected for a period of 26 years from 1982-83 to 2007-08. Growth rates showed a significant positive growth in area under pulses, vegetables and spices and fruits and nuts while cereals showed significant negative growth. The area under jowar, bajra, ragi and minor millets are experiencing a substantial annual decrement. The area under rice has recorded a mild

annual increment. The growth in area under oilseeds and commercial crops was negative and insignificant. Similarly the production of cereals, pulses, vegetables and fruits showed a significant positive growth. The production of oilseeds and commercial crops registered insignificant positive growth. The productivity of different crops recorded significant growth in the case of cereals, pulses and fruits. Productivity of oilseeds recorded moderately positive growth. The productivity of commercial crops registered insignificant positive growth and for vegetables the growth in productivity was insignificant and negative.

Divya et al. (2013) the study was conducted on time series data on area, production and yield from the period 1955-56 to 2004-05, with respect to six major finger millet growing districts of Karnataka. The study particularly aims at examining the growth and instability of area, production and yield of finger millet crop in the state. The trend lines show an increase in both production and yield even though the area under the crop is decreasing. The growth rates in area, production and yield was calculated using compound growth rates. The analysis indicates that there was negative growth in area and positive growth in yield in all the selected districts of Karnataka. The variability in production is attributed to decline in area and increase in yield.

## **MATERIAL AND METHODS**

The present chapter deals with the concise description of the data collection and analytical method used in the light of stated objectives. The specific methods concern to the analysis of time series data related to land use pattern, cropping pattern, working population, source of irrigation, infrastructure facilities, in order to exhibit its instability in Damoh district and its seven blocks are dealt in this chapter.

The research methodology split into following heads.

1. Selection of area
2. Nature and collection of data
3. Period of study
4. Analytical tools

### **1. Selection of area:**

Damoh district of Madhya Pradesh was selected purposely as due to investigator is well acquainted with the area. Damoh district having 7 blocks i.e. Damoh, Jabera, Hatta, Batiyagarh, Pathariya, Tendukheda and Patera and all the blocks were considered for study purpose.

### **2. Nature and collection of data:**

The study was based on secondary data. The secondary data covers different aspects like land use pattern, cropping pattern, irrigation structure, infrastructure position, population structure and status of government sponsored schemes/programmes i.e. Surajdhara and National Food Security Mission for paddy and wheat crop.

### **Source of data:**

The required secondary data was collected from M.P. Agril. Statistics, Annual District Statistics and Annual Report of Farmer Welfare and Agriculture Development Department etc.

### **3. Period of study :**

The study pertains to agriculture Year 2002-03 to 2011-12.

#### 4. Analytical tools :

The following Statistical tools were used for analysis of the data.

##### 1. Absolute change

$$\text{Absolute change} = P_n - P_o$$

Where ,

$P_n$  = Triennium average of current year for land use pattern, cropping pattern and source of irrigation of Damoh district.

$P_o$  = Triennium average of base year for land use pattern, cropping pattern and source of irrigation of Damoh district.

**2. Relative change:** Relative change was worked out by index number technique which is a good measure for relative performance.

$$\text{Relative change} = \frac{P_n - P_o}{P_o} \times 100$$

Where,

$P_n$  and  $P_o$  same as described in absolute change

**3. Measurement of variability:** This is a measure of dispersion for the purpose of comparing two or more statistical series. For comparing the variability, coefficient of variation is used which is expressed in percentage terms and it is explained in the following formula.

$$\text{C.V.} = \frac{\text{Standard deviation } (\sigma)}{\bar{X}} \times 100$$

$$\sigma = \sqrt{\frac{1}{n} \sum x^2 i - \left( \sum \frac{x_i}{n} \right)^2}$$

where,

$X$  = An observation of variate value

$n$  = Number of observation

$\Sigma$  = Summation

C.V. = Coefficient of variation

$\bar{X}$  = Arithmetic mean

#### 4. Trend analysis and growth rate

For the estimation of trend and simple growth rate, following linear equation was used.

$$Y = a + b x$$

Where,

Y = Dependent variable

a = Intercept/ constant

b = Regression coefficient / Rate of change

x = Independent variable

$$\text{Test of significance : } (t) = \frac{b}{SE \text{ of } b}$$

Where,

b = trend value

SE = Standard error

$$\text{4. Simple growth rate} = \frac{b}{\bar{Y}} \times 100$$

b = Regression coefficient

$\bar{Y}$  = Mean of dependent variable

## **RESULTS AND DISCUSSION**

This chapter deals with the analysis and interpretation of the secondary data collected for the study and to present the results in the context of stated objectives. The analysis of secondary data concerns with the land use pattern, cropping pattern, irrigation sources, population status, infrastructure position and impact of government schemes in different blocks of Damoh district.

### **Land Use Pattern of Damoh District**

#### **4.1 Absolute change, relative change and coefficient of variation**

The area changes in land use pattern viz forest area, barren and non agricultural uses land, other uncultivated land excluding fallow land, culturable waste land, fallow land, net area sown, double cropped area and total cropped area of Damoh district have been analysed in terms of absolute change, relative change coefficient of variation, linear trend and simple growth rate during study period (i.e.2002-03 to 2011-12) and these have been presented in the following section (Table 4.1 and 4.2).

##### **Absolute change**

Data shows Table 4.1 that the absolute change in area of forest, other uncultivated land excluding fallow land, culturable waste land, net area sown, double cropped area and total cropped area were found positive which showed an increase in the area .While in case of barren and non agricultural uses land and fallow land, the absolute change in area was negative which shows a down fall of area of barren and non agricultural uses land and fallow land. As far as absolute change in total cropped area was concerned it was positive in Damoh district.

##### **Relative change**

The change in area of land use pattern in the current years over the base year have been analysed in terms of relative change and results are provided in the same table. It was observed from the table that the relative change in forest area, other uncultivated land excluding fallow land, culturable



waste land, net area sown, double cropped area and total cropped area were found positive in Damoh district, which shows increased in the area under major aspect of land use pattern except the barren and non agricultural uses land and fallow land in the study area.

### **Coefficient of variation**

The statistical measures for variability in the area of land use pattern during the study period have been used in terms of coefficient of variation and result shows in same Table 4.1. The coefficient of variation for area of culturable waste land was found highest (37.22%) and minimum for the forest area (0.07%).

**Table 4.1: Absolute change, relative change and coefficient of variation for Land Use Pattern of Damoh District**

(Area unit : hectare)

<b>Particulars</b>	<b>Base year</b>	<b>Current year</b>	<b>Absolute Change</b>	<b>Relative Change (%)</b>	<b>CV (%)</b>
Forest Area	267050.33	267398.00	347.67	0.13	0.07
Barren and non agricultural uses land	91230.67	83447.00	-7783.67	-8.53	7.59
Other uncultivated land excluding fallow land	33864.33	35787.00	1922.67	5.68	3.18
Culturable waste land	13978.67	17598.00	3619.33	25.89	37.22
Fallow land	13447.33	8406.33	-5041.00	-37.49	20.39
Net area sown	309011.67	315946.67	6935.00	2.24	0.97
Double cropped area	80517.33	136045.00	55527.67	68.96	27.30
Total Cropped area	389529.00	451991.67	62462.67	16.04	7.82

It could be conducted that the positive absolute change and relative change was found in all aspect of land use pattern except barren and non agricultural uses land and fallow land in the study area. Minimum value of coefficient of variation (0.07%). for the forest area was observed which shows minimum variation in forest area during study period, it is good indicator for the study area.

## 4.2 Linear Trend and simple growth rate of Land Use Pattern

The value of trend coefficient of forest area, other uncultivated land excluding fallow land, net area sown, double cropped area and total cropped area was found positive and significant at one percent level. The value of trend coefficient of barren and non agricultural uses land and fallow land was negative and non significant

The growth rate of forest area (0.02%), other uncultivated land excluding fallow land (0.83%), culturable waste land (4.36%), net area sown (0.31%), double cropped area (7.58%) and total cropped area (2.24%) were observed positive and significant, while the growth rate of barren and non agricultural uses land (-1.39%) and fallow land (-6.59%) was found negative and non significant.

**Table 4.2: Linear Trend and simple growth rate of Land Use Pattern**

(Area unit : hectare)

Particulars	Trend		Simple growth rate (%)
	Coefficient a	Coefficient b	
Forest Area	266903.86	49.90*** (13.92)	0.02***
Barren and non agricultural uses land	95812.13	-1240.50 (654.94)	-1.39
Other uncultivated land excluding fallow land	32982.67	286.73*** (78.94)	0.83***
Culturable waste land	11200.40	643.22 (598.82)	4.36
Fallow land	14803.00	-716.35 (52.63)	-6.59
Net area sown	306880.93	976.99*** (73.29)	0.31***
Double cropped area	65804.93	8550.01*** (1949.83)	7.58***
Total Cropped area	372685.87	9527.01*** (1928.60)	2.24***

Figure in bracket shows the standard error of concerned regression coefficient  
\*, \*\*and \*\*\* indicates 10, 5 and 1 percent level of significance respectively

## **Cereal Crops**

### **4.3 Absolute change, relative change and coefficient of variation**

The absolute change, relative change and coefficient of variation in area of cereal crops of Damoh district have been provided in Table 4.3.

#### **Absolute change**

It revealed from the table that the absolute change in area for Wheat (12937.33ha.), Paddy (445ha.) and total cereals (9493.67) was found positive which showed increased in the area of wheat, paddy and total cereals while in case of jowar(-2895 ha.) and maize (-203.67 ha.) the absolute change in area was negative which shows a down fall of area of jowar and maize crops. As far as absolute change in total cereals was concerned it was positive in Damoh district.

#### **Relative change**

The change in area of cereal crops have been analysed in terms of relative change and result are shown in the same table. It was observed from the table that the relative change in area for Wheat (20.34%), Paddy (0.85%) and Total Cereals (4.90%) were found positive in Damoh district. It could be concluded that area of wheat, paddy and total cereals was increased during the study period.

#### **Coefficient of variation**

For variability in the area of selected cereal crops during the study period have been analysed in terms of coefficient of variation and shows in Table 4.3. The coefficient of variation for area of Jowar crop was found highest (35.42) followed by Wheat (10.55), Maize (6.89), Paddy (3.21) and Total Cereals (4.90).

It could be concluded that area of wheat, paddy and total cereals increases during the study period. Amongst the cereal crops maximum variation was observed in the area of Jowar crop which indicates more fluctuation was found in the area of Jowar crop.

**Table 4.3: Absolute change, relative change and coefficient of variation for area of cereal crops**

(Area unit: hectare)

<b>Crops</b>	<b>Base year</b>	<b>Current year</b>	<b>Absolute Change</b>	<b>Relative Change (%)</b>	<b>CV (%)</b>
Wheat	63602.33	76539.67	12937.33	20.34	10.55
Paddy	52573.67	53018.67	445.00	0.85	3.21
Jowar	5396.33	2501.33	-2895.00	-53.65	35.42
Maize	2099.33	1895.67	-203.67	-9.70	6.89
Total cereals	124803.67	134297.33	9493.67	7.61	4.90

#### **4.4 Linear Trend and simple growth rate of area under the cereal crops**

The trend value of area of wheat crop was observed positive and significant at one percent level and the value of trend coefficient for area of total cereals was positive and significant at five percent level. While in case of paddy, it was positive and non significant and the value of trend coefficient of jowar and maize area was negative and non significant.

The simple growth rate of area of wheat (2.69%) and total cereals (1.08%) were observed positive and significant, while the growth rate of area of paddy (0.19%) was observed positive and non significant. In case of jowar (-10.59%) and maize (-1.49%), the growth rate was found negative and non significant.

Overall it could be concluded that the trend and growth rate of jowar and maize crop area was declining, as these are the important cereal crops in the study area.

**Table 4.4: Linear Trend and simple growth rate of area under the cereal crops**

(Area unit : hectare)

Crops	Trend		Simple growth rate (%)
	Coefficient a	Coefficient b	
Wheat	58708.53	1853.59 *** (539.65)	2.69***
Paddy	52789.53	102.10 (197.00)	0.19
Jowar	6255.80	-418.71 (69.42)	-10.59
Maize	2166.87	-29.88 (12.18)	-1.49
Total cereals	121281.80	1394.56** (548.36)	1.08**

Figure in bracket shows the standard error of concerned regression coefficient.

\*, \*\* and \*\*\* indicates 10, 5 and 1 percent level of significance respectively.

## Pulse Crops

### 4.5 Absolute change, relative change and coefficient of variation in area under the pulse crops

The absolute change, relative change and coefficient of variation in area of pulse crops under Damoh district have been given in Table 4.5.

The absolute change in area of gram crop in Damoh district was found negative (-48625.67ha.) which shows that area of gram crop decreases, while in case of area of tuar, urd and total pulses, absolute change was observed positive value which shows that increases the area of tuar, urd and total pulse crops in the study area. The result of relative change in the area of pulse crops in Damoh district was found in same pattern as in the case absolute change.

### Coefficient of variation

The variability in the area was measures in terms of coefficient of variation and results are given in the Table 4.5 which has been worked out for selected pulse crops of Damoh district.

