# IMPACT OF WAN IRRIGATION PROJECT ON AGRICULTURE AND SOCIO-ECONOMIC DEVELOPMENT OF BENEFICIARY FARMERS

## THESIS

**Submitted to**
**Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola**
**in partial fulfilment of the requirements**
**for the Degree of**

## DOCTOR OF PHILOSOPHY
## IN
## AGRICULTURE
## (EXTENSION EDUCATION)

**By**

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## DECLARATION OF STUDENT

I hereby declare that the experimental work and its interpretation of the Thesis entitled **"IMPACT OF WAN IRRIGATION PROJECT ON AGRICULTURE AND SOCIO-ECONOMIC DEVELOPMENT OF BENEFICIARY FARMERS"** or part there of has neither been submitted for any other degree or diploma of any University, nor the data have been derived from any thesis / publication of any University or Scientific Organization. The source of material used and all assistance received during the course of investigation have been duly acknowledged.

**Place :** Akola (**DEOKATE NEETA HIMMATRAO**)

**Date :** / /2018 Enrolment No. EE/258

# CERTIFICATE

This is to certify that thesis entitled **"IMPACT OF WAN IRRIGATION PROJECT ON AGRICULTURE AND SOCIO-ECONOMIC DEVELOPMENT OF BENEFICIARY FARMERS"** submitted in partial fulfilment of the requirement for the degree of **"Doctor of Philosophy in Agriculture (Extension Education)"** of Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola is a record of bonafide research work carried out by **Deokate Neeta Himmatrao** under my guidance and supervision.

The subject of the thesis has been approved by the students' advisory committee.

Place : Akola
Date : / /2018

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THESIS APPROVED BY THE STUDENT'S ADVISORY COMMITTEE INCLUDING EXTERNAL EXAMINER (AFTER VIVA–VOCE)

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**Place :** Akola **Deokate Neeta Himmatrao**

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# Table of Contents

## (A) List of Tables



contd..

contd..

contd..

## (B) List of Figures



contd..

contd..

contd..

## (C) List of Plates

## (D) Abbreviations

| | | |
|---|---|---|
| Km | - | Kilometer |
| Kg | - | Kilogram |
| UN | - | United Nation |
| WP | - | Water Productivity |
| AP | - | Andhra Pradesh |
| MP | - | Madhya Pradesh |
| KVK | - | Krishi Vigyan Kendra |
| Mha | - | million hectares |
| GDP | - | Gross Domestic Product |
| SMS | - | Subject matter specialist |
| Ltd. | - | Limited |
| RRC | - | Research Review Committee |
| AAOs | - | Assistant Agriculture Officers |
| KAWAD | - | Karnataka Watershed Development |
| Freq. | - | Frequency |
| NREGA | - | National Rural Employment Guarantee Act |
| APRLP | - | Andhra Pradesh Rura Llivelihood Programme |
| MGNREGA | - | Mahatma Gandhi National Rural Employment Guarantee Act |
| *et al.* | - | et alli (and others) |
| etc. | - | et cetra (excetra) |
| Fig. | - | Figure |
| ha | - | hectare (s) |
| i.e. | - | id est (that is) |
| No. | - | Number |
| Rs. | - | Rupee (s) |
| Sl. | - | Serial |
| *viz..* | - | vide licet (namely) |
| % | - | Percentage |

## (E) GLOSSARY

**Age:** The chronological age in completed year of the individual beneficiary at the time of data collection.

**Annual income:** Gross income of family head and members of family of the beneficiary who had adopted main and subsidiary occupations in terms of rupees from all the sources in a year.

**Constraint:** The problems and difficulties faced by beneficiaries.

**Distance of dam:** How much distance in kilometers from beneficiarys farm.

**Education of family members:** The formal education taken by family members.

**Occupation:** It refers the occupation undertaken by respondents and his family members for getting source of income.

**Farming experience:** It refers the experience of respondents in terms of year of working and cultivation of crop on their field.

**Sources of information:** It refers to the sources of information used by respondents to obtain information about Wan irrigation project.

**Expenditure pattern:** The annual expenditure of the beneficiary on food, education, housing, clothing, health, electricity, religious function, other plus agriculture etc.

**Economic empowerment: It** refers to occupational success in terms of profit maximization.

**Sources of irrigation:** It refers to the sources available such as well, tube well, canal etc for irrigation.

**Method of irrigation:** It refers to the method of irrigation used by beneficiary farmers such as sprinkler, drip and flood irrigation.

**Land holding:** Land holding is actual hectare of land possessed by the respondents.

**Type of land:** It refers to the quality of land possessed by the respondents.

**Land under irrigation:** It refers to the area in hectares possessed by the respondents.

**Economic motivation:** It refers to the occupational success in terms of profit maximization and relative values of individual beneficiaries.

**Impact:** The effect of Wan irrigation project on beneficiary farmers on agriculture and socio-economic development. Effect was expressed in terms

of difference occurred on various aspects of beneficiary before and after Wan irrigation project.

**Scientific orientation:** It refers to the degree to which individual is oriented to use the scientific methods in decision making.

**Innovativeness:** It refers to the degree to which the individual respondent is earlier in adoption of new innovation than other farmer in the village.

**Frequency of irrigation in a year:** Number of times in a year irrigation water of the project available to beneficiaries field.

**Irrigation potential:** It refers to the number of hectares of land put under irrigation by the farmer out of beneficiaries total land.

**Social political participation:** The participation of beneficiaries in various political organizations.

**Suggestions:** The opinion of beneficiaries about what action should be taken for better implementation was considered.

**Agriculture development:** It is the change in cropping pattern, cropping intensity and productivity of major kharif, rabi and summer crops of beneficiary farmers before and after Wan irrigation project.

**Cropping pattern:** It refers to hectares of land covered under various crops by the farmer.

**Cropping intensity:** Cropping intensity means the proportion of the area under different crops including double and triple cropping to the net cultivated area.

**Productivity:** It refers to economic yield of production of plant product of economic importance expressed in standard unit per unit area.

**Socio-economic development:** It is the change in socio-economic status of beneficiary farmers before and after Wan irrigation project.

## (F) THESIS ABSTRACT

| | | | |
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| **a)** | **Title of the thesis** | **:** | **IMPACT OF WAN IRRIGATION PROJECT ON AGRICULTURE AND SOCIO-ECONOMIC DEVELOPMENT OF BENEFICIARY FARMERS** |
| **b)** | **Full name of the student** | **:** | **Deokate Neeta Himmatrao** |
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| **j)** | **Signature, name and address of forwarding authority** | **:** | |

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## ABSTRACT

The study entitled “Impact of Wan irrigation project on agriculture and socio-economic development of beneficiary farmers” was frame and conducted in Akola and Buldhana district of Maharashtra State at Wan irrigation project. Wan irrigation project is one of the major irrigation project in Vidarbha sanctioned by Government of Maharashtra in the year

1979 and completed in the year 2001-02. It was started functioning from 2005. It is therefore, in order to know the benefits from this irrigation to the beneficiary farmers. In the study, the total of 300 respondents were the beneficiaries of head, middle and tail reach of Wan irrigation project. The primary data were collected through personal interview, for fulfilling the following specific objectives.

1) To study the personal, socio-economic, psychological and situational characteristics of the beneficiary farmers
2) To study the impact of Wan irrigation project on agriculture and socio-economic development of the beneficiary farmers
3) To study the relationship between the selected characteristics of the beneficiary farmers with the impact of Wan irrigation project
4) To study the constraints experienced by the beneficiary farmers of Wan irrigation project
5) To invite the suggestions from the beneficiary farmers

The findings indicated that, 45.00 per cent of the beneficiary farmers were found middle age group, 37.00 per cent possess small category of land holding. In case of occupation, 66.67 per cent were engaged in agriculture as their main occupation, 37.00 per cent beneficiary respondents having 21 to 30 years farming experience. Regarding socio-economic characteristics, 37.34 per cent having annual income above Rs. 2,00,000/- and more than half (53.67%) of them using medium level of sources of information. In case of sources of irrigation and method of irrigation, cent per cent (100%) were using canal water and 38.00 per cent using sprinkler method of irrigation, respectively.

In case of situational characteristics, half of them (47.33%) possess very deep type of land and 37.00 per cent of respondents having 1.01 to 2.00 ha area under canal irrigation. Regarding, economic motivation, scientific orientation and innovativeness most of the respondents were found in high and medium level.

Regarding, frequency of irrigation in a year, irrigation potential and distance of dam, it was found that, 41.00 per cent using 4 - 6 irrigations

for the crop, 37.00 per cent were having irrigation potential up to 1.01 to 2.00 ha and nearly fifty per cent (47.67%) respondents land was found in between 21 to 31 Km distance from the dam.

The findings regarding dependent variable, impact of Wan irrigation project on the beneficiary farmers in terms of agriculture and socio-economic development. In case of agriculture development, there was change in cropping pattern, the area under cotton, tur, wheat, gram and groundnut were found increased. The cropping intensity, before and after Wan irrigation project was found increased from 121.81 to 150.96 per cent. The productivity of major kharif, rabi and summer crop were also found increased.

Regarding, socio-economic development parameters, there was change in occupation, land holding, family education, annual income, socio-political participation, expenditure pattern and economic empowerment of the beneficiary farmers in the study area. It was also observed that, 132.89 per cent impact as a whole of agriculture and socio-economic development was noticed on the beneficiary farmers through Wan irrigation project.

In case of coefficient of correlation, between selected independent variables of beneficiaries of study area with agriculture and socio-economic development parameters, it was found that, most of the independent variables were found to be significant at 0.01 and 0.05 level of probability. In case of path analysis, sources of irrigation along with frequency of irrigation in a year, land under irrigation, land holding and irrigation potential exerted the maximum direct effect and also served as vehicle for the production of indirect effect through other variables on increasing impact of Wan irrigation project on beneficiary farmers.

The major constraints expressed by the majority of the beneficiary farmers in head, middle and tail reach portion were crop damaged due to excess flow of water (65.00%), increase in salinity of soil due to continuous leakage of water in field (50.00%), no proper maintenance of major and minor distributaries and canal water not reach at the tail portion.

# CHAPTER I

# INTRODUCTION

## 1.1 Background Information

In ancient Hindu Purana, the earth was treated as mother, who nourished the mankind by offering food and water. The religions in the world have also treated land and water as important elements of human survival. Though the man in ancient days had recognized the importance of earth, he had not cared much to conserve its natural resources. The man only bowed before the earth as a goddess and was satisfied. This practice is continued since centuries, but today we find that this natural treasure is being destroyed day by day. In the light of this fact, it is the responsibility of every person not only to treat earth as goddess but also try to conserve the natural resources. The supply of freshwater that supports human health and enterprise is basically constant, representing only about 01.00 per cent of the water available worldwide. Good quality, non saline water is the global and is asset most important in satisfying the increasing demand for basic food, fiber, feed and fuels.

Irrigation has shaped the economics of many semi- arid and arid areas, permanently colouring the social fabric of numerous regions around the world. It has stabilized rural communities, increasing income and providing many new opportunities for economic advancement. Irrigation permits human habitation, quite dense populations, where it otherwise could not exist. Nevertheless, it is estimated that 60.00 per cent of the global population may suffer from water scarcity by 2025 [Qadir et al., 2007].

An estimated 260 million hectares (ha) worldwide are irrigated compared to fewer than 100 million ha in 1950.These lands constitute approximately 17.00 per cent of the world's total cultivated farmland but produce 40.00 per cent of its food and fiber. Irrigated agricultural activities also provide considerable food source and foraging areas for migratory and local birds as well as other wildlife. In short, irrigation underpins current society and lifestyle. Yet irrigation is not without its problems and critics. Water's uneven geographical distribution has made its acquisition a matter of

great contention. The picture is further complicated by the fact that the productivity of the currently irrigated land base around the world is actually declining because of soil salination, waterlogging and soil erosion.

If the water resource hungry competition swells in the form of increasing population, urbanization, environmental consciousness, recreation and tourism then agriculture's access to a critical resource is no longer guaranteed. This scarcity is especially evident in the prime agricultural areas of the arid and semi arid areas, but it is also being felt in the humid regions of the world. The United Nations [U.N. Educational, Scientific, and Cultural Organization, 2006] recently estimated that increased cropping intensity to meet world demands will require an increase of 40.00 per cent in the area of harvest crops by 2030, and that the amount of water allocated to irrigation must increase correspondingly by 14.00 per cent. However, it unlikely that the needed water will be available. This is creating a major paradox and a looming crisis. At the same time that both irrigated agriculture's land base and water supplies are being depleted and reallocated, it is being asked to produce even more.

Water is the prime and most precious natural resource as well as a basic need of life. Agriculture is the main user of the available water resources. Water resources decrease worldwide and increases pressure due to increasing and competing demands of freshwater for drinking, agricultural, urban and industrial uses. About 75.00 to 80.00 per cent of the available freshwater resource in many parts of the world is used for agriculture. Global population by 2025 will likely increase to 7.9 billion, more than 80.00 per cent of people will live in developing countries (UN, 1998). Around 36.00 per cent of the world population is projected to be living in India and China alone up to 2025 (Dam and Malik, 2003). The irrigated area should be increased by more than 20.00 per cent and the irrigated crop yield should be increased by 40.00 per cent up to 2025 to secure the food for 8 billion people (Lascano and Sojka, 2007). Therefore, the higher requirement of food for feeding the increased population with reduced water availability for crop production forces the irrigation researchers and managers to use water-saving irrigation strategies to improve the water productivity (WP) in recent years. Land and

water are the resources gifted by nature. The way in which we use these valuable resources determine the measure of progress. The problems of conserving these resources are being tackled by the government, since several decades and the efforts are getting accelerated year after year.

Water resources in India are increasingly becoming scarce. Since rainfall occurs only for three months in a few spells, storage by dams is imperative to utilize waters. On account of topographic limitations, ultimate storage capacity is only 20.00 per cent of average annual flows and utilizable water is only 38.00 per cent of the total available. The Indian economy is predominantly agricultural. Irrigation and power have brought self-reliance in food production and economic prosperity but with an increasing population, demands for water are rising fast. By 2025, all utilizable waters will be consumed. Therefore, there is inevitable necessity of major dams.The dependence of Indian's agriculture on the south-west monsoon and its consequent vulnerability has been recognized from the earliest times. There is evidence that during the Vedic period (400 B.C.) people used to irrigate their crops with dug well or inundated waters. Irrigation was gradually extended during the later Hindu, Muslim and British periods. The Virnarayana and Gangaikonda-Cholapuram tanks in Tamil Nadu and the Ananra rajasagara in Andhra Pradesh were constructed as early as in the tenth and thirteen centuries, respectively.

At independence, in 1947, there were fewer than 300 large dams in India. By the year 2000 the number had grown to over 4000, more than half of them built between 1971 and 1989. India ranks third in the world in dam building, after US and China. While some of these dams were built primarily for flood control, water supply and hydroelectric power generation. But, the primary purpose of most Indian dams (96.00%) remains irrigation. In fact, large dam construction has been the main form of investment in irrigation undertaken by the Indian government. But, starting in the 1980s, public investment in large dams in India has been the subject of a sustained controversy epitomized by the Sardar Sarovar Project centering on the balance between the social, environmental and economic costs of dams and their benefits. This essay analyzes the economic impact of large irrigation

dams in India, focusing on both their aggregate productivity effects and their distributional effects.