From the table it can be noted that the value of coefficient of variation in area of tuar crop was found highest coefficient of variation followed by the area of urd, gram and total pulses. The minimum variation was observed in the area of total pulses i.e. 5.73.

Among the selected pulse crops, negative change in area of gram crop was recorded in the study area so serious efforts are needed to increase the area of such important pulse crop.

**Table 4.5: Absolute change, relative change and coefficient of variation in area for pulse crops**

(Area unit: hectare)

Crops	Base year	Current year	Absolute Change	Relative Change (%)	CV%
Gram	175181	126555.33	-48625.67	-27.76	15.03
Tuar	2775	30558.67	27783.67	1001.21	170.14
Urd	17118.67	26961	9842.33	57.49	38.52
Total pulses	215049.3	224710.33	9661	4.49	5.73

### 4.6 Linear Trend and simple growth rate

The value of trend and simple growth rate of area of pulse crops under Damoh district have been given in Table 4.6.

It revealed from the table that the trend value of area of gram crop was found negative (-6928.15) and non significant. The trend value of area of tuar and urd crop was observed positive and significant at 10 percent level while in case of total pulses, trend value was positive and non significant (1313.65).

The value of simple growth rate of area under the tuar, urd and total pulses was found positive and significant which shows that increases in the area of tuar, urd and total pulse crops during the study period. Among the pulse crops only the value of trend and simple growth rate for area of gram crop was observed negative and non significant which indicates the decreasing in the area of gram crop. Gram is the important pulse crop in the study area so research study may be concluded to know the reason for decreasing the area.

Thus it could be concluded that during study period, area of gram crop has decline on the basis of value of trend coefficient and simple growth rate that found was negative and non significant.

**Table 4.6: Linear Trend and simple growth rate of area under the pulse crops**

(Area unit: hectare)

Crops	Trend		Simple growth rate
	Coefficient a	Coefficient b	
Gram	193452.40	-6928.15 (1199.21)	-4.46
Tuar	-9176.27	3731.70* (1828.29)	32.88*
Urd	13848.80	1668.67* (851.19)	7.25*
Total pulses	210473.53	1313.65 (1381.10)	0.60

Figure in bracket shows the standard error of concerned regression coefficient.

\*, \*\* and \*\*\* indicates 10, 5 and 1 percent level of significance respectively.

#### **Oilseed Crops**

#### **4.7 Absolute change, relative change and coefficient of variation in area for oilseed crops**

The absolute change and relative change in area of oilseed crops in the study area have been shown in Table 4.7.

The table shows that the absolute and relative change were found negative in area for linseed and groundnut crop which showed an decreasing in the area of linseed and groundnut crop whereas in case of sesamum, rai and mustard, soybean and total oilseed the absolute change have been found positive which indicates the area increases in these oilseed crops .

The result shows that the value of absolute and relative change was observed negative under the area of linseed and groundnut crop. Whereas remaining oilseed crops shows the positive value of absolute and relative change which is the good sign for the agriculture development in the Damoh district.

### **Coefficient of variation**

The statistical measures for variability in the area of oilseed crops during the study period have been analysed in terms of coefficient of variation and result shows in same Table 4.7. The coefficient of variation for area of groundnut crop was found highest (55.26) followed by linseed (48.65), soybean (44.23), total oilseed (38.59), rai and mustard (20.33) and sesamum (17.99). Among the selected oilseed crops minimum variation registered under the area of sesamum crop.

**Table 4.7: Absolute change, relative change and coefficient of variation in area for oilseed crops**

(Area unit: hectare)

<b>Crops</b>	<b>Base year</b>	<b>Current year</b>	<b>Absolute Change</b>	<b>Relative Change (%)</b>	<b>CV (%)</b>
Sesamum	1838.33	2263.00	424.67	23.10	17.99
Linseed	4954.33	1391.67	-3562.67	-71.91	48.65
Groundnut	760.33	268.33	-492.00	-64.71	55.26
Rai and Mustard	545.00	807.33	262.33	48.13	20.33
Soybean	34545.00	80256.67	45711.67	132.32	44.23
Total oilseed	42645.67	85018.00	42372.33	99.36	38.59



#### 4.8 Linear trend and simple growth rate

The value of trend coefficient of area under the soybean (7196.36), rai and mustard (29.72) and total oilseed crop (6695.98) was positive and significant at 5 percent level in Damoh district. While in case of linseed (518.65) and groundnut (69.82) crop, trend coefficient was found negative and non significant which indicates the down fall in area of linseed and groundnut crop in Damoh district.

The value of simple growth rate of area under the sesamum (2.82), rai and mustard (4.52), soybean (11.14) and total oilseed (9.43) were observed positive and significant at different level which shows the increases the area of these crops in the study area. Among the oilseed crops, the negative and non significant trend and growth rate was observed in linseed (-15.12) and groundnut (-15.72) crop it's shows decreasing in the area of linseed and groundnut crop.

**Table 4.8: Linear Trend and simple growth rate of area under the oilseed crops**

(Area unit: hectare)

Crops	Trend		Simple growth rate
	Coefficient a	Coefficient b	
Sesamum	1599.53	53.47 (34.99)	2.82
Linseed	6283.20	-518.65 (66.03)	-15.12
Groundnut	828.13	-69.82 (14.55)	-15.72
Rai and Mustard	494.67	29.72** (11.56)	4.52**
Soybean	25015.20	7196.36** (2158.01)	11.14**
Total oilseed	34211.20	6695.98** (2154.50)	9.43**

Figure in bracket shows the standard error of concerned regression coefficient

\*, \*\* and \*\*\* indicates 10, 5 and 1 percent level of significance respectively

## Kharif and Rabi Crops

### 4.9 Absolute change, relative change and coefficient of variation (%) of area under the kharif and rabi crops

The absolute change, relative change and coefficient of variation of area under the kharif and rabi crops of Damoh district have been provided in Table 4.9.

It revealed from the table that the absolute change in area of edible and non edible crop under the kharif season was found positive while in case of edible and non edible crop of rabi season crop the absolute change in area was negative. As far as absolute change in total area of kharif and rabi season crop was concerned, it was positive and result of relative change was observed in the Same pattern.

#### Coefficient of variation

It was observed from the table 4.9, the maximum variation was found in the area of non edible crop (56.40) under the the kharif season crop and minimum variation in the area of edible crop (2.98) under the rabi season crop which shows less fluctuation in the area of edible crop during study period in the study area.

**Table 4.9: Absolute change, relative change and coefficient of variation of area under the kharif and rabi crops**

(Area unit : hectare)

Particulars		Base year	Current year	Absolute Change	Relative Change (%)	CV (%)
Kharif crop	Edible crop	82797.67	147496.33	64698.67	78.14	35.65
	Non Edible crop	40217.67	54290.67	14073.00	34.99	56.40
Rabi crop	Edible crop	260938.33	248243.00	-12695.33	-4.87	2.98
	Non Edible crop	5512.00	1961.67	-3550.33	-64.41	43.13
Total	Kharif + Rabi	389529.00	451991.67	62462.67	16.04	7.82

#### 4.10 Trend and simple growth rate

The details about trend coefficient under the area of kharif and rabi season crop in Damoh district during the 2002-03 to 2011-12 have been given in the Table 4.10.

The value of regression coefficient and simple growth rate was found positive and highly significant for the area of edible crop under the kharif season crop but the value of trend and growth rate for non edible crop was positive and non significant. In rabi crop, the value of regression coefficient and growth rate were observed negative and non significant in both edible and non edible crops.

Over all it could be concluded that the area of edible and non edible under rabi crops decreases while in case of kharif crops, positive trend and growth rate was observed.

**Table 4.10: Trend and simple growth rate of area under the kharif and rabi crops**

(Area unit: hectare)

Particulars		Trend		Simple growth rate (%)
		Coefficient a	Coefficient b	
Kharif crop	Edible crop	50787.60	9928.87*** (2631.56)	9.42***
	Non Edible crop	49055.47	2043.08 (3904.33)	3.39
Rabi crop	Edible crop	265829.13	-1904.86 (579.58)	-0.75
	Non Edible crop	6937.00	-529.67 (77.43)	-13.16
Total	Kharif + Rabi	372685.87	9527.01*** (1928.60)	2.24***

Figure in bracket shows the standard error of concerned regression coefficient.

\*, \*\* and \*\*\* indicates 10, 5 and 1 percent level of significance respectively.

## **Irrigated Area**

### **4.11 Absolute change, relative change and coefficient of variation**

In the study area, the irrigated area covers from different sources and details of absolute, relative change and coefficient of variation are given in the Table 4.11.

It revealed from the table that the absolute change in irrigated area by tubewells, wells, ponds were found positive which showed an increase in the area by these sources, where as in case of irrigated area by canals and from other sources, the absolute change was negative which shows a down fall of irrigated area by canals and from other sources. The positive value of absolute change was also observed in net irrigated area as well as gross irrigated area.

The relative change in irrigated area by tubewells, wells, ponds, net irrigated area and gross irrigated area were also found positive but in case of irrigated area by canals and irrigated area from other sources was negative in the study area.

For measuring the variability in the irrigated area from different sources during the study period have been analysed in terms of coefficient of variation and result shows in same table 4.11. The coefficient of variation was found highest in irrigated area by ponds (45.88) followed by wells (13.30), tubewells (12.92), canals (9.06) irrigated area from other sources (8.01), net irrigated area (7.76) and gross irrigated area (7.61).

Over all it could be concluded that the positive absolute change and relative change was observed in all the source of irrigation except the canals and from other sources in the study area. Among the sources of irrigation, lowest variation was observed in the gross irrigated area.

**Table 4.11: Absolute change, relative change and coefficient of variation  
in area of Source of irrigation**

(Area unit: hectare)

Source of irrigation	Base year	Current year	Absolute Change	Relative Change (%)	CV (%)
Irrigated area by Canals	12240.33	12043.67	-196.67	-1.61	9.06
Irrigated area by Tubewells	24918.00	31296.67	6378.67	25.60	12.92
Irrigated area by Wells	24350.00	32223.33	7873.33	32.33	13.30
Irrigated area by Ponds	421.33	1216.67	795.33	188.77	45.88
Irrigated area from other sources	42423.33	40668.33	-1755.00	-4.14	8.01
Net Irrigated area	102142.33	108704.33	6562.00	6.42	7.76
Gross Irrigated area	104353.00	117448.67	13095.67	12.55	7.61

#### **4.12 Linear trend and simple growth rate**

The value of trend and growth rate of irrigated area by wells and ponds was observed positive and highly significant whereas value of trend of irrigated area by tubewells and gross irrigated area was positive and significant at 5 and 1 percent respectively.

In case of net irrigated area, the value of trend and growth rate was observed positive and non significant but the value was negative and non significant was found in irrigated area from other sources.

**Table 4.12: Trend and simple growth rate for irrigated area**

(Area unit : hectare)

Source of irrigation	Trend		Simple growth rate (%)
	Coefficient a	Coefficient b	
Irrigated area by Canals	12850.27	-25.34 (134.25)	-0.20
Irrigated area by Tubewells	23862.93	908.30** (294.01)	3.15**
Irrigated area by Wells	21770.53	1124.56*** (174.53)	4.02***
Irrigated area by Ponds	161.93	115.05*** (12.58)	14.48***
Irrigated area from other sources	44425.93	-294.93 (386.78)	-0.69
Net Irrigated area	104469.87	793.39 (944.85)	0.73
Gross Irrigated area	103061.60	1828.55*** (769.91)	1.62***

Figure in bracket shows the standard error of concerned regression coefficient.

\*, \*\* and \*\*\* indicates 10, 5 and 1 percent level of significance respectively.

### Block wise analysis of land use pattern

#### 4.13 Absolute change and relative change

The absolute and relative change in land use pattern under different blocks of Damoh district have been provided in Table 4.13 and 4.14.

It revealed from the table that the absolute change for forest area was found positive for all blocks of Damoh district except Hatta block while absolute change for barren and non agricultural uses land and fallow land was found negative for all blocks. Absolute change in other uncultivated land excluding fallow land and culturable waste land was found positive for all the blocks except the Pathriya block. Whereas net area sown, double cropped area and total cropped area showed the positive absolute change for all the seven blocks of study area.