Growing population and rising levels of economic activities increase human demand for water and related services. In the past, large dams have often been seen as an effective way of meeting water and energy needs. However, a global review recently carried out by the World Commission on Dams has emphasized the wide range of problems associated with dams, making it more difficult to finance large dams.

Most irrigation dams in India are embankment dams. They consist of a wall built across a river valley to impound water so as to form a reservoir upstream and a system of spillways and gates to bypass the wall so as to maintain normal river flow and convey water to a network of canals feeding irrigated regions downstream. The upstream areas that feed the dam and those submerged by its reservoir make up its “catchment” area, and the downstream areas fed by its irrigation canals make up its “command” area. Before any mitigating effects of resettlement and compensation, whether a household stands to gain or lose depends on its location relative to the placement of the dam. People living in the catchment area, who lose property and livelihood but gain little, if anything from irrigation, tends to lose out, while people living in the command area, who bear little of the social cost but gain the most from irrigation. In between 1951 and 2000, India’s production of food grains increased fourfold, from 51 million tonnes to about 200 million tonnes. This not only obviated the importation of food grains but also saving in foreign exchange. Areas irrigated by dams constituted 35.00 per cent of irrigated land in India. The most optimistic estimates attribute 25.00 per cent of the increase in food grain production to dam irrigated areas.

Why else do we build dams? Dams are important because they provide water for domestic, industry and irrigation purposes. Dams often also provide hydroelectric power production and river navigation. Domestic use includes everyday activities such as water for drinking, cooking, bathing, washing, lawn and garden management. Dams and their reservoirs provide recreation areas for fishing and boating. They help people by reducing or preventing floods. During times of excess water flow, dams store water in the

reservoir; then they release water during times of low flow, when natural flows are inadequate to meet water demand. When engineers design and maintain dams, they consider all these purposes.

India has 04.00 per cent of the world water resources and 18.00 per cent of the world population. Few countries have such an extensive river network that India has. The mighty Indus-Ganga-Brahmaputra in the North, the Narmada-Tapi-Mahanandi in the central region and Godavari-Krishna-Kaveri in the South have been symbols of existence and growth of our country right from its inception. Yet, the availability of water resources in India has its unique complexities. India has been predominately an agriculture country and even now almost 65 percent of the population directly depends on agriculture and hence it is the truth that progress of the India is very much dependent on the development of the agriculture. The increased agricultural production depends upon the number of factor of which, water plays an important role. Crops can be raised successfully only if water is available in adequate quantity either from rain surface flow or underground. Irrigation enables improvement in economy through its area and yield effect. It helps to transforms cropping pattern and cropping intensity towards more profitable and favorable crop enterprises. The availability of irrigation not only increases agricultural development but also results in overall socio-economic development of rural masses. The impact of irrigation is all spread as it leads to change in cropping pattern, increased yield rates, labour utilization and ultimately it brings prosperity to the areas, hence irrigation is regarded as a catalyst for socio-economic change that sets in nation the productive forces in the agriculture and socio-economic development. In most parts of the country rainfall is received mainly during June to September. This causes the problem of shortage of non- availability of water not only for irrigation, but, also for drinking.

The Maharashtra is the third largest State of the India in population as well as geographical area. Maharashtra has traditionally remained drought prone State. Nearly one-third area of the state falls in the rain shadow region where the rains are not only scanty, but also erratic in respect of irrigation. The percentage of gross irrigated area to gross cropped

area in the state was only 16.38 per cent as compared with 40.00 per cent for the country as a whole in 2002-03. The agriculture in the state is thus largely dependent on monsoon. The proportion of net irrigated area to gross cropped area was 17.08 per cent. In 2010-11, the proportion of gross irrigated area to gross cropped area increased only by 0.4 per cent. Geographical area of the Maharashtra state is 308 lakh hectares and its cultivable area is 231 lakh hectares out of this 41.00 per cent of the area is drought prone and about 07.00 per cent is flood prone. Drought or drought like condition affecting availability of water for drinking and irrigation. The State Government is putting all the efforts to create irrigation facilities. Agriculture is playing important role in development of nation. For that irrigation is the most crucial factor for increasing yield and productivity of crops in rainfed area by providing the supportive irrigation.

Agriculture in Maharashtra and particularly in Vidarbha region can be characterized by low irrigation (17.00% and 07.00%) and low rainfall. (Mayande and Taley 2009) Approximately 85 per cent of cultivated area (17.64 Mha in the state area and 4.99 Mha in the vidarbha region) is rainfed and agricultural performance is significantly influenced by the monsoon. Precipitation is concentrated over just a few months of the year and is highly variable in frequency, intensity, quantity and geographic coverage. Access to supplemental irrigation (canal or groundwater) is very limited in the low rainfall areas. Agriculture contributes 30.00 per cent of Maharashtra's GDP, these drylands support 65.00 per cent of the rural population and are the principal suppliers of cereals, pulses and oilseeds.The importance of rain fed agriculture in terms of rural employment, sustenance and livelihood cannot be over emphasized.

The demand for irrigation is continuously increasing and to increase the irrigation potential huge amount is being spent by Government for construction of irrigation project. Large numbers of irrigation projects were constructed under the category of major, medium and minor project for increasing the area under irrigation. Excess run-off harvested in the farm pond and check dams recharges existing wells. Further, with conserved water applied through micro-irrigation systems such as drip and sprinkler irrigation, it

will be possible to double the area of protective irrigation. In Amravati division there are total 25 irrigation projects, out of which 3 major and 11 minor irrigation projects. Out of which Wan, Katepurna and Jigaon are major projects.

Wan irrigation project is major irrigation project constructed on Wan river in Telhara Taluka in Akola District. Wan river forms the part of northwest boundary of Akola district of Maharashtra State of India, after entering from Amravati district. This irrigation project was sanctioned by Government of Maharashtra in 1979 with the estimated cost of Rs. 1337 lakh and up to completion of the project Rs. 22839.00 lakh was spent on the project. It was started functioning from 2005. The catchment area of this project is 279 sq. km and gross command area of this project is 25028 ha. The irrigable command area is 15100 ha and irrigation potential is 19177 ha. This project is a major source of irrigation in Akola and Buldhana district of Maharashtra State. Name given in official web site is "Wan". However, it appears that locally the place is called "Wari" and the local name of the Project is "Hanuman Sagar ". Official name is used here Wan Reservoir was created as a result of construction of Wan dam of Wan irrigation Project. Official Designation of the Project is "Wan D – 03007". Locally this is also known as "Wan Talav " or " Wan Lake".

It is therefore, felt necessary to examine the impact of this project on its beneficiaries in terms of agriculture and socio-economic development in the project area.

### 1.2 Need and importance of the Study

In spite of heavy investment on irrigation projects, the derived benefits have often been short of expectations. Actual utilization of irrigation presents a very dismal picture. It is todays need to study the impact irrigation projects on agriculture development because; it will be helpful to judge benefits of the project. It will also be helpful in giving important action, recommendations to the concerned departments.

Agriculture plays significant role in nation building and are expected to contribute a lot towards the development process. Benefits of such irrigation project can be compared.

The present study is proposed to conduct in two districts i.e Akola and Buldhana of Maharashtra State. The findings of this study were based on the responses of beneficiaries of this project. Wan irrigation project is also useful for generating the electricity and provide drinking water in Akola and Buldhana district. The water holding capacity of this dam is 84.434 $M^3$. and 59.898 $M^3$ water is reserved for irrigation purpose. The ultimate irrigation potential of this dam is 19177 ha. of land in Akola and Buldhana district of Maharashtra. The present study will be helpful to know the utility of this project in terms of agriculture and socio-economic development of the farmers in this region. Thus, in view of the need and importance of the study, the present investigation was carried out.

### 1.3 Objectives of the Study

The present study entitled **"Impact of Wan irrigation project on agriculture and socio-economic development of beneficiary farmers."** was carried out with following objectives.

1. To study the personal, socio-economic, psychological and situational characteristics of the beneficiary farmers.
2. To study the impact of Wan irrigation project on agriculture and socio-economic development of the beneficiary farmers.
3. To study the relationship between the selected characteristics of the beneficiary farmers with the impact of Wan irrigation project.
4. To study the constraints experienced by the beneficiary farmers of Wan irrigation project.
5. To invite the suggestions from the beneficiary farmers.

### 1.4 Scope of the study

India has been well endowed with large freshwater reserves, but the increasing population and over exploitation of surface and groundwater over the past few decades has resulted in water scarcity in some regions.

However, increasing urbanization and per-capita demand, the water demands of domestic, industrial and other sectors are expected to increase and become highly competitive with the irrigation sector. Irrigation, being the major water user, its share in the total freshwater demand is bound to decrease from the present 83.00 per cent to 74.00 per cent due to more pressing and competing demands from other sectors by 2025 AD (Swaminathan, 2006).

Agriculture plays significant role in nation building and are expected to contribute a lot towards the development process. Benefits of such kind of irrigation projects can be compared. Impact of Wan irrigation project will be computed by summing up the percent change in agriculture and socio-economic development of the beneficiary farmers before and after the Wan irrigation project. The present study is proposed to conduct in two district i.e. Akola and Buldhana of Maharashtra State. The findings of this study were based on the responses of beneficiaries of the Wan irrigation project.

The present study yield variable data on the socio-economic and psychological characteristics of the beneficiary farmers. This enable to understand, whether the selected characteristics really played a role impact of Wan irrigation project on agricultural and socio-economic development or not. The findings of the study will be helpful to the government in changing existing conditions and procedures and other requisiteness for future challenges, poverty alleviation and to design a suitable strategy at micro level regarding irrigation projects. This study on impact of Wan irrigation project will be useful in future for the government for better planning and implementation of the irrigation projects in rural areas.

### 1.5 Limitations of the study

The limitations of time and other resources in the present investigation have restricted the selection of locale, sample size and the variables. Hence the findings have to be viewed in the specific context of the conditions prevailing in the study area and cannot be generalized for a wider geographical area. However, careful and rigorous procedures have been adopted in carrying out the research as objectively as possible. In spite of the individual bias made by the beneficiaries in eliciting the necessary responses,

it is believed that the findings and conclusions drawn in the present study would focus for more rigorous field observations.

### 1.6 Research Hypotheses for the Study

As defined by Goode and Hatt (1952) “A hypothesis, which can be put to a test to determine its validity. It may see contrary to, or in accord with common sense. It may prove to be correct or incorrect. In any event, however, it leads to an empirical test.” In studying the relationship between variables, research hypotheses are formulated which state the anticipated relationship between the variables. However, for statistical test it becomes necessary to formulate null hypothesis. A null hypothesis states that there is no relationship between the variables. If a null hypothesis is rejected on the basis of a statistical test, it is assumed that there is a relationship between the concerned variables.

In light of the postulated conceptual framework and based on objectives of the study as well as the assumptions, the following hypotheses were formulated and presented in the null form ($H_0$):

$H_0$ : There is no significant impact of Wan irrigation project on the beneficiary farmers.

$H_0$ : There is no significant correlation between independent and dependent variables.

### 1.7 Organization of the thesis

The report of the present research on the Impact of Wan irrigation project on agriculture and socio-economic development of beneficiary farmers of Akola and Buldhana districts of Vidarbha region has been selected for the study. The thesis presented in eight chapters.

In the first chapter, background information, need and importanceof the study, objectives and scope and limitation of the study has been presented.

The second chapter namely Review of Literature, comprises review of relevant literature and findings of various past researcher studies conducted in different locations on the similar topics.

The research methods, techniques and tools used for measuring variables their categorization have been presented in methodology chapter.

Fourth chapter contains socio-economic status of Akola and Buldhana districts of Vidarbha region.

The fifth chapter is devoted to the findings of the present study and relevant discussion thereon.

The sixth chapter contains summary and conclusions of the investigation.

The seventh chapter is implications for the further.

The last and eight chapters contain literature cited.

This has followed by appendices and vita at the end.

## CHAPTER II

# REVIEW OF LITERATURE

Review of literature is one of the most important aspects in social research process as it provides necessary guidelines and motivates the researcher to proceed in desired direction. It also helps researchers in formulating their own hypothesis while going through it. Literature relevant to the present topic of research has been collected from various books, journals, periodicals and thesis available in various universities. These are incorporated in the present chapter according to the various independent and dependent variables taken under the study. The literature reviewed is presented in the following sequences.

2.1 Independent variables

2.2 Dependent variables

2.3 Constraints

2.4 Suggestions

### 2.1 Independent Variables

The set of independent variables in the present study included personal, socio-economic, psychological and situational characteristics of the respondents. The review of past studies pertaining to these variables has been presented below.

#### 2.1.1 Age

Vankar (2000) concluded that the majority of the farmers of unirrigated villages (76.67%) and irrigated villages (65.00%) in Khambat Taluka of Anand district were from middle age group.

Begadi *et al.* (2001) noted that average age of respondent was 50 year and there was positive relation between age and adoption of soil and water conservation technology by farmer.

Chinchmalatpure (2001) revealed that more than two fifth (41.60%) of the project affected farmers belonged to middle age group.

Madhavareddy (2001) in his study in Bangalore on peoples participation in watershed development programme implemented by government and non-government organization, a comparative analysis revealed that equal percentage of respondents (38.30% each) belonged to the middle age category in both government organization and non-government organization watershed. Higher per cent of farmers (38.30%) of government organization watershed belong to young age category compared to 23.30 per cent of farmers belonging to old age group.

Rathod (2001) in his study on impact of watershed development programme on tribals of melghat observed that; mean age of small, medium and large tribal respondents was 41.65, 45.78, 49.97 years, respectively.

Dabhi (2002) reported that nearly half of participatory irrigation management (47.00 per cent) society belonged to middle age group.

Sridhara (2002) in his evaluative study of watershed programme in Pavagada taluka of Tumkur district in Karnataka found that 44.67 per cent of the respondents were middle aged, while, 28.00 per cent of them were young and remaining 27.33 per cent belong to old age.

Korde *et al.* (2003) in a research work at Kal irrigation project in Raigad district revealed that, age was related negatively and does not bear any association with change in cropping intensity and productivity of major crops.

Rathod and Ingle (2003) in a research work at Melghat revealed that age was related negatively and dose not bears any relationship with change in productivity.

Raghunandan (2004) in his study a study on knowledge and adoption level of soil and water conservation practices by farmers in northern Karnataka reported that 45.33 per cent of the respondents belonged to the middle age group, followed by old age (36.25%) and young age group (18.75%) respectively.

Mane (2005) found that 57.00 per cent respondents of soybean growers were from middle age group of 36 to 50 years.

Ambhore (2006) conducted study in Buldhana district and found that majority of the respondents (52.67%) were included in the middle age group of 36-50 years.

Deshmukh *et al.* (2007) revealed that majority of respondent belong to middle age group.

Patil (2007) reported that a majority (55.00%) of the respondents of groundnut grower were from middle age group of 32 to 51 years.

Shankar *et al.* (2007) in the study of farmers perception and adoption pattern of soil and water conservation measures in Nalgonda District of Andhra Pradesh and found that majority of the respondents (60.00%) were old.

Thakur (2007) in his study on prospect of soil and water conservation practices in drought prone area of western vidarbha concluded that, majority of respondents (48.00%) were from above 50 years age and it also shows that 48.00 per cent of respondents were in old age group of above 50 years age.