**Table 4.13: Block wise absolute change for land use pattern**

(Area unit: hectare)

Items	Blocks						
	Damoh	Pathriya	Jabera	Tendukheda	Batiagarh	Hatta	Patera
Forest Area	175.67	0.33	81.00	72.67	53.00	-10.67	327.00
Barren and non agricultural uses land	-1394.00	-767.00	-2035.33	-700.33	-739.00	-741.67	-1378.33
Other uncultivated land excluding fallow land	693.00	-4.00	740.67	119.67	131.67	81.33	239.33
Culturable waste land	1147.67	-185.00	993.33	287.33	226.00	182.33	967.33
Fallow land	-1166.33	-789.00	-773.67	-626.33	-775.33	-272.67	-703.00
Net area sown	928.67	1745.00	994.00	847.00	1103.67	761.33	566.33
Double cropped area	13453.67	13268.67	6667.33	3315.67	8695.67	4545.67	5392.33
Total Cropped area	14382.33	15013.67	7661.33	4162.67	9789.33	5307.00	5958.67

**Table 4.14: Block wise relative change for land use pattern**

(Area unit : hectare)

Particulars	Blocks						
	Damoh	Pathriya	Jabera	Tendukheda	Batiagarh	Hatta	Patera
Forest Area	0.41	0.02	0.14	0.10	0.15	-0.03	1.42
Barren and non agricultural uses land	-7.61	-12.63	-7.82	-5.65	-7.35	-13.78	-10.64
Other uncultivated land excluding fallow land	22.42	-0.17	12.39	1.72	2.19	1.24	8.59
Culturable waste land	48.41	-9.78	56.84	10.00	12.37	8.47	86.65
Fallow land	-61.58	-65.62	-41.71	-20.32	-46.24	-13.21	-40.45
Net area sown	1.58	3.01	2.90	2.88	2.80	1.65	1.32
Double cropped area	86.37	88.92	52.55	31.55	70.99	61.39	73.31
Total Cropped area	19.36	20.59	16.31	10.42	18.96	9.90	11.83



It could be concluded that the absolute change was found negative in barren and non agricultural uses land and fallow land for all blocks and forest area decline only in Hatta block while area of other uncultivated land excluding fallow land and Culturable waste land was decreases and remaining aspect of land use pattern shows the positive absolute change for all the seven blocks.

Regarding result of relative change of land use pattern under different blocks of Damoh district, the pattern of result was found same as in the case of absolute change but the variation in the value was observation under different aspect of land use pattern.

#### **4.14 Coefficient of variation**

In this section, an attempt has been made to know the variation in land use pattern in terms of coefficient of variation in the different block of Damoh district and details are given in the Table 4.15.

During the study period (i.e.2002-03 to 2011-12) the highest (0.88%) and lowest (0.02%) fluctuation was found in forest area of Patera and Pathriya block respectively In case of barren and non agricultural uses land, maximum and minimum variation was observed in Hatta and Tendukheda block respectively. More fluctuation was observed in Damoh block (10.90%) and low in Tendukheda block in case of other uncultivated land excluding fallow land. In case of culturable waste land and fallow land, minimum fluctuation has been recorded under the Tendukheda block (19.96 and 10.93%) and maximum variation was observed in Patera and Pathriya block respectively. Whereas the highest fluctuation in net area sown was found in Damoh block (47.53%) and lowest in Hatta block (0.75%). The value of coefficient of variation was observed minimum in Tendukheda block for double cropped area and total cropped area and maximum in Hatta and Pathriya block respectively.

Over all, maximum fluctuation was observed in patera block (68.58%) under the culturable waste land and minimum was found in Tendukheda block. Less variation was observed in forest area which shows the positive sign in the study area.

**Table 4.15: Block wise Coefficient of variation (%) of land use pattern**

Particulars	Blocks						
	Damoh	Pathriya	Jabera	Tendukheda	Batiagarh	Hatta	Patera
Forest Area	0.26	0.02	0.09	0.05	0.15	0.04	0.88
Barren and non agricultural uses land	6.92	12.36	6.28	5.10	7.26	14.45	9.07
Other uncultivated land excluding fallow land	10.90	2.05	8.07	1.19	2.17	1.71	3.98
Culturable waste land	32.74	39.55	58.07	19.96	37.96	31.90	68.58
Fallow land	39.09	45.09	22.62	10.93	31.66	12.26	24.66
Net area sown	47.53	1.29	1.28	1.41	1.38	0.75	0.94
Double cropped area	32.54	33.15	22.71	13.11	26.43	38.23	28.44
Total Cropped area	9.52	10.15	7.94	4.63	8.83	7.51	5.67

#### **4.15 Linear trend and simple growth rate**

The blockwise trend and growth rate of land use pattern have been provided in Table 4.16.

The value of regression coefficient and simple growth rate were estimated positive and significant at different level of significant for forest area, other uncultivated land excluding fallow land, culturable waste land, net area sown, double cropped area and total cropped area in all the seven blocks of Damoh district except forest area in Damoh block and culturable waste land in Pathriya block. Regarding the value of regression coefficient and simple growth rate for barren and non agricultural uses land and fallow land were found negative and non significant in all seven blocks of Damoh district

Over all it can be concluded that the negative trend and simple growth rate was found only in case of barren and non agricultural uses land and fallow land in all the blocks of Damoh district which indicates the down fall of the area. Whereas net area sown, double cropped area and total cropped area was found positive and significant for all blocks except the Patera block, it is good sign for the agriculture development in the study area.

**Table 4.16: Block wise trend and simple growth rate for land use pattern**

(Area unit : hectare)

Particulars	Blocks													
	Damoh		Pathriya		Jabera		Tendukheda		Batiagarh		Hatta		Patera	
	Coefficient b	SGR	Coefficient b	SGR	Coefficient b	SGR	Coefficient b	SGR	Coefficient b	SGR	Coefficient b	SGR	Coefficient b	SGR
Forest Area	-27.16 (8.43)	-0.06	0.06 (0.03)	0.0035	11.81*** (4.41)	0.02	10.67*** (1.32)	0.01	8.69 (5.08)	0.03	-1.71 (1.45)	-12.71	47.58** (16.86)	0.21
Barren and non agricultural uses land	-219.61 (122.80)	-1.22	-124.41 (72.06)	-2.13	-319.75 (148.55)	-1.26	-114.59 (60.06)	-0.94	-119.98 (71.91)	-1.22	-121.93 (75.54)	-16.37	-218.66 (107.96)	-1.74
Other uncultivated land excluding fallow land	100.15*** (23.80)	10.90	1.44 (5.65)	0.06	107.92* (44.03)	1.75	14.44 (8.33)	0.21	18.99 (13.84)	0.31	15.62 (12.10)	13.72	34.73*** (5.74)	1.19
Cultivable waste land	182.13* (86.46)	6.46	-10.64 (74.55)	-0.66	167.86 (122.72)	8.35	55.65 (65.40)	1.90	41.04 (79.31)	2.26	42.62 (76.82)	6.36	164.55 (99.65)	11.42
Fallow land	-165.61 (9.24)	-12.75	-111.89 (11.17)	-14.33	-110.25 (6.50)	-7.37	-82.45 (19.11)	-3.02	-111.30 (20.07)	-9.31	-39.55 (23.08)	-17.12	-97.67 (24.85)	-6.61
Net area sown	133.13*** (30.12)	0.23	245.50*** (17.13)	0.42	142.41*** (13.36)	0.41	116.28*** (26.72)	0.39	162.56*** (29.43)	0.41	105.13*** (17.35)	29.93	72.39 (39.65)	0.17
Double cropped area	2054.09*** (510.20)	8.79	2098.47*** (510.55)	9.02	994.34*** (235.69)	6.23	490.35*** (71.89)	4.00	1336.86*** (228.10)	7.86	755.43* (390.59)	18.64	814.21*** (189.38)	7.85
Total Cropped area	2189.18*** (489.86)	2.66	2343.96*** (512.70)	2.85	1136.75*** (243.75)	2.24	606.62*** (76.31)	1.44	1498.02*** (253.48)	2.63	860.56* (398.87)	20.03	886.61*** (165.45)	1.66

Figure in bracket shows the standard error of concerned regression coefficient

\*, \*\* and \*\*\* indicates 10, 5 and 1 percent level of significance respectively

## Cereal Crops

### 4.16 Absolute and Relative change in area of cereal crops

The absolute and relative change in area of cereal crops under the different block of Damoh district are given in Table 4.17 and 4.18.

Among the blocks of Damoh district more change was observed in Jabera block under the area of wheat, paddy and total cereals. In case of jowar crop, maximum change was recorded in the Damoh block. In case of maize crop, highest area increases under the Batiagarh block in terms of absolute change.

It can be concluded that among the seven blocks, area of wheat, paddy and total cereals was sharp increases in Jabera block as compare to other blocks. While in case of jowar crop, absolute change was observed positive only Damoh block and in case of maize all blocks shows the negative absolute change except the Damoh and Batiagarh block.

**Table 4.17 Block wise absolute change in area of cereal crops**

(Area unit: hectare)

Crops	Blocks						
	Damoh	Pathriya	Jabera	Tendukheda	Batiagarh	Hatta	Patera
Wheat	3913.00	549.00	3967.00	3528.00	2524.00	-1549.00	-597.67
Paddy	577.67	-72.33	1753.67	-618.33	-72.00	-411.33	148.33
Jowar	101.67	-349.00	-79.00	-154.00	-1184.33	-944.00	-286.33
Maize	26.33	-5.00	-74.67	-146.67	133.67	-128.67	-8.67
Total cereals	4628.00	97.33	5478.00	2363.67	1223.67	-3119.00	-799.33

**Table 4.18 Block wise relative change (%) in area of cereal crops**

(Area unit: hectare)

Crops	Blocks						
	Damoh	Pathriya	Jabera	Tendukheda	Batiagarh	Hatta	Patera
Wheat	(34.83)	5.10	36.63	46.92	32.60	-19.54	-6.97
Paddy	(4.21)	-46.07	11.65	-4.08	-47.37	-50.89	2.22
Jowar	(24.40)	-59.35	-43.73	-50.60	-67.90	-62.09	-44.60
Maize	(7.38)	-18.99	-19.58	-21.24	54.71	-44.62	-7.76
Total cereals	(17.94)	0.84	20.60	9.87	12.10	-29.12	-4.97

The finding of relative change, it is remarkable to note that area of wheat increased in all blocks of Damoh district except the Hatta and Patera block. In case of paddy, Damoh, Jabera and Patera blocks shows increasing in the area and the remaining blocks was found decline in the area. In case of Jowar, area was increases only in Damoh block. In case of total cereals only Hatta and Patera block shows the decline in the area and remaining blocks shows the increase in the area of total cereals which indicates the better sign for development in the agriculture in the study area.

#### 4.17 Coefficient of variation for area of cereal crops

The variation was noted by computation of coefficient of variation and it is depicted in Table 4.19.

It reveals from the table that more variation was observed in Jowar crop in all the blocks and less variation was recorded in Paddy crop under Damoh, Jabera and Tendukheda block. While in remaining block, less variation was observed in total cereals.

It could be concluded that the maximum variation was observed in Jowar crop for all blocks of Damoh district. Minimum percentage variation was observed in Pathriya, Batiagarh and Patera block in the area of total cereals. In case of Damoh, Jabera and Tendukheda block, lowest variation was found in the area of paddy crop.

**Table 4.19: Block wise coefficient of variation (%) for area of cereal crops**

Crops	Blocks						
	Damoh	Pathriya	Jabera	Tendukheda	Batiagarh	Hatta	Patera
Wheat	16.62	7.44	16.59	18.04	15.59	14.24	8.66
Paddy	4.15	25.34	6.46	4.91	32.05	35.98	7.55
Jowar	23.35	39.60	29.32	31.18	49.44	48.23	41.97
Maize	4.48	22.49	13.68	10.44	28.65	28.22	7.52
Total cereals	8.78	6.46	8.52	6.10	9.57	16.70	5.50

#### **4.18 LinearTrend and simple growth rate**

Regression coefficient and simple growth rate for area of cereal crops are given in Table 4.20.

The value of regression coefficient and SGR was observed positive and highly significant in the area of wheat crop in all the block except Hatta and Patera. The regression coefficient and SGR was registered negative for the area of jowar crop in all blocks expect the Damoh block. In case of paddy crop trend value and growth rate was found negative for all blocks expect the Damoh, Jabera Patera block and maize crop was observed positive and significant value of trend and rate growth in Damoh and Batiagarh block while total cereals was found positive trend and growth rate for all blocks except the Hatta and Patera block.

**Table 4.20: Blocks wise trend and simple growth rate (%) for area of cereal crops**

(Area unit: hectare)

Crops	Blocks													
	Damoh		Pathriya		Jabera		Tendukheda		Batiagarh		Hatta		Patera	
	Coefficient b	SGR	Coefficient b	SGR	Coefficient b	SGR	Coefficient b	SGR	Coefficient b	SGR	Coefficient b	SGR	Coefficient b	SGR
Wheat	594.39*** (137.09)	4.60	81.35 (91.26)	0.74	528.89*** (145.14)	4.33	491.79*** (74.86)	5.47	362.53*** (93.81)	4.16	-218.89 (91.15)	-3.04	-98.99 (75.82)	-1.20
Paddy	97.47 (59.16)	0.68	-10.02 (1.38)	-7.80	271.53*** (74.72)	1.68	-85.34 (80.30)	-0.57	-10.29 (3.43)	-7.70	-49.44 (20.96)	-7.61	28.98 (60.37)	0.42
Jowar	15.64 (12.29)	3.16	-48.37 (8.00)	-11.85	-12.24 (2.33)	-8.53	-22.66 (3.26)	-9.54	-172.34 (17.47)	-15.70	-133.09 (38.24)	-12.36	-44.49 (19.71)	-8.64
Maize	3.96** (1.32)	1.08	-0.75 (0.53)	-3.31	-11.02 (3.60)	-3.32	-20.52 (1.77)	-3.35	18.18* (9.29)	5.38	-18.27 (3.31)	-8.29	-1.46 (0.82)	-1.32
Total cereals	1.06 (1.97)	0.00	19.11 (87.14)	0.16	764.21*** (99.22)	2.64	328.47** (135.02)	1.31	172.66 (99.33)	1.66	-430.65 (97.59)	-4.64	-123.84 (2.39)	-0.78

Figure in bracket shows the standard error of concerned regression coefficient

\*, \*\* and \*\*\* indicates 10, 5 and 1 percent level of significance respectively



## Pulse Crops

### 4.19 Absolute and Relative change for area of pulse crops

The change in area of pulses under the different blocks of Damoh district in the current year (triennium ending 2011-12) over the base year (triennium ending 2005-06) have been computed in terms of absolute and relative change and result are provided in the Table 4.21 and 4.22.