Gawande (2008) reported that 53.54 per cent of cotton growers were belonged to middle age group followed by 27.50 per cent respondents of old age group and 19.16 per cent respondents of young age group.

Gupta *et al*. (2009) found in their study in the Watershed area of Vijapur block of Jammu, large numbers of respondents belong to 25 to 62 years. The mean age of respondents was 44 years.

Bhople *et al*. (2010) found that majority (53.33%) of the beneficiary farmers were found in the middle age group of 36-50 yrs, this was followed by 30.00 per cent beneficiary who were observed in the old age group (above 50 yrs.) The beneficiary in young age group having age up to 35 yrs. was found to be 16.67 per cent.

Tayade (2010) reported that a majority of the respondents of cotton growers belonged to the middle age group of 35 to 50 years followed by young (up to 34 years) and old age group of 51 and above years, respectively.

Yadav *et al.* (2013) in their study techno-economic changes among the farmers in relation to watershed development programme in Maihar block of Satna district (M.P.) found that majority o respondents (44.17%) were in the middle age group followed by young (36.67%) and old (19.16%).

### 2.1.2 Land holding

Jayale (1992) in his study on horticultural crops observed that, majority of the respondents (63.33%) had medium land holding up to 06.00 hectare, 23.33 per cent respondents had small land holding up to 02.00 hectare and only 13.34 per cent of respondents had above 6.1 hectare land holding.

Kushwaha (1996) found that majority of the tomato growers (64.00%) belong the small farmer categories.

Temkar (2000) revealed that 32.83 per cent of the dairy farmers were marginal farmers followed by 32.50 percent medium farmers, 21.67 per cent small farmers and only 10.00 per cent dairy farmers were large farmers.

Bindu Pullikken (2001) conducted that about two third of the beneficiary of the Jawahar well scheme (66.00%) belonged to medium category of land holding ranging from 2.01 hectare to 10 hectares. A little more than one fifth (22.67%) of the respondents were small land holders possessing land up to 2 ha.

Patel (2001) reported that 88.00 per cent of the vegetable growers possessed land up to 2.5 hectare.

Timbadia (2001) reported that more than fifty per cent (54.00%) of drip owners possessed big size of land holding.

Dabhi (2002) indicated that majority (66.00%) of the respondents of members of PIMS and more than half of the non-members (57.00%) were marginal farmers possessed below 01.00 ha of land holding.

Dhuware and Pande (2002) noted that size of land holding was significantly associated with the adoption of watershed management practices.

Ingle (2002) observed that 47.97 per cent beneficiaries of lift irrigation project belonged to medium land holding category of 4.01 ha to 10.00 ha. As much as 28.46% of the beneficiaries were observed in large land holders category possessing above 10.00 ha of land.

Patel *et al*. (2002) observed that land holding had positive and significant association with their extent of adoption of watershed management technology.

Anupama Adhau (2003) in research work at Jamwadi irrigation project reported that, 42.58 percent of the beneficiaries have possessed land holding between 2.51 to 5.00 acres.

Korde *et al*. (2003) in a research work at Kal irrigation project in Raigad district revealed that, 62.00 per cent and 92.00 per cent beneficiaries and non-beneficiaries, respectively had marginal land holding.

Shashidhara (2003) in his study on socio-economic profile of drip irrigation farmers in Shimoga and Davanagere district of Karnataka state revealed that, comparatively more number of farmers (46.67%) belonged to semi medium category followed by medium (32.22%) and small land holding categories (18.89%).

Bhange *et al*. (2005) found that the total land holding of the beneficiary farmers from three watersheds have remained the same. The irrigated area under the watersheds had increased by 24.94 per cent whereas unirrigated area and fallow land had decreased by 23.18 per cent and 01.76 per cent respectively. This clearly indicates that there was a positive effect of various recommended watershed management activities carried out under NWDP-RA, in all the three watersheds.

Khaire (2005) reported that, 73.50 per cent fig growers were having medium size of land holding i.e. 1.01 to 4.00 ha.

Ambhore (2006) conducted study in Buldhana district and found that majority of the respondent (65.33%) possessed medium size of land holding.

Dolli (2006) in his study on sustainability of natural resources management in watershed development project in Karnataka and revealed that, majority of respondents' belonged to large land holding (7.85 acres).

Rajput (2006) found that, relatively higher production of farmer belong to medium and small land holding.

Raut (2006) reported that, majority i.e. 72.22 per cent of orange growers were having small land holding followed by medium land holding i.e. 20.00 per cent and large land holding i.e. 7.78 per cent.

Mewar and Pandya (2007) indicated that majority (58.00 %) of tomato grower's possessed small size of land holding, followed by 26.00 per cent and 16.00 per cent of them who had medium and large size of land holding, respectively.

Mohiuddin *et al.* (2007) revealed that most of the sampled farmers belonged to the small and medium size groups in Satkania and Patiya respectively.

Shankar *et al.* (2007) in Nalgonda District of Andhra Pradesh found that majority of the respondents (60.00%) having land holding up to 5.00 acres means small.

Shashidara *et al.* (2007) revealed that land holding has non-significant association with adoption, while remaining independent variables exhibited positive association.

Thakur (2007) concluded that 38.00 per cent of respondents belong to the semi medium category with land holding ranging 2.01-4.00 ha. One fourth of the respondents 27.33 per cent were belong to small farmer category passes land in between 1.0-1.2 ha. Thus the farmer majority belongs to semi medium farmer category.

Wankhede (2008) reported that nearly half of the i.e. 48.64 per cent respondents banana growers had semimedium land holding followed by 42.27 per cent of them had small land holding.

Kale *et al.* (2011) reported in his research review committee project entitle constraints in adoption of land care techniques for saline-sodic

soils of purna valley that from all age and land holding groups respondents were observed in purna valley.

Tayde (2011) study on impact of Watershed development programme on its beneficiaries in Buldhana district and concluded that, land holding of beneficiaries in watershed of semi medium group was 25.55 per cent and 33.34 per cent non beneficiaries.

Shambharkar *et al*. (2013) conducted his study on impact of farm ponds on beneficiary farmers during 2012-13 as a RRC project and observed that moderate percent of beneficiary farmers were possessing medium (35.00%), semi-medium (30.00%) and small (17.50%) category of land holding, followed by large (16.66%) category of land holding.(7.85acres)

Suvarna Ingole (2013) reported in her study that maximum numbers of the respondents were having medium land holding ranging from 4.01 to 10.00 ha.

Yadav *et al.* (2013) study on “Techno-economic changes among the farmers in relation to watershed development programme” in Maihar block of Satna district (M.P.) revealed that about 44.17 per cent respondents had small size of land holding whereas 38.33 per cent had medium size of land holding. Only 17.50 per cent of respondents had large size of land holding.

**2.1.3 Annual income**

Sharma (2001) revealed that in his study integrated watershed development Kandi project majority of farmers (58.83%) had medium annual income.

Timbadia (2001) stated that more than half (57.33 %) of the drip owners had annual income up to Rs.50000.00/-.

Bhopale *et al*. (2002) study in Akola district and found that about 40.00 per cent of each respondent had an annual income upto 50,000 and above75,000 annually.

Reddy *et al*. (2003) in their study environmental sustainability through watershed programme in semiaride region of Andhra Pradesh and

revealed that, capital income increased from Rs. 1,443 in 1984-85 to Rs.1,917 in post project period.

Mane (2005) reported that 76.00 per cent of the respondents had medium annual income from ` Rs. 47,667 to Rs. 1, 55 086 /-.

Mapari (2005) conducted study on technological consequences of integrated watershed development programme on beneficiaries in Akola district and observed that, about one third of the beneficiaries of (31.11%) had income from farming up to Rs. 50,000, followed by 29.63 per cent of respondents having more than Rs. 2, 50,000 incomes from farming.

Reddy (2005) reported that in her study a study on knowledge, extent of participation and benefits derived by participant farmers of the watershed development programme in Raichur district of Karnataka majority of the respondents (60.00%) belonged to income group of Rs. 11,001 to Rs. 22,000 per annum. Whereas, 20.00 per cent of them belonged to income group of Rs. 22,001 to 33,000 an equal per cent of respondents (10.00%) belong to income up to Rs. 11,000 and Rs. 33,000 and above respectively.

Nipanikar (2006) observed in his study on impact of watershed development programme on beneficiaries of Osmanabad district that, 55.84 Per cent of beneficiaries had medium annual income whereas, 27.50 per cent of beneficiaries belonged to low annual income category while, 16.66 per cent of beneficiaries had high annual income.

Mate (2006) revealed that 64.80 per cent of the respondents were having medium annual income from Rs. 40,001 to Rs. 80,000/-.

Deshmukh (2007) study on knowledge and adoption of agriculture technologies in marathwada and releaved that majority of respondent (81.59%) fall under medium level of income having Rs.1001 to 87,000 per annum.

Shankar *et al*. (2007) in the study of ‘Farmers perceptions and adoption patterns of soil and water conservation measures’ in Nalgonda District of Andhra Pradesh and shows that, higher percentage of respondents (70.00%) was having annual income ranging between Rs. 50, 001 to 1,00,000 per annum.

Anonymous (2008) reported that more than half (56.67 %) of the wheat growers had obtained annual income from 50,001 to 1,50,000 from agricultural main occupation while nearly 60.00 per cent of the farmers obtained annual income below 50,000 from secondary occupation.

Tayade (2010) observed that 66.67 per cent of the respondent cotton growers had annual income from Rs. 56,268 to Rs.1, 53,783 /-.

Kale *et al*. (2011) in his study research review committee project entitle constraints in adoption of land care techniques for saline-sodic soils of Purna Valley and reported that, over one third of the farmers each (34.17%) having annual income up to Rs. 50,000 and between Rs. 50,001 to Rs.1,00,000 (35.00%) This was followed by 11.67 per cent respondents belonging to income group with annual income between Rs.1,00,001 to Rs.2, 00,000. Whereas, 10.00 per cent farmers have annual income between Rs. 4,00,001 to Rs. 8,00,000 and 9.16 per cent farmers have annual income between Rs.2,00,01 to Rs. 4,00,000. The average annual income of selected farmers comes to Rs.1, 40,158 in Purna Valley.

Tayde (2011) carried out study on impact of watershed development programme on its beneficiaries in Buldhana district and reported that, annual income of beneficiaries in watershed of high group was 28.88 per cent and 11.66 per cent non beneficiaries.

Dahal (2013) found in his study that, BIP irrigation project has increase net income of farmers and this project also played a vital role to increase price of land too.

**2.1.4. Occupation**

Karpagam (2000) in his study on knowledge and adoption behavour of turmeric growers in Tamil Nadu reported that, majority of the respondents (71.66%) had only agriculture as their occupation, followed by agriculture and dairy (11.67%), agriculture + business (16.67%).

Kumar (2000) observed that higher percentages of farmers were practicing farming as their main occupation.

Mandal (2000) stated that the percentage of agriculture labour and service has decreased at present and the percentage of non-agricultural labour, non-government service has increased.

Pandey (2000) found that majority of the respondents (43.75%) practicing only one occupation. Similarly about 37.50 per cent were engaged in two occupations and only limited i.e. 18.73 per cent were engaged in more than two occupations in relation to adoption of rice production technology.

Sharma *et al.* (2000) found occupation has the significant correlation with the adoption level of crop production technologies.

Farooqui and Godse (2003) found the major population of the area was dependent on agriculture. They were having their own land or they were working on other field as labor.

Deshmukh *et al.* (2007) observed that majority of respondents (96.52%) having agriculture as their main occupation

Mohiuddin *et al.* (2007) revealed that agriculture was the main occupation of the selected farmers and 15.00% and 17.00% farmers have no secondary occupation in Patiya and Satkania respectively i.e. they are fully engaged in agriculture.

Yashomati Karande (2008) noticed that 57.55 per cent respondents were engaged in farming ,14.16 per cent in labour work , 10.00 per cent in service , 08.33 per cent in farming + business, only 03.33 per cent in business and 01.66 per cent engaged in labour work + farming.

Anonymous (2012) found that the major occupation of the study area was agriculture and business and the income of household is dominated by agriculture with 70.7 per cent.

Pooja Damodar (2013) observed that majority of the women respondents (56.66%) had farming as family occupation, farming followed by, farming + business (21.16%), farming + service (15.83%), farming + labour (05.83%) and farming + forest (02.00%) work as family occupation, respectively.

Shambharkar *et al.* (2013) found the occupation of farmers from agriculture plus labour was changed to agriculture and agriculture plus subsidiary occupation.

### 2.1.5 Farming experience

Amol (2006) conducted a study on indigenous technical knowledge about rice cultivation and bovine health management practices in Konkan region of Maharashtra and reported that, majority of the respondents (90.19%) had high farming experience (>20 years), while not a single respondent had low farming experience (up to 10 years) and 9.86 per cent of the respondents had medium farming experience.

Ghodeswar (2006) noticed that, more than half (55.00%) of respondents had experience of 4 to 6 years while 23.34 per cent of cultivars had experience of 7 years and above and 21.66 per cent of them had experience up to 3 years in pomegranate cultivation.

Swati Chitalkar (2007) observed that 45.00 per cent of beneficiaries and 41.25 per cent of non-beneficiaries had medium farming experience i.e. between 15 to 18 years.

Sindram (2008) carried out a study on analysis of organic farming practices in pigeon pea in Gulbarga district of Karnataka and reported that, majority of the farmers (69.17%) had low experience in farming and nearly one third farmers (30.83%) had high experience in farming.

Suresh (2008) in his study on technological gap in adoption of improved cultivation practices by soybean growers in Dharwad and indicated that, the majority of the respondents (58.67%) had medium farming experience (10 to 20 years), while 30.66 per cent of the respondents had high farming experience (more than 20 years) and 10.66 per cent of respondents had low farming experience.

Bhople *et al.* (2010) found that, near about three fourth (72.23%) of the beneficiary farmers having more than 10 yrs of experience in agriculture, it was followed by 17.77 per cent having 6 to 10 yrs of experience in agriculture and only 10.00 per cent had below 5 yrs of experience in agriculture.

Tayde (2011) conducted study on impact of watershed development programme on its beneficiaries and revealed that, farming experience of beneficiaries in watershed of medium category was 52.22 per cent and 76.67 per cent of non beneficiaries.

Anonymous (2013) evident from his study that less than half (47.50%) of the beneficiary farmers had farming experience ranging from 15 to 17 yrs followed by 32.00 per cent of the respondents were having above 27 yrs of experience and more than one fifth (21.00%) of the respondents were having farming experience up to 15 yrs.

### 2.1.6 Sources of information

Bhople *et al.* (1997) reported that 98.33 per cent and 95.83 per cent of the orange growers consulted friends, neighbours and progressive orange growers of Maharashtra respectively. This was followed by listening the radio broadcast, visit to the office of the village extension worker, contact with agro services centers and personal contact with Agricultural Extension Officer (AEOs), university scientists and participation on field days were the least consulted sources/channels.

Raghavendra (1997) in a study on knowledge and adoption behaviour of Arecanut farmers of South Canara district, in Karnataka state, revealed that 50.00 per cent of the arecanut growers consulted progressive farmers for cultivation practices of Arecanut followed by mass media sources, 25 per cent and institutional sources 20 per cent.

Kumar (1998) in his study on knowledge, adoption and economic performances of banana growers, revealed that a major proportion 50 per cent of the banana growers had consulted neighbours and friends to get information regarding Banana cultivation.

Ravindra *et al.* (1998) reported that, majority of women respondent 75.00 per cent had no any source of information from any organization while remaining had medium source of information.

Wagdhare *et al.* (1998) reported that village extension workers (VLWs) of training and visit system were the top most credible source and

information as perceived by the small farmers of the Maharashtra, followed by neighbours/friends, progressive farmers and TV.

Jyothil (2000) reported that input dealers were the most frequently consulted information sources followed by progressive farmer, TV, Extension personnel of private organization, friends, radio and Assistant Agriculture Officers (AAOs).

Singh (2000) reported that, majority of the respondents (65.00%) had no any cosmopolitness with agricultural agencies for information while remaining 35.00 per cent had good source of information.

Bindu Pullikken (2001) reported that sectional engineer was found to be important information source used by 49.33 per cent farmers beneficiary of Jawaharlal wells scheme regularly. The majority of respondents were also found to be contacting various sources of information.

Sonawane *et al*. (2001) conducted a study on utilization of communication sources by the farmers for seeking farm information and revealed that among the personal localite sources friends (90.62%) were the major source of information for the farmers followed by neighbourers (76.56%), relatives (60.15%) and progressive farmers (60.15%), whereas, among the personal cosmopolite sources Agricultural Assistant (96.87%) was the main source of information followed by university scientists (53.90%), Agricultural Officer (25.78%) and subject matter specialists (SMS) (21.87%).

Borse (2002) found that 54.55 per cent of the respondents were using medium sources of information where as 26.35 per cent of them had used low source of information, about 20.00 per cent of the respondent were using high source of information.

Chawane (2002) concluded that extension contact positive influenced the knowledge and adoption of soil and rain water management practices by the farmer.

Chonegowada (2002) reported that majority of women respondents, 78.00 per cent had no used any sources of information from any organization while remaining had medium level use of sources of information.

Ingle (2002) in a research work Impact of lift irrigation project on beneficiaries reported that sources of information was not significantly related with change in employment.

Jayalatha (2003) conducted a study on impact of commercial bank schemes on the growth of entrepreneurs and revealed that majority (65.22%) of the respondents used advertisement by banks as main source of information at middle level. Nearly 21.14 per cent and 35.71 per cent of them used the same source at high and low levels respectively.

Vidya Tayde (2003) revealed that sources of information were related positively and highly significant with change in production and productivity.

Rabindrajit *et al.* (2003) in their study conducted revealed that 50.00 per cent of the respondents seeking the information personally and 42.05 per cent of respondents seeking the information by impersonal sources.

Kulhal (2004) found that 56.67 per cent of the respondents were using medium sources of information, where as 25.00 per cent of them had used high source of information, about 19.00 per cent of the respondent were using low sources of information.

Dhakane (2005) observed that, 42.67 per cent of the grape growers had used medium level of sources of information.

Ambhore (2006) found that majority of respondents (47.33%) kept extension contact to a moderate extent.

Mate (2006) revealed that, 69.50 per cent of the respondents were using medium sources of information, where 20.00 per cent and 14.50 per cent of the respondent had used high and low sources of information, respectively.

Raghavendra (2007) A study on management practices of pineapple growers in Karnataka reported that Sources of information of pineapple growers, that, the majority were contacted with Assistant Horticultural Officers (66.25%), where as only (43.75%) of respondents have consulted once in a month and (22.50%) of them once in a year and remaining (33.75%) never consulted.

Thakur (2007) pointed out that, among the sources majority of the respondents found to be contacting the other sources (80.00%) like progressive farmer, village leader, etc. The respondents were conducting Gramsevak 78.67 per cent, Agriculture Assistant 64.66 per cent and Taluka Agriculture Officer 49.67 per cent sometime seeking information about soil and water conservation technology.

Wankhede (2008) reported that majority i.e. 54.54 per cent of the banana growers had medium use of information sources.

Mande and Nimbalkar (2010) reported that source of information showed positive and highly significant correlation with training need of farm women.

Kale *et al.* (2011) reported that the cent percent (100.00%) of the selected farmers having low extension contacts level in Purna command area in Vidarbha region of Maharashtra.

Anonymous (2013) concluded that majority of the respondents (69.16%) were having medium level of sources of information followed by 16.67 per cent of them who were under low level and only 14.44 per cent were observed in high level of sources of information.

### 2.1.7 Sources of irrigation

Rathod (2005) conducted study in Melghat area to find out the impact of watershed development programme on tribals of melghat and reported that, 77.50 per cent of the sugarcane growers irrigated the field from open well followed open well and bore well (20.00%), open well and nala (25.00%).

Narayanmurthy (2006) reported that coverage of irrigation in Vidarbha region is only 14.00 per cent of total cropped area.

Mohanty (2009) revealed that the large area of Vidarbha remained agriculturally backward owing to absence of any irrigation and due to erratic mansoon as compared to Western Maharashtra.

Meena *et al.* (2012) in their study on watershed technology in arid zone of Rajasthan inferred that the poor irrigation facilities among crop

production were most important impediment. This might be due to non-availability of ground water for irrigation because water level has gone down.

Mankar *et al.* (2013) concluded that, majority 77.00 per cent of respondents had well, 12.00 per cent had no source of irrigation whereas, 07.00 per cent, 03.00 per cent and 01.00 per cent respondents had canal, tube well and river as source of irrigation respectively.

Kale *et al.* (2013) revealed that, 52.50 per cent respondents had tube well, 43.33 per cent had no source of irrigation, 02.50 per cent had river and 01.67 per cent respondents had canal as a source of irrigation respectively.

### 2.1.8 Method of irrigation

Suhas L. Ketkar (1989) found that beneficiaries in lower catchment area mostly useed drip irrigation method to avoid water loss.

Kumar *et al.* (2003) found in their study that the use of drip or sprinkler irrigation system has resulted in economical use of precious irrigation water and rainwater harvesting along with the entire range of watershed development measures like, check dams and sub-surface dykes proved to be the best measures to recharge the groundwater.

Majumdar (2004) in his study pointed out that different methods used by the the beneficiary farmers such as surface irrigation, subsurface or sub irrigation, overhead or sprinkler irrigation, drip irrigation.

Santu Sangar (2005) examined that the irrigation plays a significant role in the agricultural development and drip irrigation was mostly preferred by farmers as it has many advantages.

Maraddi (2006) observed that with 76.11 and 78.88 per cent of the respondents having full knowledge regarding application of irrigation once in 10 to 15 days through furrow method, while 17.77 per cent and 17.22 per cent of respondents having partial knowledge regarding application of irrigation once in 15 to 20 days through alternate furrow method.

Vairavan K. (2010) found that by adopting the ‘Drip Irrigation Technology in Sugarcane’, the farmers could save water up to 50.00 per cent

and achieve higher yield of 60 tonnes per acre and hence they preferred drip irrigation method.

Bhagyawant *et al.* (2012) observed that small land holders to marginal farmers prefer drip irriation system for irrigation.

Pawar and Patil (2013) found that majority (56.00%) of the beneficiary farmers were using drip irrigation method.

Shambharkar *et al.* (2013) found that large majority (87.78%) of beneficiary farmers were irrigated their land by sprinkler method of irrigation followed by drip (12.22%).

**2.1.9 Type of land**

Koshti *et al.* (2007) found that out of 415 ha agricultural land possessed by the respondents. They perceived that 42.41 per cent soil of land they possessed was medium, 39.28 percent perceived their soil are heavy and remaining area of 18.31 per cent ha was light and shallow.

Pawar and Patil (2013) found that 40.00 percent of beneficiary farmers were having very deep type of land followed by deep and moderately deep type of land

**2.1.10 Land under irrigation**

Sakhare (1998) reported that 53.34 per cent grape growers had medium hectars of area under drip followed by 10.66 and 36.00 per cent had large and small area respectively.

Eligar (1999) observed that majority (69.17%) of drip adopters had area upto 1.00 ha irrigated through drip irrigation system.

Kale (2000) found that majority (56.00%) of the drip adopters had medium area under drip followed by one third (36.00%) of adopters had small area under drip irrigation.

Gurav (2000) observed that 42.15 per cent of the respondents had medium ha of area under drip irrigation, followed by small (34.31%) and large (23.34%) area under drip.

Anupama Adhau (2003) in research work at Jamwadi Iiirigation Project revealed that, 43.67per cent of the beneficiaries had put 2.51 to 5.00 acres of land under irrigation.

Nandre and Dhakane (2003) observed that majority (60.00%) of the respondents had 0.7 to 1.0 ha area under drip irrigation.

Swati Gawande (2003) revealed that, area under project was found positive and highly significant with change in employment.

Narayan Moorthy (2006) reported that coverage of irrigation in Vidharbha region is only 14.00 per cent to total cropped area.

Bannapure (2007) observed that about two third (69.09%) of the respondents belonged to medium size area under drip irrigation, whereas, 16.36 per cent and 14.55 per cent respondents possessed small and large area under drip irrigation respectively.

Patil (2007) found that 11.25 per cent of the users of drip irrigation system for grape orchard had small area under drip, whereas 66.25 per cent and 22.50 per cent of them had medium and high area under drip irrigation system respectively.

Shambharkar *et al.* (2013) conducted in his history on impact of farm pond on beneficiary farmers during 2012-2013 as RRC project which was presented and revealed that more than half (58.00%) of the beneficiary farmers were having area underirrigation in the range of 1.61 to 3.20 ha followed by 30.00 per cent of the respondents who were having irrigated area above 3.20 ha and 1.60 ha (12.00%) were having area under irrigation

Pawar and Patil (2013) found that 22.00 per cent beneficiary farmers were having their small land holding under irrigation followed by semi medium, marginal, medium and large land holding.

### 2.1.11 Economic motivation

Ramesh Babu (1987) in a study on grape growers of Bangalore and Kolar districts in Karnataka, observed that 38.33 per cent of respondents had high economic motivation, whereas, majority of respondents (61.67%) had low level of economic motivation**.**

Srinivasareddy (1995) reported that 40.00 per cent of the mango growers had high level of economic motivation followed by medium (34.0%) and low (26.0 %) economic motivation.

Chowdary (1997) inferred that 68.33 per cent of farmers had medium economic motivation followed by 16.67 per cent and 15.00 per cent under low and high economic motivation, respectively in a study on KVKs.

Reddy (1997) concluded that 48.00 per cent of the diversified farmers had medium economic motivation followed by low (32.67 %) and high (19.33 %) economic motivation, respectively.

Reddy Gurava (1998) conducted a study on impact of training programmes of Agricultural Marketing as a follow-up activity of KVK in Chittoor district of Andhra Pradesh noted that majority of farmers (76.67%) had medium economic motivation followed by low (15.83 %) and high (7.50%).

Chandra (2001) observed that majority of paddy growers had medium level of economic motivation.

Chavai *et al.* (2003) observed that, 45.94 per cent youths were getting employment in their for 240 to 300 days while 37.84 per cent were getting work for 180 to 240 days and 16.72 per cent was employed for above 300 days in a year.

Reddy Prasad (2003) concluded that majority of the rice farmers (64.90%) fall under medium economic motivation followed by low (19.20%) and high (15.90 %).

Deokar (2008) found that majority of respondents from both categories of beneficiary and non-beneficiary farmer were found in medium level of economic motivation.

Dhruw (2008) found that 79.16 per cent respondents had medium level of economic motivation, while 11.68 per cent and 9.16 per cent respondents had high and low level of economic motivation respectively.

Sharnagat (2008) indicated that, majority of the respondent beneficiaries (75.33%) had medium level of economic motivation, followed by

16.67 per cent and 8.00 per cent of the respondent beneficiaries had low and high level of economic motivation, respectively.

Shendge (2010) revealed that 66.67 per cent respondents had medium economic motivation, followed by 22.50 per cent and 10.83 per cent were having medium and high economic motivation.

Devarani and Bandhyopadhyay (2012) revealed that the majority of the farmers had low economic motivation.

Yadav *et al.* (2012) noted that most of the respondents (42.50%) had medium economic motivation followed by high (30.00%) and low (27.50%) level of economic motivation.

Rathod *et al*. (2013) reported that, 59.00 per cent farmer were having medium whereas, 30.00 per cent and 11.00 per cent were having low and high economic motivation respectively.

Shambharkar *et al.* (2013) concluded in his study on impact of farm ponds on beneficiary farmers during 2012-2013 as a RRC project which was presented and submitted in April 2013 and revealed majority (73.73%) of bebeficiary farmers, respondents were found to be included in the medium category of economic motivation followed by 16.67 per cent of them were in low category of economic motivation.

Thatchinamoorthy and Selvin (2014) found that the majority of the SRI farmers (87.50 per cent) had medium to high level of economic motivation behavior and the remaining 12.50 percent of the SRI farmers had low level of economic motivation behavior.

**2.1.12 Scientific orientation**

Ajay Kumar (1989) reported that 56.00 per cent of the grape growers of Rangareddy district had high level of scientific orientation, whereas 21.00 and 23.00 per cent of the respondents had medium and low levels of scientific orientation, respectively.

Sakharkar (1995) observed that majority (65.34%) of soybean growers of Nagpur district belonged to medium category of scientific

orientation, 17.33 per cent of the farmers belonged to both low and high scientific orientation category.

Saravana kumar (1996) found that majority (70.00%) of the mango growers of Dharmapuri district were in the medium scientific orientation category followed by low (15.83%) and high (14.17%) category.

Chandran (1997) reported that 31.67 per cent of the respondents belonged to the low scientific orientation category, while 30.00 per cent and 38.33 per cent of them were found to have medium and high scientific orientation, respectively.

Kale (2000) observed that 63.00 per cent of the drip adopters belonged to medium scientific orientation category followed by 22.00 per cent of them belonged to low scientific orientation category and 15.00 per cent of the drip adopters belonged to high scientific orientation category.

Karpagam (2000) reported that majority of the respondents (75.00%) were in medium category followed by low category (13.33%) and high category (11.67%) with respect to scientific orientation.

Bhosale (2003) concluded that above half (50.67%) of the respondents of orange grower had medium level of scientific orientation,while 25.37 per cent and 24.00 per cent of respondent possessing low and high level of scientific orientation respectively.

Patel (2005) revealed that, half of the respondents had medium level of scientific orientation.

Ganeshprasad (2006) indicated that majority of the turmeric growers in Chamarajnagar district had high scientific orientation (48.33%).

Patil (2007) found that about 15.00 per cent of the users of drip irrigation system for grape orchard had low level of scientific orientation. However, 61.25 per cent and 23.75 per cent of them had medium and high level of scientific orientation respectively.

### 2.1.13 Innovativeness

Prajapati (1993) concluded that majority (72.00%) of the beneficiaries of social forestry programme had medium level of innovativeness.

Padmaih and Rao (1997) found that innovativeness was positively correlated with the attitude towards Integrated Watershed Development Programme.

Chikhale *et al.* (2002) studied on impact of training imparted by KVK on dryland agriculture techniques revealed that majority of trainees belong to medium level of innovativeness.

Shashidhara (2003) in his study a study on socio-economic profile of drip irrigation farmers in Dharwad and reported that the distribution of high innovativeness was noticed by 52.22 per cent of farmers followed by 31.11 per cent of them having medium innovativeness. The remaining 16.67 per cent of the farmers were found to exhibit low innovativeness.