The table shows that the absolute change was found negative in gram crop for all the blocks of Damoh district which indicates the decline in the area of gram crop in the study area. In case of tuar crop, absolute change was observed positive for all the blocks of Damoh district which shows the increasing the area of tuar crop in all the seven block of Damoh district. The absolute change in case of urd crop, it was also found positive in all the blocks except Batiagarh block (-1085.17). As far as absolute change in total cereals was concerned, it was found negative in only two blocks i.e. Pathriya and Batiagarh block.

**Table 4.21: Blocks wise absolute change for area of pulse crops**

(Area unit: hectare)

Crops	Blocks						
	Damoh	Pathriya	Jabera	Tendukheda	Batiagarh	Hatta	Patera
Gram	-14401.3	-8822.00	-3038.33	-3121.33	-5409.00	-7105.00	-6718.67
Tuar	5318.667	5006.67	2059.33	2782.00	3802.33	4702.67	4112.67
Urd	5167	110.67	1637.00	1956.67	-1085.17	955.50	1780.50
Total pulses	1246.33	-753.67	1172.00	1320.33	-1291.33	4723.67	3243.67

**Table 4.22: Block wise relative change for area of pulse crops**

(Area unit: hectare)

Crops	Blocks						
	Damoh	Pathriya	Jabera	Tendukheda	Batiagarh	Hatta	Patera
Gram	-41.38	-23.94	-19.93	-25.85	-24.42	-24.72	-26.54
Tuar	1819.38	928.88	1001.30	986.52	737.84	813.61	1135.05
Urd	354.47	4.31	131.24	331.08	-26.34	20.02	105.76
Total pulses	2.96	-1.75	6.15	8.79	-4.52	12.94	10.54

It reveals from the table 4.22 that the relative change in area for total pulses, was observed positive in all the blocks except Pathriya and Batiagarh block. But in case of gram crop, the result of relative change was found same in case of absolute change. The relative change of tuar and urd crop was also found positive in all the blocks its good sign for in the study area.

Over all it could be concluded that area of tuar and urd crop was increases but the area of gram crop decreases. It's need more effort to increase the area of gram crop by the concerned person as gram crop is one of the important pulse crop in the study area.

#### 4.20 Coefficient of variation

For variability in the area of pulse crops during the study period have been analysed in terms of coefficient of variation and result are given in Table 4.23.

The highest fluctuation in area of tuar crop was found in Pathriya block (200.79%) and lowest in Jabera block (133.38%) . But in case of gram crop, maximum and minimum variation was observed in Damoh and Jabera block respectively. More fluctuation was observed in Tedukheda block (72.73%) and low in Pathriya block (21.88%) under urd crop. Under the total pulses, minimum fluctuation was estimated in Damoh block (6.42%) and maximum in Jabera block (9.99%).

Thus it can be concluded that maximum variation was observed in area of tuar crop in Pathriya block and minimum fluctuation has been recorded in total pulses under the Damoh block.

**Table 4.23: Block wise coefficient of variation (%) for area of pulse crops**

Crops	Blocks						
	Damoh	Pathriya	Jabera	Tendukheda	Batiagarh	Hatta	Patera
Gram	25.06	12.49	9.82	14.12	12.67	15.29	15.64
Tuar	170.60	200.79	133.38	148.06	184.62	162.42	171.94
Urd	66.17	21.88	67.04	72.73	25.49	37.18	45.03
Total pulses	6.42	8.09	9.99	8.95	8.05	6.93	6.48

#### **4.21 Linear trend and simple growth rate for area of pulse crops**

The value of regression coefficient and simple growth rate of area for important pulse crops are given in Table 4.24.

It reveals from the table that the trend coefficient and SGR of area of gram crop were negative and insignificant in all the blocks of Damoh district. The value of trend coefficient of tuar and urd area were positive and significant at 1, 5 and 10 percent level in different block of study area. In case of area for total pulses, the trend value was positive and nonsignificant in Damoh, Jabera and Tendukheda block while positive and significant in Hatta and Patera block. The negative and insignificant trend coefficient was also found in case of Pathriya and Batiagarh block. The result of growth rate of pulses was found in same pattern as in the case of linear trend analysis. The result of simple growth rate is also depends on the value of regression coefficient.

It could be concluded that the area of gram crop has been decline in all the seven blocks of Damoh district in terms of trend coefficient and simple growth rate but the area of tuar and urd, was increases in all the blocks of the study area.

**Table 4.24: Block wise linear trend and simple growth rate for area of pulse crops**

(Area unit : hectare)

Crops	Blocks													
	Damoh		Pathriya		Jabera		Tendukheda		Batiagarh		Hatta		Patera	
	Coefficient b	SGR	Coefficient b	SGR	Coefficient b	SGR	Coefficient b	SGR	Coefficient b	SGR	Coefficient b	SGR	Coefficient b	SGR
Gram	-2080.95 (436.65)	-7.12	-1244.14 (185.24)	-3.80	-428.10 (48.19)	-3.09	-445.57 (86.82)	-4.08	-782.19 (98.26)	-3.94	-984.02 (314.29)	-3.75	-962.26 (231.89)	-4.27
Tuar	731.38** (308.74)	36.18	651.63 (423.97)	31.66	286.01** (102.34)	30.96	368.45* (167.43)	30.03	504.17 (289.20)	31.99	631.35* (293.67)	32.46	558.93* (253.13)	34.95
Urd	800.35*** (148.31)	19.36	40.22 (68.41)	1.47	280.49 (174.33)	10.95	309.42** (114.76)	16.57	108.50 (156.61)	3.12	444.94 (257.49)	8.13	372.87*** (100.41)	13.91
Total pulses	170.07 (286.02)	0.43	-177.96 (390.78)	-0.42	211.22 (219.26)	1.06	181.84 (152.37)	1.15	-203.67 (245.66)	-0.75	683.91*** (199.21)	1.77	448.24** (178.29)	1.42

Figure in bracket shows the standard error of concerned regression coefficient.

\*, \*\* and \*\*\* indicates 10, 5 and 1 percent level of significance respectively

## Oilseed Crops

### 4.22 Absolute change in area of oilseed crops

Table shows that absolute change for sesamum crop was found positive for all the blocks of Damoh district except the Pathriya, Tendukheda and Batiagarh block. Absolute change for linseed and groundnut crop was found negative for all blocks. As far as absolute change in rai and mustard, soybean and total oilseeds was concerned, it was found positive for all the blocks which indicates the area of rai and mustard, soybean and total oilseeds increases in all the seven blocks.

Over all it could be concluded that the area of sesamum, rai and mustard, soybean and total oilseeds has been increases in the Damoh, Jabera, Hatta and Patera block which is good sign for the agriculture development.

**Table 4.25 Block wise absolute change in area of oilseed crops**

(Area unit : hectare)

Crops	Blocks						
	Damoh	Pathriya	Jabera	Tendukheda	Batiagarh	Hatta	Patera
Sesamum	65.67	-102.00	20.67	-20.67	-34.33	420.00	75.67
Linseed	-181.00	-852.67	-272.00	-72.00	-521.33	-1164.00	-475.33
Groundnut	-10.33	-407.00	-9.00	-2.33	-84.67	-9.00	-4.00
Rai and Mustard	14.00	25.33	7.00	42.67	67.67	79.00	29.00
Soybean	7782.33	17704.67	854.33	616.33	10693.33	4386.67	3679.67
Total oilseed	7680.33	16368.67	620.33	566.67	10120.67	3712.00	3304.33

### 4.23 Relative change in area of oilseed crops

The relative change in area of linseed and groundnut was observed negative in all the blocks. While in case of area of rai and mustard, soybean and total oilseeds were found positive in all the seven blocks which indicates

that an increase in the area of these crops. In case of Pathriya, Tendukheda and Batiagarh block, the relative change in area of sesamum was found negative and remaining four blocks i.e. Damoh, Jabera, Hatta, Patera, the relative change was positive.

Over all it could be concluded that in all the seven blocks, the relative change were found positive in the area of rai and mustard, soybean and total oilseed which shows that the area of these crops increases in the study area.

**Table 4.26 Blocks wise relative change in area of oilseed crops**

(Area unit : hectare)

Crops	Blocks						
	Damoh	Pathriya	Jabera	Tendukheda	Batiagarh	Hatta	Patera
Sesamum	32.03	-42.50	11.03	-7.50	-9.60	101.29	48.09
Linseed	-52.87	-84.56	-66.61	-40.22	-55.38	-79.89	-76.91
Groundnut	-13.90	-76.84	-0.56	-35.00	-59.35	-56.25	-66.67
Rai and Mustard	17.72	138.18	6.80	33.42	350.00	62.86	41.63
Soybean	196.14	117.57	640.75	868.08	108.20	122.59	198.65
Total oilseed	164.85	97.11	74.56	86.12	89.21	66.37	122.23

#### 4.24 Coefficient of variation

For instability in the area of oilseeds crop during the study period (2002-03 to 2011-12) have been analysed in terms of coefficient of variation and have been provided in Table 4.27.

The coefficient of variation for area of sesamum crop was found highest (40.75) in Hatta block and lowest (13.73%) in Jabera block during the study period. In Pathriya block, more variation in the area of rai and mustard(92.29%) and low variation was in sesamum(26.05%). The value of coefficient of variation was found minimum in sesamum (13.73%) followed by rai and mustard (19.12%), groundnut (20.19%), total oilseeds(37.17%), linseed(43.56%) and soybean (84.68%) under the Jabera block. In the Tendukheda and Batiagarh block, more variability was found in the area of

soybean(92.64%) and mustard(109.31%) respectively. In case of Hatta and Patera block value, of coefficient of variation was found maximum in the area of groundnut crop.

Among the oilseed crops, maximum variation was observed in the area of rai and mustard(109.31%) in Batiagarh block and minimum variation was found in the area of sesamum(13.73%) in Jabera block of Damoh district.

**Table 4.27: Block wise coefficient of variation in area of oilseed crops**

Crops	Blocks						
	Damoh	Pathriya	Jabera	Tendukheda	Batiagarh	Hatta	Patera
Sesamum	20.60	26.05	13.73	24.24	25.39	40.75	36.99
Linseed	37.43	63.62	43.56	52.20	34.94	58.69	72.30
Groundnut	25.90	68.91	20.19	51.31	58.85	65.51	89.06
Rai and Mustard	35.25	92.29	19.12	19.49	109.31	42.21	36.17
Soybean	54.01	40.34	84.68	92.64	38.08	49.41	61.87
Total oilseed	50.11	37.10	37.17	43.22	34.40	37.01	51.83

#### **4.25 Linear trend and simple growth rate in area of oilseed crops**

It reveals that the positive and significant trend value at 5 percent level was found in Damoh block under the area of sesamum, soybean and total oilseeds, whereas in case of linseed, groundnut and rai and mustard crop the trend value was found negative and insignificant which indicates the decline in the area. The highest value of simple growth rate was found under the area of soybean (13.31%) in Damoh block. In case of Pathriya block value of simple growth rate was found maximum under the area of linseed (-20.50%) and minimum was in the area of sesamum (-6.23%). The positive and highly significant trend value was found in the area of soybean and total oilseeds and remaining crops the value of trend and growth rate was found negative and insignificant. In case of Jabera block, trend value was observed positively significant at one percent level for the area of groundnut,

soybean and total oilseeds. In Tendukheda block, trend and growth rate both are found negative in the area of sesamum, linseed and groundnut whereas in rai and mustard shows the positive and significant trend value at five percent level and trend value was observed positively significant at 10 percent level in the area of soybean and total oilseeds.

The positive and insignificant trend and growth rate was found in the rai and mustard (16.52%) in Batiagarh block but in value of trend coefficient was positive and highly significant in the area of soybean and total oilseeds. In Hatta block regression coefficient and growth rate was observed negative in the area of linseed and groundnut crop, while in case of sesamum and soybean it was observed positive and significant at 5 percent level whereas total oilseeds shows the positive and significant trend coefficient and growth rate at 10 percent level. In Patera block, negative and non significant trend and growth rate value was observed in linseed and groundnut while positive and insignificant in sesamum and rai and mustard. In case of soybean and total oilseed, the positive and significant trend and growth rate was found.