Mapari (2005) observed that, in his study technological consequences of integrated watershed development programme on beneficiaries in Akola district, nearly half of the respondent's beneficiaries of integrated watershed development programme (50.37%) had medium level of innovativeness followed by 47.41 per cent having low innovativeness.

Rathod (2005) in his study on knowledge and adoption pattern of improved sugarcane practices in Bidar district noted that the respondents were distributd at 33.33, 52.50 and 14.16 per cent for low, medium and high innovative proneness category, respectively.

Reddy (2005) in her study on a study on knowledge, extent of participation and benefits derived by participant farmers of the watershed development programme in Raichur district of Karnataka and revealed that, majority of the respondents (82.00%) belonged to medium innovativeness category, whereas, 11.03 per cent and 06.66 per cent of them belong to high and low level of innovativeness categories, respectively.

Tamilselvi *et al.* (2008) in his study on entrepreneurship development among rural women found that more than half of the

respondents (52.00%) had high level of innovativeness followed by medium (33.00%) and low (15.00%) level of innovativeness.

Shendge (2010) found that 24.17 per cent respondents were having low, 72.50 per cent were having medium and only 03.33 per cent were having high innovativeness.

Yadav *et al.* (2013) study on techno-economic changes among the farmers in relation to watershed development programme in Maihar block of Satna district (M.P.) and revealed that, a fairly half of respondents (50.00%) were in the medium innovativeness category. Whereas (27.50%) of respondents had high and (22.50%) respondents had low innovativeness.

**2.1.14 Frequency of irrigation in a year**

Nayak (2007) revealed that 70.62 per cent of the respondents having the knowledge about time lag between first irrigation and subsequent irrigation.

Andarzian *et al.* (2011) showed that, highest grain yield could be obtained by applying four irrigation at sowing, tillering, stem elongation and flowering.

Pawar and Patil (2013) observed that half of the beneficiary farmers (50.00%) were using 4 to 5 frequencies of irrigation followed by 2 to 3 frequencies of irrigation (39.00%) and 11.00 per cent were using above 5 frequencies of irrigation.

**2.1.15 Irrigation potential**

Sundar and Rao (1981) observed that in order to improve the utilization of irrigation potential they suggested proper maintenance of the main canal and distribution system above the pipe-outlet, development of field channels and adoption of a rotational system.

Patil (1983) in his project on 'Irrigation Scheme and Small Farmers' studied Masuda in Ajmer District shows that Lift Irrigation Scheme has helped the small farmers in terms of bringing more area under irrigation.

Hazra (1993) in his study on management of rainwater resources on watershed basis for sustainable agriculture production –An

experience of Tejpur watershed found that watershed programme has helped to increase the irrigation potential by farmers, which definitely helped to increase the productivity of crops.

Navadkar *et al.* (2003) observed that in India, tremendous development has been witnessed through the successive Five Year Plans by developing the irrigation potential.

Pawar and Patil (2013) observed that majority of the beneficiary farmers (61.00%) were having their small land holdings under irrigation followed by semi medium, marginal, medium and large land holding.

### 2.1.16 Distance of dam

Easter and Martin, (1977) viewed in the title on 'Water Resource Problems in Developing Countries' that the location of the villages from the main canal happened to be the main factor influencing the cropped area and in turn the cropping intensity.

Ramakrishnan and Sivanantham (1989) found that majority (53.00%) of the beneficiaries possessed their land holdings in upper catchment area; where as 47.00 per cent of their land holdings were in lower catchment area.

Muni Kishore (2006) revealed that majority (55.31%) of beneficiaries possessed their lands in upper catchment area; where as 44.69 percent of their lands were in lower catchment area.

## 2.2 Dependent Variable

The dependent variable for the study is impact of Wan irrigation project on beneficiary farmers.

### 2.2.1 Impact of Wan irrigation project

The impact of Wan irrigation project was studied in terms of agriculture development and socio-economic development.The referances of past studies pertaining to this variable has been presented below.

#### 2.2.1.1 Agriculture development

Agriculture development has been studied in terms of cropping pattern, cropping intensity and productivity of major crops.

#### 2.2.1.1.1 Change in cropping pattern

Korde (2001) concluded that, majority (76.00%) of the beneficiaries and non beneficiaries (72.00%) belonged to medium cropping pattern category. There were 22.00 per cent of the beneficiaries and 08.00 per cent of the non beneficiaries, in high cropping pattern category. Only 02.00 per cent of the beneficiaries and 20.00 per cent of non beneficiaries were in low cropping pattern category.

Diwate *et al.* (2002) found that, wide range of crops like paddy and horticultural crops like mango, cashew were grown by beneficiary group as compared with non beneficiary group.

Bhange *et al.* (2005) found that in kharif season area under bajara had decreased by 30.66 per cent while it had increased in maize by 21.82 per cent followed by tomato (06.00%).In rabi season major increases in area was observed in gram and wheat crop by 15.66 per cent and 10.06 per cent respectively and there was slight decrease in area under jowar (04.66%).In summer season significant increase in area under groundnut and onion crop was observed. Further it was also noticed that flowers and fruit crops were replacing other crops.

Rajeswari Desai (2005) revealed that majority construction of farm pond had brought about perceptible change in cropping pattern by increasing area under rabi cropsabout30.18 per cent in case with farm pond compared to without farm pond (13.05%)

Jugale (2006) observed that, the basic crops before watershed development programmes in the region consist of cereals and pulses like bajra, jowar, tur, matki, mung etc. But, after watershed development programmes there was change observed in cropping pattern.

#### 2.2.1.1.2 Change in cropping intensity

Bagi (1981) viewed in the article on ‘Economics of Irrigation in Crop Production in Haryana’ that irrigation makes possible to grow crops all year around and hence can increase the cropping intensity. Fourth, cultivation of better quality and high value crops may become feasible. Therefore, the

development of irrigation infrastructure is nothing less than an agricultural revolution.

Patel (1982) in his book on 'Inputs Productivity in Agriculture with an Emphasis on Irrigation and Farm Size' found a positive relationship between cropping intensity and irrigation; and between cropping intensity and farm size. The introduction of irrigation (Mayong Lift Irrigation Project) has significantly raised the crop intensity. The average crop intensity in the lands within the command area for sample beneficiaries increased from 131 per cent in 1967-68 to 151 per cent in 1968-69. But it remained constant (106%) for the land outside the command area. It was also found that it was the lowest (110%) for the smallest group and the highest (159%) for the largest group. In Yeshwanth's study, the intensity of cropping is 100 per cent in the case of dry farms whereas it is 168 per cent in the case of pumpset owners. This indicates a positive relationship between the intensity of cropping and irrigation.

Ramakrishnan and Sivanantham (1989) in the research article on 'Water Use Pattern in Tambaraparani Irrigation System' viewed that water is a crucial input resources in crop production. The study made at the head and tail reach situated farmers of the Tambaraparani irrigation system revealed that the cropping intensities were 300 per cent and 260 per cent in the head and tail reaches respectively.

Anonymous (2001) found in his study at Kokrigunda watershed in Orissa, cropping intensity has increased from 100.00 to 117.00 per cent over the last four year.

Rathod (2003) conducted study on impact of watershed development programme on tribals of melghat and observed that 59.25 per cent small farmers, 58.38 per cent medium farmers and 45.33 per cent large farmers did not find any change in their cropping intensity. On the whole a change of 25.00 per cent was seen in case 33.33 per cent respondents had changed their cropping intensity.

Bhople *et al*. (2004) study on impact of watershed development programme on cropping pattern and crop production in Akola district and

observed that, cropping intensity of beneficiary and non beneficiary farmers of watershed was 156.61 per cent and 106.27 per cent, respectively.

Bhange *et al*. (2005) found that the cropping intensity was maximum in rabi season, 244.05 hectares land was brought under crops followed by 37.85 ha in summer season and very negligible 20.10 ha in kharif season. The overall increase in cropping intensity was 22.27 per cent.

Mapari (2005) study on technological consequences of integrated watershed development programme on beneficiaries in Akola district, and observed that, very large proportion of respondents (97.78%) showed low changes in cropping intensity.

Rajeswari Desai (2005) observed that the gross cropped area was more in case of with farm pond (110.04 ha) compared to without farm-pond (89.96 ha). The area under double cropping (30.18%) has also increased with farm-pond as compared to without farm-pond (13.05%) mainly because of better conservation of residual moisture in the rabi season due to construction of farm-ponds. As a result, cropping intensity enhanced (141.42%) in case of with farm pond.

Narendra and Chandrasekar (2007) have analysed in the title on ‘Impact of Irrigation on Employment’ on the basis of micro study that irrigation reduces the risk and uncertainty inherent in the rain fed cropping. Irrigation has a stabilizing impact on agriculture and generates farm employment through higher levels of cropping intensity.

**2.2.1.1.3 Change in cropping productivity**

Bagi (1981) viewed in the article on ‘Economics of Irrigation in Crop Production in Haryana’ that irrigation primarily reduces the uncertainty of crop production and consequently increases agricultural productivity in a number of ways.

Patil (1983) in his project on ‘Irrigation Scheme and Small Farmers’ studied Masuda in Ajmer District shows that Lift Irrigation Scheme has increasing cropping intensity and increasing crop productivity per acre. The per acre productivity of various kharif and rabi crops increased during the post investment period.

Rajput *et al.* (2000) opined that watershed development programme should integrate with multi-disciplinary management to take up soil and water conservation activities, generation of irrigation facilities, construction of water harvesting structures for multiple uses, animal husbandry, horticulture, farm forestry and afforestation, which were necessary to maximize production on sustained basis for overall development of the area.

Naidu (2001) in his study on Vanjuvankal watershed of Andhra Pradesh noticed that there was an increase in the double cropped area in the watershed. The farmers shifted towards commercial crops and agricultural productivity was higher. The net returns of farmers growing commercial and horticultural crop increased substantially and varied from Rs. 5000 to Rs. 8000 per hectare.

Rathod (2003) study on impact of watershed development programmes on tribals of melghat and observed that above one third of the respondents from all land holding groups experienced 51 to 100 per cent increase in their agricultural productivity after WDP.

Koregoudar *et al*. (2004) studied the impact of soil and water conservation measures in dudligi watershed of Karnataka and indicated that there has been positive impact of soil and water conservation measures on watershed basic including check dams, nala bunding, farm ponds etc. on resource conservation and productivity.

Rajeswari Desai (2005) revealed that change in crop yield over without farm-pond was significance in case of maize (7.43 q/ha) followed by paddy (4.60 q/ha) indicating that paddy and maize were highly responsive for water and overall change in crop yield which vary from 16 per cent to 41 percent.

Bhange *et al*. (2005) observed that, in their study Bugewadi, Chilwadi and Pimpalgaon ujani watershed that change in crop productivity was maximum in tomato (47.00 q/ha) followed by onion (45.78 q/ha). The vegetable crops have dominated other crops in crop productivity. In other crops, change in crop productivity was observed in maize (11.30 q/ha)

followed by gram (7.17 q/ha) and jowar (6.45 q/ha) while very less change in crop productivity was observed in mung (2.18 q/ha), pea (2.25q/ha) and tur (2.50q/ha).

Shivanappan (2005) study on impact assessment of watershed development works in ground water recharge in Kissan world and reveled that, crop productivity of major crops had increased from 21.9 per cent to 31.7 per cent for sorghum and 109 per cent for maize after the implementation of watershed development in the watershed area.

Chandracharan *et al*. (2007) conducted a study on the effect of watershed practices on crop productivity and the study revealed that the production of paddy crop in the area increased by 25.00 per cent after adoption of watershed technology.

Chauhan *et al.* (2009) study on implication of watershed in bringing change in the cropping system and its productivity in Jammu district and revealed that , the crop productivity of all crops increased in the range of 15.56 to 77.78 per cent; the productivity of vegetable crops significantly increase such as in onion 60.00 per cent , radish 35.71 per cent , chilly 28.57 per cent and potato 23.53 per cent after establishment participatory watershed; the productivity of citrus increased up to 52.00 per cent, whereas 27.00 per cent area under mango and guava plantation increased after establishing of watershed-2.Similar trend was also noticed in the productivity of fruit plants. Productivity of citrus was also noticed in the productivity of fruit plants. Productivity of citrus was 50q/ha before watershed but later it went up to 75q/ha.

Tayde (2011) study on impact of watershed development on its beneficiaries in Buldhana district and showed that medium change in cropping productivity in wheat and gram respectively of 44.66 per cent, 50.00 per cent of non beneficiaries respectively.

Anonymous (2013) observed that all the crops showed change in average productivity in positive direction i.e. increase in productivity. Majority of kharif and rabi crops showed increase in average productivity. In Kharif crops cotton and soybean there was maximum increase i.e. 122.94 per

cent and 97.33 per cent average productivity over base year, followed by followed by sorghum and green gram where the increased productivity were observe as 46.60 and 20.47 per cent respectively. In case of black gram increased productivity was very less.

### 2.2.1.2 Socio-economic development

The socio-economic development has been studied in terms of socio-economic status parameters viz. change in occupation, change in land holding, change in family education, change in annual income, change in socio-political participation, change in expenditure pattern and change in economic empowerment.

#### 2.2.1.2.1 Change in occupation

Rajeswari Desai **(**2005) observed the employment generation in with farm pond (344.33) was high compared to without farm pond (329.85) with a percentage increase of 4.08 per cent. From different sources of employment, agriculture (05.59%) followed by animal husbandry (01.66%) generated more number of man-days with farm pond area.

Shambharkar *et al.* (2013) conducted his study on impact of farm pond on beneficiary farmers during RRC project which was presented and submitted in April 2013 and revealed noted that prior farm ponds 63.33 per cent beneficiaries were having agriculture as their main occupation, followed by 36.67 per cent of them were having agriculture plus labour as their main occupation. After construction of farm pond the percentage of agriculture occupation reduced down (55.56%) because of entrance of the farmers in agriculture plus subsidiary occupation. Prior to agriculture plus subsidiary occupation but after construction of farm ponds there was magic and more than one fourth (28.89%) were possessed agriculture plus subsidiary occupation. The per cent change in overall occupation after construction of farm ponds was observed at 30.67 per cent.

Suvarna Ingole (2013) reported in her study that prior to farm pond maximum number of respondents (61.66%) were having agriculture as their main occupation followed by 38.33 per cent of them were having agriculture plus labour.After construction of farm pond the percentage of

agriculture and agriculture plus labour reduced down to (55.83%) and (15.83%) respectively because of entrance of the farmers in agriculture + subsidiary occupation and agriculture respectively.Prior to construction of farm ponds none of the respondents were having agriculture + subsidiary occupation but after construction of farm ponds there was miracle and more than one fourth (28.33%) were possessed agriculture + subsidiary occupation.

**2.2.1.2.2 Change in land holding**

Raju *et al.* (1995) indicated that the selected beneficiaries had low income due to low employment days, lower size of land holding in the year 1988 -89 but later on JRY significantly contributed to income increase of beneficiaries in the selected Panchayats.

Pawar and Patil (2013) observed that there was positive change in land holding after construction of irrigation project.

Biswajit Monda (2011) found that positive change in land holding of large farmers due to irrigation.

**2.2.1.2.3 Change in family education**

Aruna Katole (2001) noticed that one third of SHGs members (36.67%) were educated upto high school level.

Tejaswini *et al.* (2004) observed that percentage of illiterate among women was upto 55.00 per cent and those who had primary and middle school education was 20.00 per cent.

Vidhya Gunjkar (2005) revealed that education was significant correlation with social and political empowerment and further stated that one third (32.00%) of the respondents were educated upto high school level.

Bharatamma *et al.* (2006) and Vidya Tayde (2006) indicated that education showed highly significant relationship with women empowerment.

Kulhade (2007) stated that over two third of the respondents (68.00%) had low change in their family education, followed by 14.66 per cent who had no change in their family education, , followed by 10.66 per cent of the respondents had medium change at their family education, followed by 06.66 per cent had higher change in their family education.

Ektapure (2007) reported that 40.00 per ent of the respondents were educated upto high school level followed by 24.66 per cent was educated upto college level.

Gunjal (2007) pointed that one third of respondents of SHGs members reported middle school level.

Mankar *et al.* (2007) observed that one fourth of the women members of self help group were educated upto high school level followed by middle school level (23.75%).

Sarada *et al.* (2007) showed that 27.70 per cent of SHGs women member were functionally illiterate and only 10.00 per cent of them had college level education.

Komal Kashid (2008) observed that nearly one-third of the women members of the self help group were educated upto college level.

Sujata Deokar (2008) inferred that 46.67 per cent of the respondents from the both beneficiary and 36.67 per cent of non-beneficiary of farmers' field school were educated upto high level.

Preeti Todasam (2008) reported that 41.33 per cent soybean grower were educated upto high school level of education.

Ashwini Shintre (2009) observed that nearly one third of the women members of the self help group were educated upto college level.

Feroze and Chauhan (2010) revealed that majority of the member (59.00%) were illiterate. Only 10.83 per cent of the members had acquired secondary level of education while none of the respondents had undergone higher secondary education in the study area.

Tayde (2010) revealed that 76.67 per cent of the respondents cotton grower had received secondary school education while 10.00 per cent of them received primary level of education.

Tilekar (2010) reported that higher percentage of the soybean grower (34.00%) had high school level of education, followed by 24.00 per cent of the soybean grower were educated upto college level and few per cent of soybean grower (06.00%) were illiterate.

Kale *et al.* (2014) observed that more than one third of the respondents (35.83%) were educated upto high schoollevel, followed by 26.68 per cent had higher secondary school education.

Khedkar and Dhakad (2014) found that, there were highly significant relationships of education of respondent with impact of SGSY.

Bhosale (2014) found that 37.78 per cent of beneficiary farmers had high school level education while, 26.67 per cent had college level education.While, 22.22 per cent of respondents had middle school education.

Lad and Deshmukh (2014) reported that, majority (58.67%) of the respondent had secondary school level education, followed by 26.00 per cent primary school level whereas 10.67 per cent higher secondary level and 04.66 per cent had college level education.

Neeta Wadetollu (2016) reported that majority of the trainees (43.33%) and non-trainees (45.00%) were educated upto higher secondary school level.

**2.2.1.2.4 Change in annual income**

Saikia (1982) in the article on 'Impact of Lift Irrigation on Small Farmers of North-East Region' studied the impact of lift irrigation in Assam. He concluded that one-year after the irrigation project, the percentage of area under traditional paddy decreased from 54.00 per cent to 22.00 per cent, whereas the area under high yielding varieties of paddy increased from 2% to 32%. The average per hectare yields of hybrid varieties of paddy increased from 1306 kg to 2199 kg. After implementation of irrigation project and the adoption of improved methods, the per family annual average income from agriculture increased from Rs.2,737/- to Rs.4,018/-.

Mehta and Joshi (1993) indicated that there has been substantial increased of 27.06 per cent in the income of the families covered under IRDP.

Rathod (2003) study on impact of watershed development programmes on tribals of melghat and observed that, above half of the respondents in small, medium and large category of farmers could increase

their income only up to (50.00%) mean increase in annual income was found to be (50.94%).

Reddy *et al.* (2003) in their study while studying on watershed in semiaride region of Andhra Pradesh observed that per capita income increased from Rs.1443 in 1984-85 to Rs 1917 in 1984-85 in post project period.

Mapari (2005) study on technological consequences of integrated watershed development programme on beneficiaries in Akola district and observed that, the majority of the respondents (62.96%) were observed low change category of income followed by (31.85%) of respondents in medium change in income.

Rajeswari Desai (2005) found that household average net income generated with farm pond (Rs. 16,748.85) was found to be relatively higher than that of without farm pond (Rs. 11,300.65).

Kulhade (2007) revealed that majority of the respondents (93.34%) could have medium change in annual income due to soybean production.

Desai *et al.* (2007) conducted an impact assessment study of farm pond in Dharwad district revealed that the gross cropped area increased by 22.32 per cent in case of with farm pond area over without farm pond area. The household average net income generated with farm pond was found to be higher than that of without farm pond.

Shambharkar *et al.* (2013) observed that relatively higher proportion (47.78%) of the beneficiary farmers, in before category were having their annual income up to Rs. 90,000/- followed by 17.78 per cent in category of above Rs. 180000/-, whereas 16.67 per cent were having annual income ranging from Rs,50,001 to 180000/-. Little more than one tenth of the beneficiary farmers (11.11%) were having their annual income ranging from Rs.90001 to 12000 and only 8.89 per cent were found in the range of Rs. 120001 to 150000/- category of annual income. After the construction of farm ponds majority of beneficiary farmers (70.00%) were having their annual income more than Rs. 180000/-, followed by 11.11 per cent beneficiaries

found in the category of Rs. 150001 to Rs. 180000, whereas equal proportion of the respondents (07.78%) were having their annual income in the range of up to 90000 and 120001 and 150000. The per cent change in annual income after construction of farm pond was 99.27 per cent.

Suvarna Ingole (2013) reported in her study that after construction of farm ponds majority of beneficiary farmers (86.87%) were having their annual income more than Rs. 180000/- followed by 7.50 per cent beneficiaries found in the category of Rs. 150001 to Rs. 180000, whereas equal proportion of the respondents (7.50%) were having their annual income in the range of up to 90000 and 120001 to 150000.Comparatively very less percentage of beneficiary farmers were observed in income category of Rs. 90001 to 120000 after construction of farm ponds.

**2.2.1.2.5 Change in socio political participation**

Dongerdive (2002) stated that majority (77.33%) of the chilli growers had membership in more than one organization, followed by 08.00 per cent and 04.00 per cent of the respondents who had membership in one organization. While,10.67 per cent of them were holding the position in organization.

Shashidhar (2003) conducted a study on drip irrigation farmers of Davanagere and Shimoga districts and revealed that 45.83 per cent of the respondents participated in group meetings followed by exhibitions (41.66%) and 18.33 per cent of them participated in krishimela.

Kumar (2004) from his study on tomato growers of Belgaum district revealed that 23.00 per cent of respondents participated regularly in agricultural exhibitions, followed by 20.83 per cent in demonstrations. Majority of them never participated in activities like trainings (66.67%), educational tours (94.17%) and field visits (92.05%).

Mewara and Pandya (2007) revealed that 44.00 per cent and 38.00 per cent of tomato growers were found to have membership in more than one organization and one organization, respectively. However, 18.00 per cent of them had no membership in any organization.

Shashidara *et al.* (2007) concluded that social participation has non-significant association with adoption, while remaining independent variables exhibited positive association.

#### 2.2.1.2.6 Change in expenditure pattern

Gopalappa (1996) studied consumption expenditure of farmers in Karimnagar district of Andhra Pradesh.The study revealed that consumption expenditure was Rs. 4323 of marginal farmers and Rs. 4656 of small farmers per household per year.

Doss (1999) in his study on testing among the models of intra household resource allocation quoted in 1991-1992 household survey of Ghana shows that the share of assets owned by women has a significant impact on household expenditure decisions.

Velgu (2001) in his study on role of migration in four villages in Mahaboobnagar and Anantpur districts in Andhra Pradesh Rural livelihood programme (APRLP), Hyderabad, reported that a total annual expenditure of Rs. 11750 and Rs. 16100 were observed in rural households of Srikakulum and Mahaboobnagar districts of A.P respectively.

Narayanamoorthy (2006) cleared that the average annual consumption expenditure of the farmer households (ACEFH) for the Maharashtra was Rs. 32268/-. The ACEFH has exceeded the annual income (Rs. 29556/-) of the farmer households in Maharashtra. This clearly suggests that Maharashtra farmers are in economic distress and the income that they get from all sources is not even enough to meet the consumption expenditure of the households.

Kulhade (2007) revealed that about half of the respondents (50.67%) could have low change in their family expenditure on various items followed by 46.64 per cent could have medium change in their family expenditure pattern.

Rathod (2007) in his study on sustainable livelihood of the lambani farmer in Hydrabad Karnataka reported that only (03.33%) had the lowest annual expenditure of Rs. 8640 and the highest expenditure was Rs. 48500 by lambani farmers (10.67%). Majority of farmers come under medium

expenditure category (Rs. 9701-19400), moderately high (20.00%) with an expenditure of Rs. 19401-29100, about10.67 per cent were in high expenditure category (Rs. 29101-38800), 3.3 per cent with low expenditure and very high (02.67%) with an expenditure of Rs. 38801.

**2.2.1.2.7 Change in economic empowerment**

Ramlingam *et al.* (1987) stated that the socio-economic status of both marginal farmers and agricultural labours increase from low to medium status after participation in IRDP. The increase socio-economic status was due to the additional income they derived by the milch animals. which the beneficiaries purchased under IRDP. There was no increase in status among farmers already belonging to high level economic status group.

Gowda (1988) indicated that, the socio-economic status, land productivity and annual income of the small and marginal farmers have increased to a considerable extent as a result of technology used through watershed development programme.

Kashyap and Singh (1991) revealed that majority of the respondents belonged to lower-middle class (50.00 %) of socio-economic status and the lower class (30.00 %) of socio-economic status.

Soundarapandian (1992) showed that with the change in the average annual income of Rs. 852 /- per house hold 90.00 per cent of the beneficiaries crossed the poverty line after the implementation of the NREP.

Patel *et al.* (1995) concluded that great majority 75.93 per cent, 87.50 per cent, 79.76 per cent and 81.43 per cent of the marginal, small, big and pooled sample farmers had medium level of techno-economic change, respectively.

Marothia (1996) during impact study observed that, although the share of non-farm employment was increasing with varying degree, the agricultural sector still continued to remain an important sector for rural employment.

Hazarika (2009) observed that almost 70 to 80 per cent of sample workers had meaningful income, other than unpaid family work after NREGA. Majority of the workers felt that they were now in better position to

fulfill their own requirements without looking at others. Nearly 65 to 70 per cent women workers attended Gram-sabha meetings held in connection with NREGA. In Bongaigaon district, a large number of job card holders were found who Panchayat representatives were.

Khera and Nayak (2009) revealed that there is significant benefits reported by women include increased food security and better ability to avoid hazardous work. In NREGA, the working hours are limited to 7-8 hours in a day and therefore it is helpful to prevent harassment of women workers. NREGA work has allowed women to spend money on their own needs; while earlier they might not have been at the liberty to do so. Some women reported that work with private landlords and contractors are often replete with an underlying threat or possibility of sexual abuse and exploitation. NREGA has brought mental satisfaction.

Ramesh and Kumar (2009) found that MGNREGA holds the powerful prospect of bringing major changes in the lives of women. MGNREGA was playing a substantial role in empowering women economically and laying the basis for greater independence and self-esteem. It has become a beacon of light in the empowerment of the rural women, and contributed substantially for the increased living and economic condition by creating equal wages to male and female workers and increased the minimum wages.

Panda *et al.* (2009) found that MGNREGA empowered rural tribal women in Sikkim and Meghalaya by enhancing their confidence level and by ensuring some degree of financial independence. In this state before MGNREGA implementation in the traditional institution like Durbars women are not allowed to have political representation. But now mandatory involvement of women in PRI institution has given boos to women empowerment in the state. Around 94.00 per cent of the women workers in Sikkim and 38.00 per cent in Meghalaya felt that have been able to access health facilities better after working in NREGA.

Pankaj and Tankha (2010) examine the empowerment effects of MGNREGA through field survey in Bihar, Jharkhand, Rajasthan and Himachal Pradesh. The study shows that a women earning from MGNREGA constituted

14.00 per cent of the total annual income of the household on average across the four sample districts in 2008-09. Majority of women workers collect and retain their wages. Before NREGA 44.00 per cent women said that they were able to meet their personal needs through their own earning where after NREGA it is 71.00 per cent. There also increased participation of women in gram sabha meetings. Besides this 73.00 per cent of women which had attended the gram sabha spoke in the meeting.

Roy and Singh (2010) in a impact study of NREGA on empowerment of the beneficiaries in West Bengal observed that, none of the development programmes in the past succeeded to empower the rural people at desired level as most of them were supply driven. One of the major goals of MGNREGA is to empower the rural people. The works under the MGNREGA are ‘demand driven rather than supply driven. Every adult member of the registered household under MGNREGA may demand work when they are in need and the Govt. is bound to provide hundred days of guaranteed wage of employment to every household who so ever has been registered under the scheme. The study reported significant positive changes in the level of aspiration, self confidence and self reliance of the beneficiaries of the scheme. A positive impact of the programme was observed on the empowerment of its beneficiaries in the study area.

Panda and Umador (2011) found that on an average 42.00 percent said that MGNREGA had helped to uplift women. There has been no change in the status of women.

Sarkar *et al.* (2011) in a study on impact of MGNREGA on reducing rural poverty and improving socio-economic status of rural poor in Burdwan District of West Bengal, observed that significant changes had taken place in the socio-economic variables like annual per capita income, monthly per capita food expenditure, annual per child expenditure on education, per capita savings, condition of the dwelling houses, access to healthcare facility and possession of other assets or luxury items for those households after regularly working in the MGNREGA.

Vanitha and Srikantha Murthy (2011) the study has found that around 31.67 per cent of participant women were highly empowered compared to only 05.00 per cent of non participant women.

Das (2012) reported that MGNREGA had positive impact on employment pattern of women. Women were benefitted both, as individual and community. Women are benefitted individually because, they are able to earn independently, spend money for their own needs and contribute in family expenditure. The benefits gained by women as community can be understood by their increased presence in the Gram sabha, increase in number of women in speaking out in the meeting and increasing capacity of interaction.

**2.3 Constraints**

Constraint is confinement, restriction of liberty or compulsion of circumstances or compulsion put upon the behavior. The referances pertaining to constraints presented in this part.

Sakhare (1998) reported that constraints faced by the drip adopters were clogging of emitters, breaking of laterals, lack of instruments and high initial cost of drip set.

Anand (2000) in his study conducted in Bidar district of the Karnataka revealed that the major problems/reasons for non adoption or partial adoption of watershed technology include lack of capital for contour bund and land leveling. Unawareness of technology for compartment bunding and live bunds, lack of knoeledge and hard sub-surface soil in opening of ridges and forrows and plantation of horticulture and forest tree species.

Bandaragoda (2000) reported that illiteracy among farmers, social pressure from big land oweners and obstacles by society proved invalid under participatory process of social organism methodology.

Gogoi (2000) reported that lack of knowledge as the major problem to 40.33 per cent beneficiary farmers in command area.