**Table 4.28 Block wise linear trend and simple growth rate in area of oilseed crops**

(Area unit : hectare)

Crops	Blocks													
	Damoh		Pathriya		Jabera		Tendukheda		Batiagarh		Hatta		Patera	
	Coefficient b	SGR	Coefficient b	SGR	Coefficient b	SGR	Coefficient b	SGR	Coefficient b	SGR	Coefficient b	SGR	Coefficient b	SGR
Sesamum	9.96** (4.05)	4.46	-12.22 (4.11)	-6.23	2.88 (2.95)	1.48	-4.47 (6.58)	-1.87	-5.92 (8.49)	-2.01	57.18** (17.74)	10.12	11.10 (7.23)	5.83
Linseed	-25.32 (9.18)	-8.63	-121.75 (9.67)	-20.50	-38.46 (6.34)	-13.04	-11.15 (7.92)	-7.68	-75.85 (12.00)	-10.53	-168.68 (32.59)	-17.01	-73.97 (14.76)	-20.80
Groundnut	-1.57 (1.80)	-2.52	-57.64 (10.22)	-20.35	1.59*** (0.46)	13.98	-0.36 (0.27)	-7.31	-12.27 (3.45)	-15.22	-1.26 (0.62)	-13.29	-0.73 (0.27)	-20.45
Rai & Mustard	-0.21 (4.98)	-0.19	4.39 (2.76)	14.93	-0.30 (2.30)	-0.29	6.28** (2.64)	4.15	7.10 (4.88)	16.52	8.52 (6.42)	5.92	4.34 (2.79)	5.75
Soybean	1203.28** (379.52)	13.31	2788.75*** (751.82)	10.60	137.52*** (39.05)	21.81	100.15* (47.49)	18.29	1656.75*** (460.35)	9.89	712.92** (295.34)	10.59	594.09** (253.70)	13.03
Total oilseed	1186.98** (384.57)	12.20	2601.55*** (751.98)	9.49	103.24** (38.88)	8.40	89.95* (45.92)	8.13	1569.82*** (456.63)	8.77	608.76* (294.72)	7.21	535.78* (252.95)	10.26

Figure in bracket shows the standard error of concerned regression coefficient.

\*, \*\* and \*\*\* indicates 10, 5 and 1 percent level of significance respectively.

## Source wise irrigated area

### 4.26 Absolute change

Out of the seven blocks only Damoh and Patera block was found positive absolute change in irrigated area by canals. The absolute change was found positive in the irrigated area by tubewells in all the blocks of Damoh district except Pathriya block. In case of irrigated area by wells, absolute change was observed positive for the Batiagarh block and Irrigated area by ponds was also found positive change for all the blocks except the Damoh block. Irrigated area from other sources was shows the negative change in Damoh, Pathriya, Hatta and Patera block which shows the downfall in the area. The positive absolute change was found in net irrigated area for all blocks except the Pathriya and Patera block. The change in gross irrigated area was found positive in all the seven block of Damoh district except Pathriya block.

**Table 4.29 Block wise Absolute change in area of Source of irrigation**

(Area unit: hectare)

Source of irrigation	Blocks						
	Damoh	Pathriya	Jabera	Tendukheda	Batiagarh	Hatta	Patera
Irrigated area by Canals	324.00	—	-953.67	-52.00	-18.33	—	352.67
Irrigated area by Tubewells	684.67	-2987.00	1688.67	1207.67	2666.33	702.00	9.67
Irrigated area by Wells	1166.33	1182.33	3211.33	1914.33	-705.67	847.33	286.00
Irrigated area by Ponds	-32.67	437.67	41.67	239.00	—	23.00	4.00
Irrigated area from other sources	-98.33	-2548.67	1967.67	1127.00	72.67	-732.33	-1543.33
Net Irrigated area	988.33	-5896.00	3954.00	4993.67	2021.67	1118.00	-613.67
Gross Irrigated area	2044.00	-3897.67	5955.67	4436.00	2067.33	1004.33	1004.33

#### 4.27 Relative change in area of source of irrigation

It can be observed from the table that the relative change for the irrigated area by canals was observed positive only in Damoh and Patera block. The irrigated area by tubewells, relative change was found positive for all the blocks except the Pathriya block which shows the increases the area. In case of irrigated area by wells only Batiagarh block shows the negative relative change. While in case of irrigated area by ponds, all blocks were found positive relative change except the Damoh block. In case of irrigated area from other sources the relative change in Jabera, Tendukheda and Batiagarh block was found positive. Relative change was observed negative under the net irrigated area only in Pathriya and Patera block and remaining 5 blocks shows the positive change.

The gross irrigated area was increases in terms of relative change in all the blocks except the Pathriya block.

**Table 4.30 Block wise relative change in area of source of irrigation**

(Area unit - hectare)

Source of irrigation	Blocks						
	Damoh	Pathriya	Jabera	Tendukheda	Batiagarh	Hatta	Patera
Irrigated area by Canals	22.02	—	-14.83	-2.73	-8.77	—	15.86
Irrigated area by Tubewells	66.91	-32.97	121.69	315.87	32.81	15.08	3.10
Irrigated area by Wells	17.64	26.50	165.45	97.03	-15.44	43.78	10.11
Irrigated area by Ponds	-19.76	858.17	61.88	519.57	—	57.50	4.88
Irrigated area from other sources	-1.49	-32.22	35.60	16.72	1.48	-14.45	-27.18
Net Irrigated area	6.24	-27.47	28.58	47.61	11.35	9.67	-5.52
Gross Irrigated area	12.89	-18.16	38.79	40.16	11.60	8.60	8.60

#### 4.28 Coefficient of variation

Coefficient of variation assesses the variability in the different source of irrigation under different blocks and details are given in Table 4.31. It reveals that in Damoh block, maximum percentage variation was observed in irrigated area by tubewells followed by irrigated area from other sources , Irrigated area by wells , net irrigated area, Irrigated area by Canals, irrigated area by Ponds and gross irrigated area. In case of Pathriya block, more variation was observed in the irrigated area by tubewells and low variation was found in gross irrigated area. The value of coefficient of variation was also found minimum in the net irrigated area followed by irrigated area by canals, irrigated area from other sources, gross irrigated area, irrigated area by ponds, irrigated area by tubewells and irrigated area by wells under the Jabera block. In case of Tendukheda and Hatta, value of coefficient of variation was found maximum in irrigated area by ponds whereas minimum variation was observed in gross irrigated area. In case of Batiagarh and Patera block the value of coefficient of variation was found maximum in the irrigated area by tubewells whereas minimum variation was in irrigated area by ponds and irrigated area by wells respectively.

Among the blocks, maximum variation was recorded in the Patera block under the irrigated area by tubewells whereas minimum variation was observed in Batiagarh block under the irrigated area by ponds.

**Table 4.31: Block wise coefficient of variation under the area covers by source of irrigation**

Source of irrigation	Blocks						
	Damoh	Pathriya	Jabera	Tendukheda	Batiagarh	Hatta	Patera
Irrigated area by Canals	14.14	—	12.52	28.41	5.55	—	13.50
Irrigated area by Tubewells	43.47	33.62	46.81	70.78	14.07	19.82	86.66
Irrigated area by Wells	14.32	23.99	62.20	31.07	11.58	17.21	8.21
Irrigated area by Ponds	14.14	65.02	29.40	73.44	0.90	49.47	36.61
Irrigated area from other sources	17.69	23.22	14.13	9.25	8.15	14.84	19.14
Net Irrigated area	14.15	22.29	11.14	16.95	6.62	13.28	11.63
Gross Irrigated area	13.43	11.98	14.69	14.78	6.75	13.10	13.10

#### **4.29 Linear trend and simple growth rate**

The value of trend coefficient and growth rate for irrigated area by different sources have been provided in Table 4.32.

It revealed from the table that the trend coefficient for irrigated area by tubewells, wells, net irrigated area, gross irrigated area in Damoh block were found positive and non significant and irrigated area by canals it was positive and significant at 5 percent level. The result of growth rate was also found in same pattern. In case of Pathriya block, trend coefficient and growth rate were found negative and insignificant under irrigated area by tubewells, from other sources, net irrigated area and gross irrigated area but value was positive and significant in irrigated area by wells and ponds. The value of trend coefficient and growth rate for irrigated area sources, positive and significant except irrigated area by canals in Jaberia and Tendukheda block. Under Batiagarh block, the value of trend coefficient and growth rate were positive and significant at different level in all the aspect except irrigated area by canals and wells. In case of Hatta block, the value of trend coefficient and growth rate were positive and non significant for all the aspect except irrigated area from other sources but the value of trend and growth rate was found positive and significant at 5 percent level for irrigated area by wells. Regarding trend coefficient and growth rate for irrigated area by tubewells, from other sources, net irrigated area and gross irrigated area were observed negative and non significant while in irrigated area by canals, wells and pond it was found positive and non significant in case of Patera block.

Over all it could be concluded that the trend value and growth rate for net irrigated area and gross irrigated area were found positive and significant in all blocks except Pathriya and Patera block in Damoh district.

**Table 4.32: Block wise linear trend and simple growth rate in irrigated area covers by different source of irrigation**

(Area unit: hectare)

Source of irrigation	Blocks													
	Damoh		Pathriya		Jabera		Tendukheda		Batiagarh		Hatta		Patera	
	Coefficient b	SGR	Coefficient b	SGR	Coefficient b	SGR	Coefficient b	SGR	Coefficient b	SGR	Coefficient b	SGR	Coefficient b	SGR
Irrigated area by Canals	53.62** (20.86)	3.14	-	-	-124.75 (81.74)	-1.96	-16.85 (64.62)	-0.86	-2.36 (0.99)	-1.18	-	-	58.08 (34.02)	2.30
Irrigated area by Tubewells	73.61 (61.41)	5.60	-437.20 (120.58)	-5.60	268.29 (65.39)	12.73	165.02*** (45.60)	18.42	384.44*** (75.85)	4.06	119.76 (111.00)	2.33	-15.20 (63.14)	-2.43
Irrigated area by Wells	182.62 (133.38)	2.48	205.86*** (4.00)	4.10	439.13*** (170.69)	13.82	272.07*** (31.20)	9.76	-106.42 (42.61)	-2.53	105.95** (32.52)	4.29	37.61 (24.84)	1.28
Irrigated area by Ponds	-5.54 (6.62)	-3.14	63.48 (123.24)	21.11	6.33* (2.09)	7.09	34.01*** (4.40)	22.78	-	-	3.27 (4.07)	5.67	1.29 (3.95)	1.38
Irrigated area from other sources	-22.23 (148.72)	-0.31	-405.59 (396.32)	-5.82	261.59*** (53.66)	4.04	151.81** (58.28)	2.07	9.81 (48.44)	0.19	-86.93 (78.41)	-1.79	-200.81 (80.29)	-4.19
Net Irrigated area	132.72 (300.52)	3.14	-949.38 (232.83)	-4.76	565.40 (52.67)	3.56	688.78*** (69.03)	5.39	285.67** (106.25)	1.51	179.21 (183.23)	1.43	-99.90 (145.93)	-0.90
Gross Irrigated area	305.66 (258.31)	1.71	-476.93 (232.83)	-2.32	850.61*** (84.71)	4.67	606.06*** (73.66)	4.62	293.27** (108.12)	1.54	161.74 (183.17)	1.29	-91.89 (145.84)	-0.83

Figure in bracket shows the standard error of concerned regression coefficient

\*, \*\* and \*\*\* indicates 10, 5 and 1 percent level of significance respectively

#### 4.30 Population structure of Damoh district

Data shows that the total population of Damoh district was 8, 98,125 as per census report of 1991 out of which 81.86 percent rural and 18.14 percent urban population was recored. In the year 2001, the total population was increased 20.69 percent over to census 1991 but the ratio of rural and urban population was near about same 2001 and 1991. After 10 year (2011) the total population of Damoh district was recorded 1264219 and it was 40.76 and 16.63 percent more then the census of 1991 and 2001 respectively. But the rural population was decreases by 2 percent and convert in to urban population.

Regarding population of SC and ST, the ratio between SC and ST was near about same in the all census i.e. 1991, 2001, 2011 but the total population under SC and ST during 2001 and 2011 increases as compared to previous census report.

**Table 4.33: Population structure of Damoh district**

(Unit- No's)

Year	Total population	Rural population	Urban population	SC population	ST population
1991	898125	735203 (81.86)	162922 (18.14)	180350 (20.08)	111114 (12.37)
2001	1083949	879598 (81.15)	204351 (18.85)	211258 (19.49)	136175 (12.56)
2011	1264219	1013668 (80.18)	250551 (19.82)	246337 (19.48)	166295 (13.15)

Figure in bracket shows percentage to total population.

#### 4.31 Working population of Damoh district

The details about the position of total worker and non worker during different census years have been provided in the Table 4.34.

The total worker was divided in to four categories i.e. cultivator, agriculture labour, house hold worker and other worker. The number of other

worker, total worker and non worker were increases in the 2001 and 2011 census year as compared to previous census year. In case of agriculture labour and house hold worker increases in the census 2001 as compared to previous census year but it was decreases in the 2011 year then the 2001. Regarding number of cultivator, it was decreases 1.45 percent in the year 2001 and 1.46 percent in the year 2011 as compared to previous census report.