Kale (2000) reported that constraints faced by the drip adopters were clogging of emitters, breaking of laterals, lack of instruments and high initial cost of drip set.

Katkar (2000) reported that main constraints faced by the drip adopters were clogging of emitters, breaking of laterals, lack of instruments and high initial cost of drip set. The other problems were delay in availability of loan, transport facilities, lack of technical knowledge, high cost of parts, irregular power supply and inadequate supply.

Arumugam (2001) reported that the major constraints expressed by the members of water user association were lack of financial assistance that hinders the effective functioning of the association, problems regarding poor maintainance of irrigation structure and the presence of weeds in the tank.

Kavita (2001) found that the major constraints expressed by the farmers were lack of timely supply of water, drainage problems and lack of credit facilities.

Sharma (2002) concluded that large percolation losses from irrigation water applied to farmers field seepage lossess from channels, over use of escape channels from canal system, relatively low level of ground water flow due to subsurface barriers and absence of drainage were responsible for water logging. This limits the utilization of water by the farmers.

Gurav *et al.* (2003) reported that high initial cost, requirement of regular maintenance, unavailability, of technical guidance and quality spare parts locally, were the most important constraints faced by the drip adopters.

Nirmala (2003) reported that the farmers perception and constraints analysis under impact study of water development programme on socio-economic dimensions in Ranga Reddy district of Andhra Pradesh and found that technologies were beneficial in the form of increased income (58.33%), increased moisture (51.66%) and increased productivity (48.33%) along with increased employment generation.Redused soil erosion integrated ground water recharge etc. were benefits of technology as perceived by the farmers. Further observed that the major reason for non-adoption of structures in non-watershed area were lack of capital (51.06%) technical know-how (46.60%), size of holding (45.00%) followed by problems of

irrigation, inadequate input availability, nonavailability of labour, inadequate extension services, poor quality of land etc.

Swati Gawande (2003) observed that 19.64 per cent of the respondents facing constraints of non availability of spare parts and repair services followed by chocking of micro-tubes and dripper (16.00%),followed by lack of technical knowledge about drip irrigation system (12.50%), followed by pipe joint leakageand damage to drip sets by rats and repair services (08.00% and 07.14%).

Ulemale *et al*. (2003) stated that major problems were the high cost of spare parts, high cost of chemical and acid for acid treatment, high expenses on repair, bursting of filter screen, cracks to pipe line, faulty layout, leakages of joints, chocking, blockage of dripper and microtube, lack of technical knowledge, lack of detail knowledge about drip technology.

Vidya Tayde (2003) revealed that half of the respondents (50.33%) expressed that the extension personnelof the implemting agency i.e, District supritendent Agriculture officer, did not contact regularly to all the beneficiaries, followed by 43.00 per ent beneficiaries were facing non availability of spare parts and repair services for the sprinkler irrigation system.

Bannapure (2007) found major constraints in adoption of drip irrigation system for banana crop were clogging of emitters (86.37%), higher initial investment (81.82%), and requirement of regular maintenance (80.00%), unavailability of person for guidance (72.73%) and inadequate knowledge and lack of proper training (70.9%) delay in availability of loan (59.10%).

Mansur *et al.* (2007) reported that more than half of the respondents (56.67%) in his study opined that proposed method of bunding was not useful.While more than one-fifth of the respondents had no idea about its utility.

Patil (2007) found that the problems faced by considerable number of the users of drip irrigation system for grape orchard were clogging of emitters (82.50%), breaking of laterals (61.25%), and the problems of

availability of instruments (56.25%). The other problems such as material transport facilities (41.25%), lack of technical knowledge (33.75%) and high cost of spare parts (31.25%) were faced by them.

Bhople *et al.* (2010) reported that major constraints experienced by beneficiaries were no proper distribution of water (90.00%) followed by more flow of water in head and middle reach (83.33%).

Bahire (2011) observed that major constraints faced by drip users were lack of technical knowledge and wrong decision of drip irrigation unit, also clogging of emitters, low discharge of water at the end of emitters.

Meti (2012) observed that major constraints faced by drip adopters were complicated procedures in getting loan, delay in sanction of loan, non availability of fertilizers, inadequate supply of electricity, choking of laterals and drippers, initial investment is high, inadequate follow up services by drip agencies, non availability of quality materials and rodents damage to the laterals.

Shambharkar *et al*. (2013) observed that large majority of the respondents (91.11%) faced constraints such as farm pond sedimentation followed by half of the respondents who faced the constraints of disturbances of wild animals.

**2.4 Suggestions for better implementation of irrigation projects**

Suggestions refer to the opinion of beneficiaries about what action should be taken for better implementation of the project. The referances pertaining to suggestions presented in this part.

Kale (2000) reported that the major suggestions endorsed by the drip adopters were timely availability of loans, regular guidance and effective after sales service for maintainance from dealers, reduction in the cost of drip set, availability of spare parts locally at reasonable rates and imparting training to farmers for improving knowledge and skill to use the system efficiently.

Murthy and Indumati (2011) suggested that subsidies for farm machinery should be provided in order to assist farmers who are facing the economic scarcity of labour. These policies are crucial for sustaining the food security as well as livelihood security of agricultural sector in the drought-prone as well as in irrigation-dominated states of India.

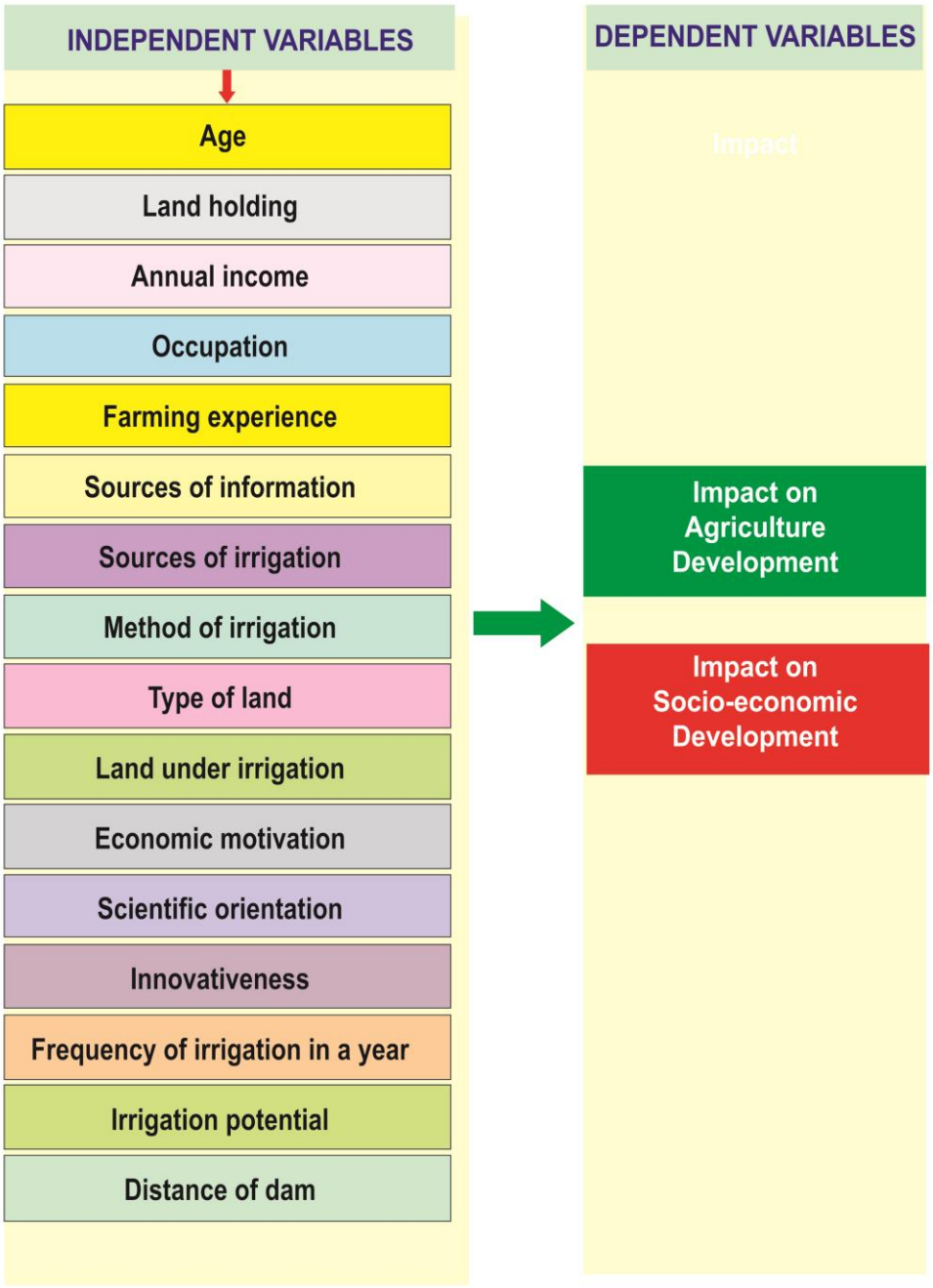



**Fig. 1 Conceptual model of study**

## CHAPTER III

# METHODOLOGY

The researcher during the course of investigation has to develop different measurement techniques, tools and procedures for research. The terms and concepts used need to be appropriately defined their measurement techniques and measured accurately. Appropriate tools for data collection have to be selected, developed and used. In present study, to evaluate the impact of Wan irrigation project on beneficiaries, standard and detailed methodology was developed and used for studying various aspects concerning Wan irrigation project in Western Vidarbha region. The same have been described in present chapter with relevant details under the following sub section.

The sub-section of research methodology includes

3.1 Locale of study

3.2 Research design

3.3 Sample and sampling technique

3.4 Collection of data

3.5 Variables selected for the study, their operational definition, measurement and categorization

3.5.1 Operationalization, scoring, measurement and categorization of independent variables.

3.5.2 Operationalization, scoring, measurement and categorization of dependent variables.

3.5.2.1 Impact of Wan irrigation project

3.5.2.1.1 Agriculture development

3.5.2.1.2 Socio-economic development

3.6 Constraints

3.7 Suggestions

3.8 Tabulation and analysis of data

3.9 Statistical methods used

## 3.1 Locale of the Study

The present investigation was carried out in Akola and Buldhana districts of Western Vidarbha region of Maharashtra. Western Vidabha region situated between $22^0$ 55′ N to $77^0$45′ E

Western Vidarbha is bounded by Madhya Pradesh to the North, Eastern Vidarbha to the East, Telangana state to the South, Marathwada region (Aurangabad Division) to the south and southwest and Nasik division to the West. Geographical area of western Vidarbha is 46090 sq. km. The temperature in the month of May is generally high, average maximum and minimum temperature in 2017 on Amravati division was 40.1ºc and 12.4ºc respectively. Western Vidarbha falls in medium and assured rainfall zone of Maharashtra state having an average annual rainfall 918.08 mm.

Western Vidarbha consists of five districts and total population is 11,266,653 according to 2011 census.The major crops grown in this area are cotton, soybean, tur, maize and udid in kharif season wheat, gram and vegetables in rabi season and groundnut in summer season. Wan irrigation covers total 54 villages. Out of which 41villages were from Akola and 13 villages from Buldhana district.

## 3.2 Research Design

For the evaluation impact assessment of Wan irrigation project on beneficiaries ex-post-facto research design was used. According to Ker linger (1964) ex-post-facto research is a systematic empirical enquiry in which the scientists do not have direct control on influencing the independent variables because their manifestation have already occurred. Hence, this design was considered appropriate for the study.

## 3.3 Sample and sampling technique

### 3.3.1 Selection of respondents

In the present study, the command area of Wan irrigation project was divided into three segments as head reach, middle reach and tail reach. From each segment five villages were selected on the basis of beneficiary farmers. Out of total 15 selected villages, 10 villages were from Akola and 5 vilages from Buldhana district. From each selected village 20 beneficiary

farmers were selected as respondents. Total of 100 beneficiaries from each segment.

Thus, for the proposed study, total 300 beneficiaries constituted the sample respondents. Out of total 300 respondents 200 farmers from Akola and 100 farmers from Buldhana district.The respondents were selected by random sampling method from Akola and Buldhana districts of western Vidarbha region of Maharashtra.

**Table 1. Total number of beneficiaries selected from each segment of command area of Wan irrigation project**

| Sl.No. | Segments of Command area | No. of beneficiaries (n=300) |
|---|---|---|
| **1** | Head reach | 100 |
| **2** | Middle reach | 100 |
| **3** | Tail reach | 100 |

**Table 2. Segment wise villages and number of beneficiaries selected from Akola and Buldhana district**

| Sl. No. | Segments | Name of villages | Name of Districts | Number of Respondents |
|---|---|---|---|---|
| A) | Head reach | 1) Danapur | Akola | 20 |
| | | 2) Hingni | Akola | 20 |
| | | 3) Raykhed | Akola | 20 |
| | | 4) Varkhed | Akola | 20 |
| | | 5) Belkhed | Akola | 20 |
| | Total **(A)** | | | **100** |
| B) | Middle reach | 1)Kakanvada (Khurd) | Buldhana | 20 |
| | | 2)Sheri (Khurd) | Akola | 20 |
| | | 3) Ghodegaon | Akola | 20 |
| | | 4) Malegaon | Akola | 20 |
| | | 5) Varud (Budruk) | Akola | 20 |
| | Total **(B)** | | | **100** |
| C) | Tail reach | 1)Wankhed | Buldhana | 20 |
| | | 2) Paturda (Khurd) | Buldhana | 20 |
| | | 3) Paturda (Budruk) | Buldhana | 20 |
| | | 4) Pimpri | Buldhana | 20 |
| | | 5) Thar | Akola | 20 |
| | Total **(C)** | | | **100** |
| | Grand Total **(A+B+C)** | | | **300** |