Total worker and non workers increases in 2001 and 2011 year it may be due to increase total population and the number of cultivator decreases in the 2001 and 2011 census year as compared to previous census year, it's indicates that the number of cultivator may be decreases due to decline in the agriculture area.

**Table 4.34: Working population of Damoh district**

(Unit- No's)

Year	Cultivator	Agriculture labour	House hold worker	Other worker	Total worker	Total non worker
1991	116312 (31.63)	83841 (22.80)	47990 (13.05)	119556 (32.52)	367699	530426
2001	114624 (23.56)	84793 (17.43)	70488 (14.49)	216581 (44.52)	486486	597463
2011	114611 (23.17)	80165 (16.21)	67383 (13.62)	232436 (47)	494595	769624

Figure in bracket shows percentage to total worker.

#### **4.32 Infrastructure facility**

The total road length in Damoh district was recorded 2282.53 and 1909.27 km. in the year 2002-03 and 2011-12 respectively. After 2007-08, both increases and decreases trend of road length was present. The proportion of kachcha and pakka road was observed 1:1.85 and 1: 1.40 in the year 2002-03 and 2011-12 respectively.



Regarding position of school its covers different group of school i.e. primary, middle, high and higher secondary school. Total number of primary school was 1574 in the year 2002-03 and 7.05 percent number of school was reduces in the year 2011-12. In the year 2002-03 total number of middle, high and higher secondary school were recorded 580, 52 and 46 during the year 2002-03 and only 25 high school was increases while the number of middle and higher secondary school, were decrease in the year 2011-12. Only 11 college was recorded in the year 2002-03 and there was no change in the number of colleges during different year.

Only 1 main post office, 19 sub post office and 8 banks were situated in Damoh district during 2002-03 and there was no change in the position of post office, sub post office and banks in the year 2011-12.

**Table 4.35: Infrastructure facility of Damoh District**

Year	Road length (km.)			Schools (Number)				College (Number)		Post office (No.)	Sub Post office (No.)	Banks (No.)
	Pakka road	Kachcha road	Total Road length	Primary school	Middle school	High school	Higher secondary school	college	Professional college			
2002-03	1483.2	799.33	2282.53	1574	580	52	46	5	6	1	19	8
2003-04	1473.2	809.03	2282.53	1570	578	53	44	5	6	1	19	8
2004-05	1483.2	799.33	2282.53	1566	573	53	44	5	6	1	19	8
2005-06	1491.6	790.93	2282.53	1559	573	58	38	5	6	1	19	8
2006-07	1181.5	790.93	2282.53	1549	570	59	38	5	6	1	19	8
2007-08	1049.2	778.43	1827.63	1538	567	65	39	5	6	1	19	8
2008-09	1119	917.93	2036.93	1518	567	65	40	5	6	1	19	8
2009-10	950.6	833.13	1783.73	1498	567	65	40	5	6	1	19	8
2010-11	950.6	833.13	1783.73	1479	564	72	42	5	5	1	19	8
2011-12	1112.4	796.87	1909.27	1463	563	77	45	6	5	1	19	8

### **4.33 Infrastructure facilities**

The blockwise infrastructure facilities have been provided in Table 4.36.

Total road length covers in two parts i.e. pakka and kachcha road. The total road length was reduced in the year 2011-12 over the 2002-03 year in all the blocks except Hatta block. In Hatta block 24.05 percent total road length was increases in the year 2011-12 over the 2002-03 year. On an average, the proportion of kachha and pakka road was observed 1:1.86 and 1:1.51 during 2002-03 and 2011-12 respectively in the study area.

Regarding the position of school, only in three blocks i.e. Jabera, Tendukheda and Batiagarh, the number of primary schools was increases in the year 2011-12 over the base year 2002-03 although the small number of primary school was increases. The number of middle school was increases in the year 2011-12 then the year 2002-03 in Pathriya, Jabera, Tendukheda Batiagarh and Patera but the number was not same. The number of high school also increases in Jabera, Tendukheda, Batiagarh and Hatta block during 2011-12 then 2002-03. Regarding number of high school it was increases in all the blocks except in Tendukheda block. As far as position of government college, professional college and post office, there was no change during 2002-03 to 2011-12.

Over all it could be concluded that road length was decreases during 2002-03 to 2011-12 in all the blocks except Hatta block. In few block the number of school was also increases and there was no change in the government college, professional college, post office and sub post office in study area.

**Table 4.36: Block wise Infrastructure facilities of Damoh district**

Year	Road length (km.)			Schools (Number)				college (Number)		Post office (No.)	Sub Post office (No.)
	Pakka road	Kachcha road	Total Road length	Primary school	Middle school	High school	Higher secondary school	college	Professional college		
Damoh											
2002-03	282.2	122.51	404.71	431	197	14	22	2	2	1	9
2011-12	221.42	126.93	348.35	360	119	22	10	2	2	1	9
Pathriya											
2002-03	182.90	36	218.9	193	69	6	7	1	-	-	2
2011-12	161.12	23	184.12	174	71	15	5	1	-	-	2
Jabera											
2002-03	228	120.08	348.08	197	66	6	5	1	1	-	2
2011-12	83.92	101.08	185	198	80	6	7	1	1	-	2
Tendukheda											
2002-03	273.50	215.55	489.05	197	68	7	3	-	1	-	2
2011-12	241.02	205.95	446.97	203	89	6	7	1	1	-	2
Batiagarh											
2002-03	166	79.74	245.74	171	63	7	2	-	-	-	1
2011-12	89.32	70.94	160.26	174	76	9	6	-	-	-	1
Hatta											
2002-03	213.8	80.19	293.99	188	80	8	5	1	1	-	2
2011-12	220.32	144.41	364.72	184	73	11	8	1	-	-	2
Patera											
2002-03	136.8	145.26	282.06	197	37	4	2	-	1	-	1
2011-12	95.28	124.56	219.84	170	55	8	2	-	1	-	1

## **Government Schemes**

Agril. and rural development play a very important role in Indian economy. Govt. running number of programmes scheme for improvement of agril. and rural development. In this study two important scheme/ programme i.e. Surajdhara Yojana and National Food Security Mission for rice and wheat crop were considered to know the impact of the programmes in the study area.

### **Surajdhara Yojana**

This scheme has been introduced in 1999-2000. Under this scheme foundation seed of various crops are provided to the cultivators for 1/10 of their holding, so that for next year's cultivator will have good quality seed for 100 percent of the area.

#### **Objective:**

The objective is to provide seeds of improved and high yielding varieties for cereals, oilseeds and pulse crops, through replacement of old varieties. It shall cover small and marginal farmers of ST and SC categories.

Main component of the scheme are as follows

#### **1. Seed Exchange programme**

Small and Marginal farmers who will give the local seed, will be replaced with high yielding improved variety quality seed. Value of the seed given by the farmer should be 25 percent of the seed being replaced to him/her, or, will have to pay 25 percent cost of the seed being provided.

#### **2. Seed self Reliance programme**

Farmers shall be provided foundation /certified seed for 1/10th of their cultivated area. They will be trained for quality seed production and shall be provided the required technical know-how according to their field conditions.

#### **3. Seed Production programme**

Small and marginal farmers within the vicinity of 10 Kms radius of the Govt. Farm shall be selected for seed production of improved varieties recommended for the area. Priority shall be fixed on the basis of First come First serve system.

**Beneficiaries:**

For SC/ST small and marginal farmers only.

**Subsidy Rates:**

Under this scheme SC/ST farmers are provided 75 percent subsidy on foundation or certified seeds.

**4.34 Surajdhara yojana for ST category farmers**

Surajdhara yojana covers three aspect i.e. seed exchange, seed self reliance and seed production. The yearwise details about surajdhara yojana for ST farmers in Damoh district have been provided in Table 4.37.

It reveals from the table that the target of area under seed exchange was vary from year to year (2007-08 to 2013-14) and achievement was observed more than the target (115.72%) only in year of 2007-08. Although achievement was observed more than 80 percent during 2008-09 to 2011-12 year and more than 60% target was achieved in the year 2012-13 and 2013-14. It was observed that more than 200 quintals seed were exchange in each year except 2012-13 year. Maximum and minimum number of beneficiaries were recorded 621 and 320 respectively. Under the seed self reliance aspect only in two year i.e. 2007-08 and 2011-12, the achievement of area covered was more than 100 percent while in the year of 2008-09, 2010-11 and 2013-14 the achievement was very poor (10 to 15%). The seed quantity and number of beneficiaries were covered as per the proportion of targeted area. Seed production is one of the important aspect under the scheme. Data shows that the maximum area of 90 hectare was targeted in the year 2010-11 and it was range from 38 to 90 hectare. Maximum (45) and minimum (10) quintal of seed quantity was produced in the year 2011-12 and 2008-09 respectively. The beneficiaries was also covered as per the actual area covered under the seed production.

Thus it could be concluded that among the three aspect performance of seed exchange was good as compared to seed self reliance and seed production. So efforts are needed to fulfill the target and covers more number of beneficiaries for agril. Development in the study area.

**Table 4.37: Year-wise physical target and achievement under the surajdhara yojana for ST category farmers in Damoh district**

Year	Seed exchange				Seed self reliance				Seed production			
	Target area (ha)	Achievement Area(ha)	Seed quantity (Qt.)	Beneficiaries (No.)	Target area (ha)	Achievement Area (ha)	Seed quantity (Qt.)	Beneficiaries (No.)	Target area (ha)	Achievement Area (ha)	Seed quantity (Qt.)	Beneficiaries (No.)
2007-08	332.50	385 (115.72)	360	621	95	163 (171.57)	143	188	47.5	12 (25.26)	12	14
2008-09	420.50	405 (96.31)	305	490	135	15 (11.11)	25	42	38	11 (29.95)	10	13
2009-10	350	318 (90.86)	210	390	100	68 (68)	154	170	50	18 (36)	15	18
2010-11	630	512 (81.27)	290	533	105	14 (13.33)	20	21	90	35 (38.89)	24	35
2011-12	400	315 (78.75)	375	430	110	115 (104.54)	210	310	50	41 (82)	45	45
2012-13	435	298 (68.51)	175	320	150	114 (76)	105	200	40	34 (85)	25	30
2013-14	933	578 (61.95)	275	500	267	44 (16.48)	74	93	45	40 (88.82)	42	42

Figure in bracket shows the percentage of achievement to the target.

#### **4.35 Surajdhara yojana for SC category farmers**

The yearwise details about surajdhara yojana for SC farmers have been provided in Table 4.38.

Table shows that the under the seed exchange, target area was increases from 2007-08 to 2013-14 and vary from year to year during study period. Achievement was found less than the target only in the year 2009-08.

The achievement was also recorded more than 90 percent to target during four year i.e. 2007-08, 2008-09, 2010-11 and 2011-12 and more than 80 percent to target in only two year i.e. 2012-13 and 2013-14. It was observed that more than 300 beneficiaries were recorded in each year except 2008-09 year. Maximum (730) and minimum (210) seed quantity were exchange in the year of 2013-14 and 2008-09 respectively. In case of seed self reliance, only in the year of 2008-09 the achievement of area was more than 100 percent than the targeted area whereas more than 70 percent achievement of area than the targeted area was found in remaining years except in the year of 2013-14. It was observed that more than 100 quintals seed were comes under self reliance in only two year i.e. 2008-09 and 2011-12 and in remaining year more than 70 quintals of seed were comes under the aspect except in the year 2007-08. Number of beneficiaries vary from year to year and maximum (192) number of beneficiaries were recorded during the year of 2008-09.

Under the Seed production aspect, the target area was vary from the year to year during study period. The maximum area of 75 hectare was targeted in the year 2013-14. It was observed that more than 65 percent achievement than the target was found only in two year i.e 2011-12 and 2012-13 , while in remaining years, very low achievement was found over the target . The seed quantity and number of beneficiaries were covered as per the proportion of area covered.

Over all it can be concluded that among the three aspect, performance of seed production aspect was very poor as compared to seed exchange and seed self reliance under the surajdhara yojana. So more efforts are needed to fulfill the target then farmers, in the study area will get full benefit through the surajdhara yojana.



**Table 4.38: Year-wise physical target and achievement under the surajdhara yojana for SC category farmers in Damoh district**

Year	Seed exchange				Seed self reliance				Seed production			
	Target area (ha )	Achievement Area (ha)	Seed quantity (Qt)	Beneficiaries (No.)	Target area (ha)	Achievement Area (ha)	Seed quantity (Qt)	Beneficiaries (No.)	Target area (ha)	Achievement Area (ha)	Seed quantity (Qt)	Beneficiaries (No.)
2007-08	325	310 (95.38)	291	329	80	67 (70.53 )	60	75	35	7 (20)	7	8
2008-09	410	395 (96.34)	210	256	105	125 ( 119.05 )	125	190	55	8 (14.55 )	10	10
2009-10	525	526 (100.19)	381	412	150	90 (60)	72	192	75	21 (28)	17	17
2010-11	550	530 (96.36)	336	363	70	55 (78.57)	89	102	35	12 (34.29)	10	10
2011-12	560	537 (95.89)	370	405	130	130 (100)	132	145	65	47 (72.31)	37	37
2012-13	800	650 (81.25)	680	725	108	80 (74.07)	84	114	60	41 (68.33)	28	25
2013-14	867	770 (88.84)	730	700	233	110 (47.21)	87	126	75	13 (17.33)	10	13

Figure in bracket shows the percentage of achievement to the target.

#### **4.36 Financial progress under the surajdhara yojana**

Year-wise financial details of surajdhara yojana for ST and SC category farmers have been given in Table 4.39 and 4.40

It reveals from the table that the total financial target for ST categories farmers increases from the year of 2007-08 to 2013-14 except in the year of 2009-10. The total financial achievement was covered more than 90 percent over the total target in the year of 2007-08, 2009-10 and 2011-12 whereas in remaining years, it was found about 65 percent and range was recorded from 68 to 97 percent .

Table 4.40 shows that year-wise financial position for SC category farmers, total financial target was recorded an amount of Rs. 5.93 lakh during 2007-08 year and it increases 151 percent in the year of 2013-14 over the 2007-08. About 90 percent was recorded over the target in the year of 2007-08, 2008-09, 2010-11 and 2011-12 while more than 80 percent total target was covered in the year of 2009-10 and 2012-13.

It could be concluded that full financial target was not achieved in different year for ST and SC farmers under the surajdhara yojana so concerned person should try to achieve full financial target then farmers of SC and ST categories will be benefited in the study area.

**Table 4.39: Year-wise Financial progress under the surajdhara yojana for ST category farmers in Damoh district**

Year	ST farmers								
	Target (Rs. Lakh)			Total Target	Achievement (Rs. Lakh)			Total Achievement	% of Achievement Over the Target
	Seed exchange	Seed reliance	Seed production		Seed exchange	Seed reliance	Seed production		
2007-08	6.94	1.27	0.28	8.49	6.94	1.27	0.05	8.26	97.29
2008-09	7.50	2	0.05	9.55	7	0.20	0.01	7.21	75.50
2009-10	7	1.50	1	9.50	7	1.15	0.40	8.55	90.00
2010-11	8.20	1.75	1.60	11.55	8.10	0.10	0.95	9.15	79.22
2011-12	8.50	2.10	1.15	11.75	7.50	2.10	1.15	10.75	91.49
2012-13	9.25	2.50	1.05	12.80	5.50	2.25	1.02	8.77	68.52
2013-14	12.25	3.50	1.10	16.85	10	1	2	13	77.15

**Table 4.40: Year-wise Financial progress under the surajdhara yojana for SC category farmers in Damoh district**

Year	SC farmers								
	Target (Rs. Lakh)			Total Target	Achievement (Rs. Lakh)			Total Achievement	% of Achievement Over the Target
	Seed exchange	Seed reliance	Seed production		Seed exchange	Seed reliance	Seed production		
2007-08	4.08	1.68	0.17	5.93	4.08	1.67	0.01	5.76	97.13
2008-09	5.50	1.99	1.20	8.69	5.50	2.00	0.80	8.3	95.51
2009-10	6.90	3	1.50	11.40	6.90	2.00	0.97	9.87	86.58
2010-11	2.90	1.58	0.70	5.18	2.85	1.65	0.25	4.75	91.70
2011-12	5.80	2.60	1.30	9.70	5.70	2.65	1.10	9.45	97.42
2012-13	8.50	1.30	1.20	11.00	7	0.95	0.85	8.8	80.00
2013-14	9.00	4.00	1.90	14.90	8.20	1.50	0.80	10.5	70.47

## **National Food Security Mission**

### **Introduction:**

To implement the resolution of National Development Council (NDC) which envisages to increase the production of Rice, Wheat and Pulses to the ton of 10 million tons, 8 million tons and 2 million tons respectively, a Centrally Sponsored Scheme, 'National Food Security Mission' (NFSM) has been launched in 2007-08 in 311 districts of 17 States. NFSM has three sub-components viz:

- NFSM-Rice
- NFSM-Wheat
- NFSM-Pulses

### **Objectives of the Mission:**

1. Increasing production of rice, wheat and pulses through area expansion and productivity enhancement in a sustainable manner.
2. Restoring soil fertility and productivity.
3. Enhancing farm level economy (i.e. farm profits) to restore confidence of farmers.
4. Creation of employment opportunities.
5. Promotion and extension of improved technologies i.e., seed, Integrated Nutrient Management including micronutrients, soil amendments, IPM and resource conservation technologies along with capacity building of farmer.

### **Criteria for Selection of districts:**

The rice districts selected under NFSM is less than the average productivity of the state and the district has at least 50,000 ha area under rice crop.

The wheat districts selected under NFSM-wheat is less than the average productivity of the state and at least 50 percent of the area under wheat is irrigated.

Pulses districts selected under NFSM has potential for expansion of area under pulses through intercropping, use of rice-fallow and replacement of upland rice.

### **Crop to be covered**

#### **Pulses:**

Arhar, Moong and Urd (kharif season) and Gram, Pea, Lentil, Teora, Moong and Urd (Rabi / summer season)

#### **Oilseeds:**

Soyabean, Til, Castor, Niger, Groundnut, Sunflower (kharif season) and Safflower, Sunflower, Mustard, Toria, Rapeseed, Linseed, Castor, Niger and Groundnut (Rabi / summer season)

#### **Cereals:**

Rice, Maize, Jowar and Kodo – Kutki (kharif season) and Wheat, Gram (Rabi / summer season)

### **4.37 National Food Security Mission (Paddy crop)**

The National Food Security Mission adopted demonstration, distribution of seed and providing incentive for improvement of production. The Year-wise progress under National Food Security Mission for Paddy crop have been provided in the Table 4.41.

Three types of demonstration for paddy crop were adopted in the study area. Regarding demonstration of improved package of practices, highest number (500) of demonstration were adopted in the year 2009-10 and number of demonstration was vary during different year. While the maximum (550) and minimum (100) number of demonstration on SRI were adopted during 2008-09 and 2010-11 respectively. The number of demonstration on hybrid rice technology was observed in the year 2012-13. The high yielding varieties seed was distributed in all the year (2008-09 to 2012-13). The distribution of seed minikits covers only three year i.e. 2008-09, 2009-10 and 2010-11. Under National Food Security Mission, incentive for micro nutrient and plant protection chemical and bioagent also provided. Both incentive were distributed for paddy crop during the year 2008-09 to 2012-13. The financial

amount was allotted as per the number of demonstration during different year. The distribution of high yielding varieties seed and incentive for micro nutrient and plant protection chemical, the funds was given to the farmers under the programme. But no funds are required to distribute the seed minikits as seed minikits directly provided to beneficiaries through the programme in the study area.

Thus it could be concluded that the National Food Security Mission is helpful to improved the paddy production through demonstration, distribution of seed and providing incentive for improvement of rice production in the study area. The farmers in the study area are benefited by Food Security Mission and also improved the economic condition of farming community upto some extent in the study area.

**Table 4.41 Year-wise progress under National Food Security Mission (Paddy crop) in Damoh district**

(Financial unit: Rs. in lakhs)

Particulars		Demonstration of improved package of practices	Demonstration on SRI	Demonstration of hybrid rice technology	Distribution of HYVs	Seed minikits of HYVs	Incentive for micro nutrient	Incentive for plant protection chemical and bioagent
Year		Number	Number	Number	Number	Number	Hectare	Hectare
2008-09								
Achievement	Physical	273	550	202	208	1176	90	2500
	Financial	4.56	11.24	5.14	2.25	0	0.30	24.50
2009-10								
Achievement	Physical	500	284	186	132	1500	140	3452
	Financial	8.60	4.90	2.14	1.32	0	0.70	29.53
2010-11								
Achievement	Physical	200	100	100	149	1900	137	1989
	Financial	4.75	1.50	1.50	1.70	0	0.69	21.76
2011-12								
Achievement	Physical	150	150	0	273	0	295	1536
	Financial	3.98	4.50	0	2.46	0	1.48	13.38
2012-13								
Achievement	Physical	100	400	250	188	0	294	1857
	Financial	11.75	21.90	14.58	2.15	0	1.47	19.28



#### **4.38 Year-wise beneficiaries under National Food Security Mission for Paddy crop**

The year-wise distribution of beneficiaries under National Food Security Mission for paddy crop are given in the Table 4.42.

Under demonstration of improved package of practices, system of rice intensification and hybrid rice technology, all the categories of farmers viz. SC, ST and general were covered during 2008-09 to 2012-13 but the proportion among SC, ST and general was not same. It was observed from the table that the majority of farmers belong to general category for all the aspect during different year.

Thus it could be concluded that all the categories of farmers were benefited through National Food Security Mission in the study area. As per coverage of different categories of farmers, this programme is benefited and helpful to improved the agril. and rural development in the study area upto some extent.

**Table 4.42: Year-wise beneficiaries under National Food Security Mission-Paddy in Damoh district**

Particulars		Demonstration of improved package of practices	Demonstration on SRI	Demonstration of hybrid rice technology	Distribution of HYVs	Seed minikits of HYVs	Incentive for micro nutrient	Incentive for plant protection chemical and bioagent
Year	unit	Number	Number	Number	Number	Number	Number	Number
2008-09								
Beneficiaries	SC.	51	78	28	27	96	15	600
	ST.	23	36	17	15	149	8	440
	Gen.	199	436	157	166	931	67	1460
	Total	273	550	202	208	1176	90	2500
2009-10								
Beneficiaries	SC.	72	43	28	18	210	23	40
	ST.	63	38	21	9	278	18	33
	Gen.	365	203	137	105	1012	99	3379
	Total	500	284	186	132	1500	140	3452
2010-11								
Beneficiaries	SC.	35	19	22	12	212	18	389
	ST.	27	13	11	9	190	17	212
	Gen.	138	68	67	128	1498	112	1388
	Total	200	100	100	149	1900	137	1989
2011-12								
Beneficiaries	SC.	28	23	0	36	0	62	66
	ST.	17	13	0	24	0	53	44
	Gen.	105	114	0	213	0	180	1426
	Total	150	150	0	273	0	295	1536
2012-13								
Beneficiaries	SC.	20	84	40	0	0	58	370
	ST.	20	60	53	0	0	30	184
	Gen.	60	276	157	188	0	206	1303
	Total	100	400	250	188	0	294	1857

#### **4.39 Year-wise physical and financial achievement made under National Food Security Mission for Wheat crop**

The Year-wise progress under National Food Security Mission for wheat crop have been provided in the Table 4.43.

In the study area, wheat crop is one of the important crop in rabi season. National Food Security Mission also cover wheat crop and adopted only demonstration of improved package of practices for this crop. The minimum 200 demonstration were included under the programme in each year. High yielding varieties seed and minikits for wheat crop also distributed at different quantity and number of minikits during different year. The incentive for micro nutrient and gypsum also given to the farmer in all the period but incentive for gypsum not provided during 2011-12 and 2012-13. Under the programme, the assistance for diesel pumpsets was also given and also arranged the farmer training during 2008-09 to 2012-13.

Over all it could be concluded that important aspect related to wheat production was included under the programme and this programme is very useful to adopt improved practices and high yielding varieties to enhanced the wheat production in the study area and also helpful to agril. and rural development in the study area.

**Table 4.43: Year-wise physical and financial achievement under National Food Security Mission for Wheat crop**

(Financial unit: Rs. in lakhs)

Particulars		Demonstration of improved package of practices	Seed distribution	Minikits of improved seeds	Incentive for micro nutrient	Incentive for gypsum	Assistance for diseal pumpsets	Farmer training
Year		Number	Quintal	Number	Hectare	Hectare	Hectare	No's of participant
2008-09								
Achievement	Physical	250	3843	3263	190	153	336	660
	Financial	3.95	20.24	0	3.49	0.43	33.60	3.34
2009-10								
Achievement	Physical	650	3506	1540	170	140	150	750
	Financial	9.70	18.14	0	3.30	0.33	17.10	3.93
2010-11								
Achievement	Physical	226	767	1120	140	106	160	430
	Financial	3.85	4.68	0	3.05	0.23	16.75	1.87
2011-12								
Achievement	Physical	300	1458	900	160	0	190	540
	Financial	4.75	9.69	0	3.25	0	18.80	2.75
2012-13								
Achievement	Physical	200	605	700	200	0	250	570
	Financial	4	3.29	0	3.85	0	21.20	2.90

#### **4.40 Year-wise beneficiaries under National Food Security Mission (Wheat crop)**

The distribution of different category of farmers under National Food Security Mission for wheat crop in Damoh district are provided in the Table 4.44.

Under National Food Security Mission, for wheat crop, farmers of SC, ST and general were covered. It reveals from the table that majority of beneficiaries belong to general category which covers all the aspect but the number of beneficiaries was not same in different years to covers different aspect.

Over all the more number of beneficiaries was recorded in seed distribution programme then the other programme during 2008-09, 2009-10 and 2011-12. In the year 2010-11 and 2012-13, the beneficiaries under minikits of improved seed was more than the other aspect of programme. sWhich shows that more number of farmers were interested for receiving only hybrid seed of wheat crop under the programme as seed is one of the important component in production of wheat crop. In this way farmers of the study area were benefited under the Food Security Mission so this programme is helpful to improved the productivity of wheat crop in the study area.

List of Government schemes in Damoh district

- Surajdhara yojana
- Balram Tal Yojana
- Sprinkler yojana
- Beejgram yojana
- Farmer's field school
- Micro irrigation
- National Project of Bio-gas Development
- Subsidy of Bullock carts
- Boring Tube wells
- National food security mission

Out of these schemes Surajdhara yojana and National food security mission select for the study purpose.

**Table 4.44: Year-wise beneficiaries under National Food Security Mission (Wheat crop)**

Particulars		Demonstration of improved package of practices	Seed distribution	Minikits of improved seeds	Incentive for micro nutrient	Incentive for gypsum	Assistance for diseal pumpsets	Farmer training
Year	unit	Number	Number	Number	Number	Number	Number	Number
2008-09								
Beneficiaries	SC.	48	172	482	45	27	18	44
	ST.	33	139	388	55	18	9	97
	Gen.	169	3532	2393	90	108	309	519
	Total	250	3843	3263	190	153	336	660
2009-10								
Beneficiaries	SC.	136	286	312	18	55	21	157
	ST.	109	178	271	12	20	13	134
	Gen.	405	3042	957	140	65	116	459
	Total	650	3506	1540	170	140	150	750
2010-11								
Beneficiaries	SC.	28	123	58	40	33	45	100
	ST.	13	98	44	30	19	35	80
	Gen.	185	546	1018	70	54	80	250
	Total	226	767	1120	140	106	160	430
2011-12								
Beneficiaries	SC.	23	213	106	50	0	39	165
	ST.	18	106	89	30	0	20	35
	Gen.	259	1139	705	80	0	131	340
	Total	300	1458	900	160	0	190	540
2012-13								
Beneficiaries	SC.	52	230	200	75	0	50	125
	ST.	48	105	115	25	0	25	100
	Gen.	100	270	385	100	0	175	345
	Total	200	605	700	200	0	250	570



## **SUMMARY, CONCLUSIONS AND SUGGESTIONS FOR FURTHER WORK**

### **5.1 Summary**

Performance of agriculture plays a major role in the progress of the economy in achieving the development goals of eradication of poverty, faster and sustainable growth and modernization of society. Agriculture sector is the backbone of the country's development and life line for 65 percent of the population in rural areas and approximately more than 58 population are still dependent on agriculture for their livelihood. Rural development in India is one of the most important factors for the growth of the Indian economy. India is primarily an agriculture-based country. Agriculture contributes nearly one-fifth of the gross domestic product in India. In order to increase the growth of agriculture, the Government has planned several programmes pertaining to Agriculture in the rural areas. Rural development has assumed global attention especially among the developing nations. It has great significance for a country like India where majority of the population, around 65 percent of the people, live in rural areas..

Agriculture and rural development depends on growth of productivity of various regional crops and existing infrastructure facilities in the area. At present it is very necessary to know the present status of agriculture and rural area then it will be immense interest to the researchers and policy makers. With the consideration of importance of agriculture and rural important in the Indian economy the following specific objectives have been considered in the study.

1. To study the trend and growth rate of land use pattern, cropping pattern and irrigation structure under different block of Damoh district.
2. To assess the population and infrastructure development in the study area .



3. To study the impact of selected government sponsored schemes/ programmes towards the development of agriculture & rural development in the study area.
4. To suggest the policy implementation on the basis of findings.

Damoh district of Madhya Pradesh was selected for study purpose. Damoh district having 7 blocks i.e. Damoh, Jabera, Hatta, Batiyagarh, Pathariya, Tendukheda and Patera and all the blocks were considered for study purpose. The study was based on secondary data and collected from M.P. Agril. Statistics, Annual District Statistics and Annual Report of Farmer Welfare and Agriculture development Department etc. The secondary data covers different aspects like land use pattern, cropping pattern, infrastructure position, population structure and status of government sponsored schemes/programmes i.e. Surajdhara and National Food Security Mission for rice and wheat crop only. The study pertains to agriculture Year 2002-03 to 2011-12. Absolute change, relative change, coefficient of variation, linear trend and simple growth rate statistical tools were used for analysis of the data.

## **5.2 Conclusions**

The analysis of the data provides the following conclusions:

1. The trend value for barren and non agricultural uses land and fallow land was found negative and non significant while remaining factors of land use pattern was observed positive and highly significant which shows positive sign for agriculture development in Damoh district.
2. Among the cereal crops, maximum variation was observed in the area of Jowar crop which indicates more fluctuation was found in the area of Jowar crop in the study area.
3. The trend and growth rate in area of jowar and maize crop was found decreases as these are the important cereals crops in the study area.
4. Among the pulse crops, the value of trend coefficient and simple growth rate was found negative and non significant in the area of gram crop in Damoh district.

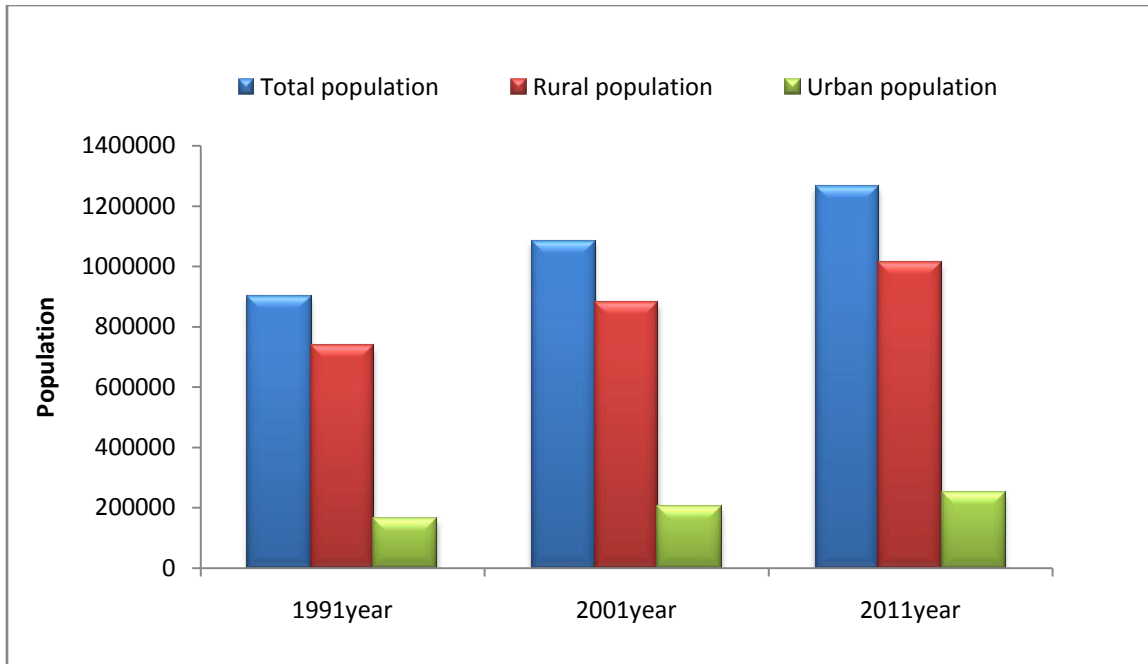
5. Among the oilseed crops, the negative and non significant trend and growth rate was observed in the area of linseed and groundnut crop.
6. The area of edible and non edible rabi crops decreases while in case of kharif crops , positive trend and growth rate was observed in the study area.
7. Among the sources of irrigation, lowest variation was observed in the gross irrigated area.
8. The value of trend and growth rate of irrigated area by wells and ponds was observed positive and highly significant.
9. Blockwise analysis shows that the negative trend and simple growth rate was found only in case of barren and non agricultural uses land and fallow land in all the blocks of Damoh district.
10. The maximum variation was observed in Jowar crop for all blocks of Damoh district.
11. The area of gram crop has been decline in all the seven blocks of Damoh district in terms of trend coefficient and simple growth rate. In case of tuar and urd, area was increases in all the blocks of the study area.
12. Among the oilseed crops, maximum variation was observed in the area of rai and mustard in Batiagarh block and minimum variation was found in the area of sesamum in Jabera block of Damoh district.
13. The trend value and growth rate for net irrigated area and gross irrigated area were found positive and significant in all blocks except Pathriya and Patera block.
14. The total population of Damoh district was 40.76 and 16.63 percent more in the year 2011 then the census of 1991 and 2001 respectively. But the rural population was decreases by 2 percent.
15. The total population under SC and ST during 2001 and 2011 increases as compared to previous census report.
16. The number of total worker and non worker were increases in the 2001 and 2011 year as compared to previous census year while in case of number of cultivator, it was decreases 1.45 percent in the year 2001 and 1.46 percent in the year 2011 as compared to previous census report.

17. In Damoh district the proportion of kachcha and pakka road was observed 1:1.85 and 1: 1.40 in the year 2002-03 and 2011-12 respectively. Total number of primary, middle and higher secondary school, were decrease and only high school was increases in the year 2011-12.
18. The blockwise data shows that road length was decreases during 2002-03 to 2011-12 in all the blocks except Hatta block. In few block the number of school was also increases and there was no change in the Government College, professional college, post office and sub post office.
19. Under the surajdhara yojana among the three aspects, performance of seed exchange was good as compared to seed self reliance and seed production for SC and SC category farmers in Damoh district .
20. National Food Security Mission for wheat crop the minimum 200 demonstration were included under the programme in each year. High yielding varieties seed and minikits for wheat crop also distributed at different quantity and number of minikits during defferent year.
21. Under the programme, the assistance for diseal pumpset was also given and also arranged farmer training during 2008-09 to 2012-13.

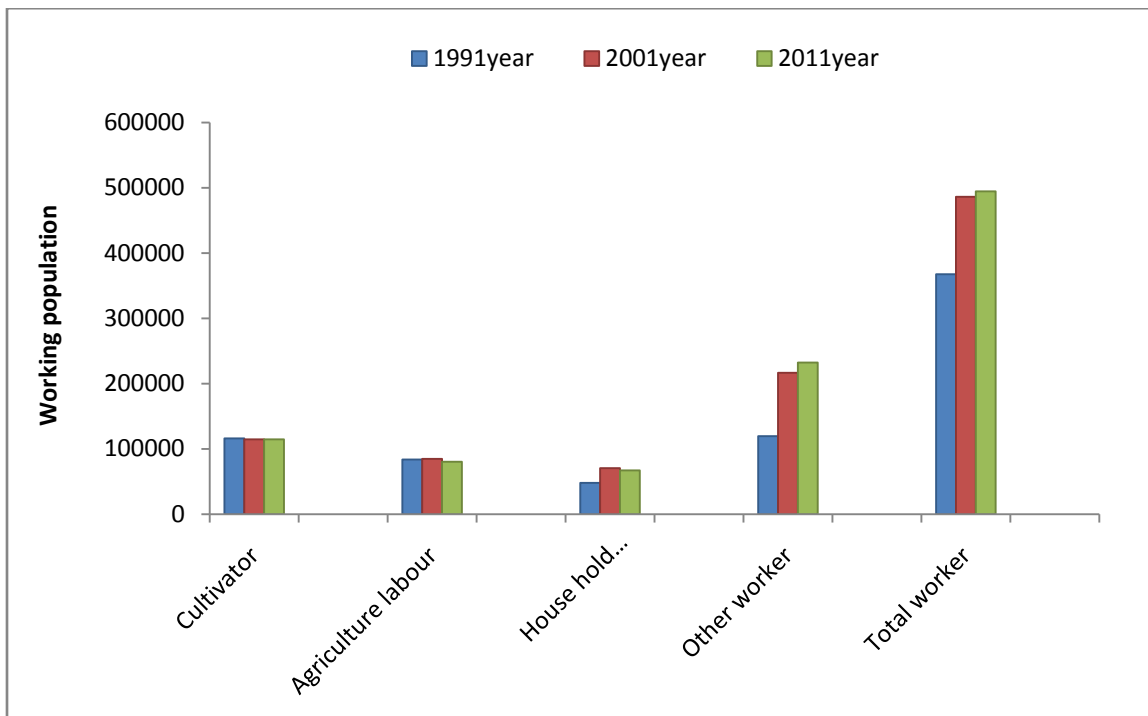
### **5.3 On the basis of this study the following recommendation are suggested**

1. Among the cereals, pulses and oilseed crops the area of jowar, maize, gram, linseed and groundnut crop were decline at the block level. These are important crops in the study area, so a survey may be undertaken by the competent agencies to identify the problem for declining the area of these crops.
2. Efforts are required to increase the irrigated area by different sources in all the block of Damoh district.
3. The population of Damoh district was increases but there was no change in the government college, professional college, post office, banks etc. Policy makers may developed a plan for improvement of infrastructure facilities as per the proportion of population.

4. The position of road length is not good in the study area. So government should frame appropriate policy to constructed and improvement the road length.
5. Creation of awareness generation about the National Food Security Mission and Surajdhara yojana in all the blocks is necessary to extent it benefits to the large number of farmers in the study area, then these programmes will also helpful to agriculture and rural development.



**Fig. 1: Population of Damoh district**



**Fig. 2: Working population of Damoh district**

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