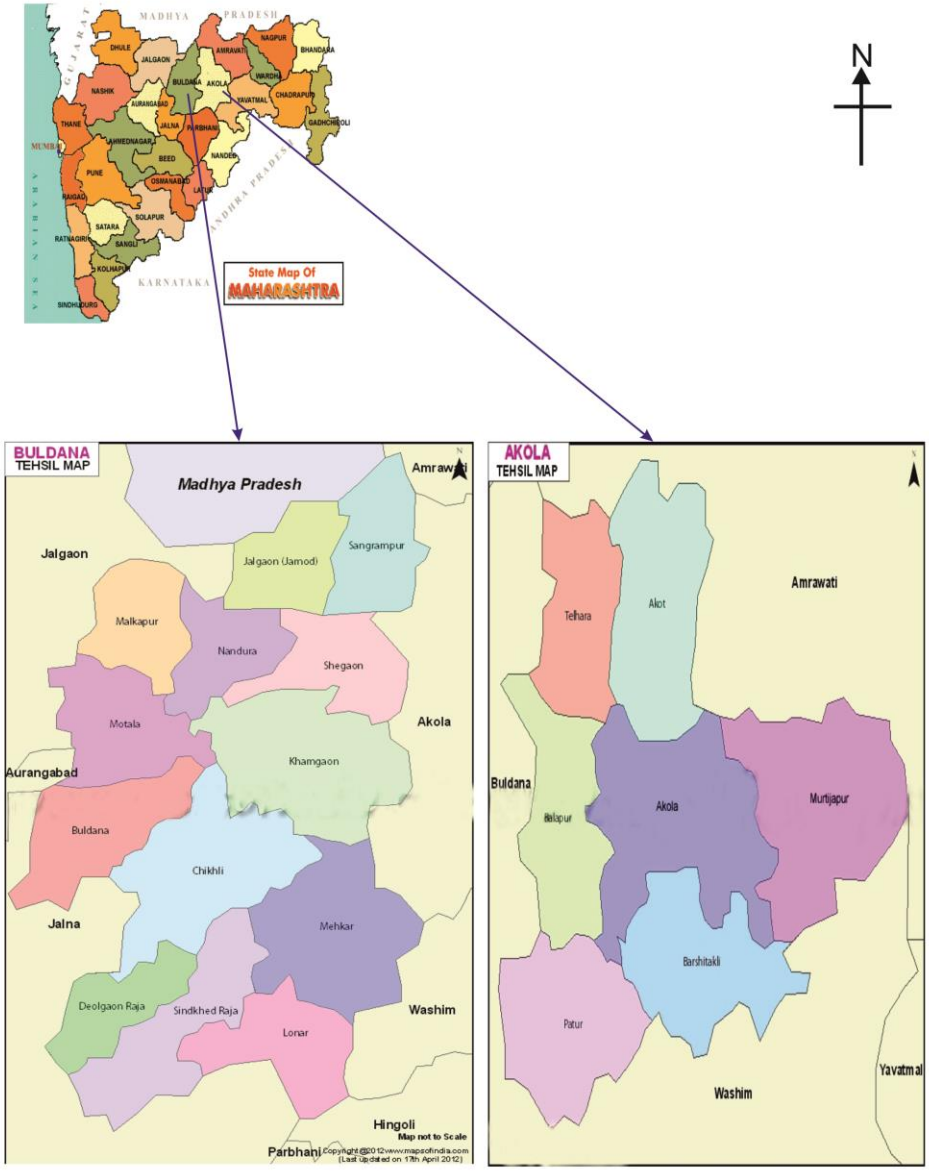
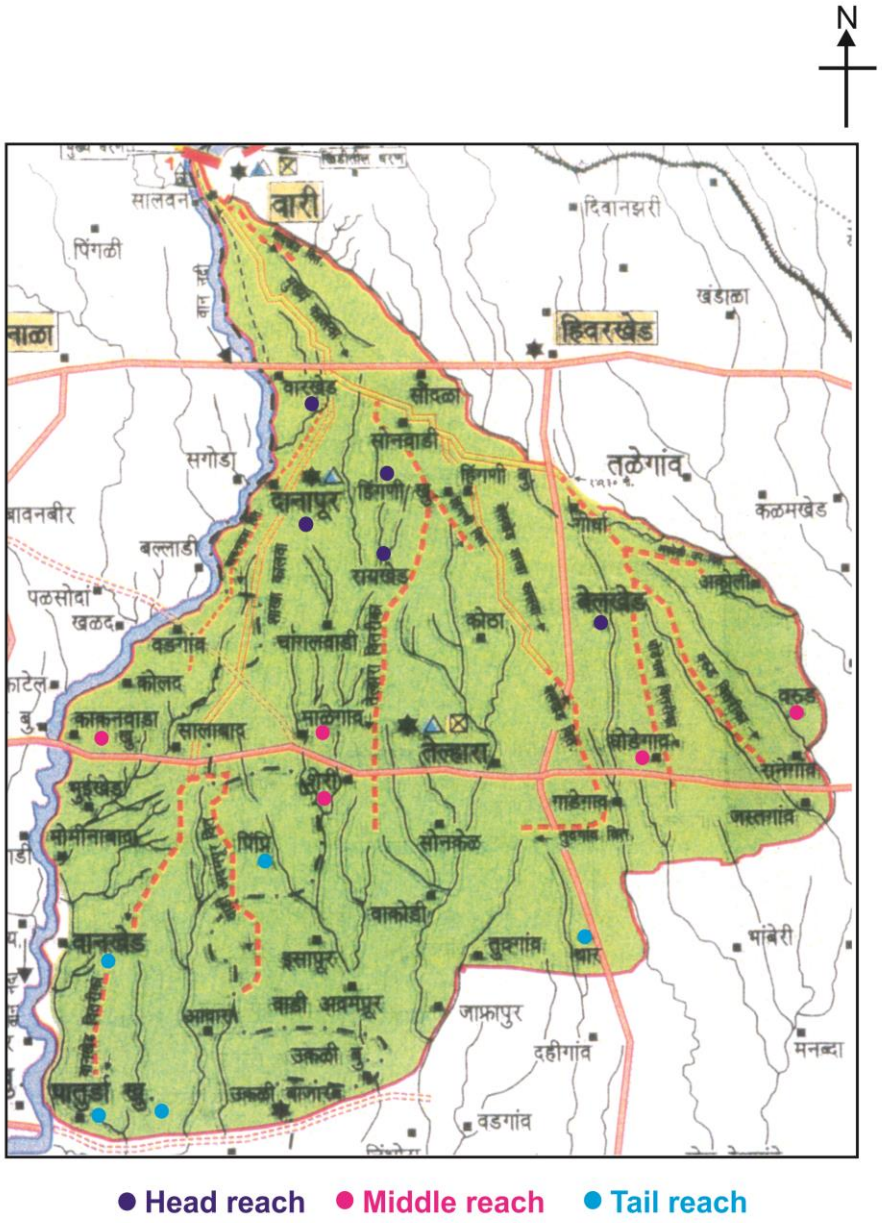



**Fig. 2a. Map of Akola and Buldhana Districts**




● Head reach ● Middle reach ● Tail reach

**Fig. 2b. Map of command area of Wan irrigation project**

### 3.4 Collection of data

The interview schedule was developed keeping in mind the objectives and variables selected for the study and in constitution with the chairman and advisory committee members.The interview with the beneficiary farmers was conducted at resident or place with comfort situation. Before actually procuring the information from beneficiary farmers they were introduced with the objectives of the present study. It helped to build rapport with the respondents for collecting reliable information. They were assured that the information would be used only for the research purpose. The data were collected by interviewing the beneficiary farmers personally. Interview schedule was checked before closing of an interview for its completeness in all aspects. Total 300 beneficiaries were interviewed from 15 villages of 2 districts.

#### 3.4.1 Pre-testing of interview schedule

In order to detect mistakes and shortfalls if any, in the interview schedule and to achieve simplicity, clarity, reliability, practicability, anticipated interpretation, appropriate logical sequence and to avoid ambiguity, the pre-testing of interview schedule was done in non sampled area. The interview schedules were administered to 30 beneficiary farmers. The data collected were thoroughly examined/ studied to detect the unfamiliar words, vagueness and complexity of questions, included in the interview schedule. Considering the experience of pre-testing, necessary alterations in statements of the interview schedule were done.The personal contact method was used for pre-testing of interview schedule.

### 3.5 Variables selected for the study, their operational definition, measurement and categorization

Based on the review of available literature, considering relevancy and opinion of the experts in the field of Extension Education, Agricultural Engineering and Statistics. The variables studied were age, land holding, annual income, occupation, farming experience, sources of information, sources of irrigation, method of irrigation, type of land, land under irrigation, economic motivation, scientific orientation, innovativeness,

frequency of irrigation in a year, irrigation potential and distance of dam as independent variables whereas impact of Wan irrigation project in terms of agriculture and socio-economic development as dependent variables.

### 3.5.1 Operationalization, scoring, measurement and categorization of independent variables of beneficiaries

#### 3.5.1.1 Age

Age is operationally defined as chronological age of an individual in completed years at the time of data collection.

One score was assigned to each completed years and it is categorized as below.

| Sl.No | Age | Years |
|---|---|---|
| 1 | Young | Up to 35 |
| 2 | Middle | 36 to 50 |
| 3 | Old | Above 50 |

#### 3.5.1.2 Land holding

Conceptually land holding is the actual hectare of land possessed by the individual and his family members. Land holding operationally defined as the actual hectare of land possessed by the beneficiaries for cultivation of various crops.

The categorization of the land holding was done as per the norms of Governmentof Maharashtra.

| Sl.No. | Land holding | Area (Ha) |
|---|---|---|
| 1 | Marginal | Up to 1.00 ha. |
| 2 | Small | 1.01 to 2.00 ha. |
| 3 | Semi medium | 2.01 to 4.00 ha |
| 4 | Medium | 4.01 to 10.00 ha |
| 5 | Large | Above 10.01 ha |

### 3.5.1.3 Annual income

Operationally it is defined as the gross annual income earning in rupees of the respondents and his family members from all available sources in a year and it is categorized as follows.

| Sl. No | Annual income (Rs.) |
|---|---|
| 1 | Up to 50,000 |
| 2 | 51,001 to 1,00,000 |
| 3 | 1,00,001 to 1,50,000 |
| 4 | 1,50,001 to 2,00,000 |
| 5 | Above 2,00,000 |

### 3.5.1.4 Occupation

It refers to the occupation undertaken by respondents and his family members for source of income.

The scale developed by Thakare (2004) was used for measuring the occupation.

| Sl. No. | Occupation | Score |
|---|---|---|
| 1 | Agriculture+ Labour | 1 |
| 2 | Agriculture | 2 |
| 3 | Agriculture+ Allied occupation | 3 |
| 4 | Agriculture+ Business | 4 |
| 5 | Agriculture + Services | 5 |

### 3.5.1.5 Farming experience

It is operationally defined as the experience of respondents in terms of year of working and cultivation of land on his field.

| Sl. No. | Farming experience |
|---|---|
| 1 | Upto 10 yr. |
| 2 | 11 – 20 yr. |
| 3 | 20 – 30 yr. |
| 4 | Above 30 yr. |

### 3.5.1.6 Sources of information

Operationally it is defined as the source of information used by respondents to obtain information about agriculture and allied field.

It was measured on three point continuum i.e. always, sometime and never with the score of 2, 1 and 0 respectively.

The categorization is made by using the equal interval method in low, medium and high category as below.

| Sl. No. | Sources of information | Score |
|---|---|---|
| 1 | Low | Upto 56.26 |
| 2 | Medium | 56.27 - 67.36 |
| 3 | High | Above 67.36 |

### 3.5.1.7 Sources of irrigation

It refers to the sources such as well, tube well, river, canal etc. available for irrigation with the respondents and scoring is done as below.

| Sl. No. | Irrigation source | Score |
|---|---|---|
| 1 | No source | 0 |
| 2 | River | 1 |
| 3 | Well/ Tube well | 2 |
| 4 | Canal | 3 |
| 5 | Farm pond | 4 |

### 3.5.1.8 Method of irrigation

It refers to the method of irrigation used by the beneficiaries such as sprinkler, drip and surface irrigation for irrigating the field crop. The scoring is done as follows.

| Sl. No. | Method of irrigation | Score |
|---|---|---|
| 1 | Sprinkler | 3 |
| 2 | Drip | 2 |
| 3 | Flood/ Surface irrigation | 1 |

### 3.5.1.9 Type of land

Conceptually, it refers to the quality of land possessed by the respondents.

Operationally, type of land is defined as soil status of an individual respondent's farm as mentioned in land use classification as very deep, deep, moderately deep, shallow and very shallow.

Responses of respondents are taken on status of their farm soil. Categorization and scoring was done on the basis of higher status of their farm soil as given below.

| Sl.No. | Land use classes | Status of soil | Score |
|---|---|---|---|
| 1 | Class – I | Very deep | 5 |
| 2 | Class – II | Deep | 4 |
| 3 | Class – III | Moderately deep | 3 |
| 4 | Class – IV | Shallow | 2 |
| 5 | Class – V | Very shallow | 1 |

### 3.5.1.10 Land under irrigation

Conceptually it refers to the area of land in hectares under irrigation of the respondents.

It is operationally defined as the area of land in hectares of beneficiary farmers under irrigation project. It is categorized as below.

| Sl. No | Land under irrigation | Area (ha) |
|---|---|---|
| 1 | Marginal | Up to 1.00 ha |
| 2 | Small | 1.01 to 2.00 ha |
| 3 | Semi medium | 2.01 to 4.00 ha |
| 4 | Medium | 4.01 to 10.00 ha |
| 5 | Large | Above 10.00 ha |

### 3.5.1.11 Economic motivation

It refers to the occupational success in terms of profit maximization and relative values of individual beneficiaries. It was measured using scale developed by Supe (1969).

In this scale there are six statements, out of which items 1,2,3,4 and 5 were the positive, while statements 6 is negative statement.

The scale having 5 categories of responses and were quantified as strongly agree, agree, undecided, disagree and strongly disagree with the score of 5, 4, 3, 2, 1 for positive statements and reverse for negative statements.

In this way obtained score was classified into three categorized as low, medium and high on the basis of mean $\pm$ standard deviation as below.

| Sl. No. | Category | Score |
|---|---|---|
| 1 | Low | Up to 78.59 |
| 2 | Medium | 78.60 to 91.63 |
| 3 | High | Above 91.63 |
| | Mean = 85.11 | S.D. = 6.52 |

### 3.5.1.12 Scientific orientation

Conceptually, it refers to the degree to which individual is oriented to use the scientific methods in decision making.

Scientific orientation is operationally defined as the degree to which farmer is oriented to use the scientific methods in farming.

It will be measured with the help of standardized scale developed by Supe and Singh (1969).

The scale consist six statements, out of the six statements in the scale, statements 1, 3, 4, 5 and 6 were positive and remaining 2 negative. It was measure on five-point continuum i.e., strongly agree, agree, undecided, disagree and strongly disagree with the score.

In this way total score was obtained and respondents were finally classified into three categories on the basis of mean $\pm$ standard deviation as follows. The obtained score categorized as low, medium and high as follows.

| Sl.No. | Category | Score |
|---|---|---|
| 1 | Low | Up to 66.20 |
| 2 | Medium | 66.21 to 80.94 |
| 3 | High | Above 80.94 |

Mean = 73.57 S.D. = 7.37

### 3.5.1.13 Innovativeness

It is defined as the degree to which the individual respondent is earlier in adoption of new innovation than other farmer in the village.

Innovativeness is operationally defined as the degree to which a beneficiary farmer adopts new idea about agricultural technologies earlier than other in village.

It was measured with the help of scale developed by Singh (1972). The scale consist of six statements, out of the six statements in the scale, statements 1, 4, 5 were positive and remaining 2, 3 and 6 were

negative. It was measure on three-point continuums i.e., agree, undecided and disagree.

In this way total score was obtained and respondents were finally classified into three categories on the basis of mean ± standard deviation as follows.

| Sl.No. | Innovativeness | Score |
|---|---|---|
| 1 | Low | Up to 72.98 |
| 2 | Medium | to 72.99 to 80.02 |
| 3 | High | Above 80.02 |
| | Mean = 76.50 | S.D. = 3.52 |

**3.5.1.14 Frequency of irrigation in a year**

It is operationally defined as number of times in a year irrigation water of the project given to beneficiaries field. It is categorized as follows.

| Sl.No. | Frequency of irrigation (No. of irrigation /Year) |
|---|---|
| 1 | Up to 3 |
| 2 | 4 – 6 |
| 3 | Above 6 |

**3.5.1.15 Irrigation potential**

It is operationally defined as the hectares of land comes under irrigation out of total land possessed by the farmer. One score was assign to each hectare of land comes under irrigaton. It is categorized as below.

| Sl. No. | Irrigation potential |
|---|---|
| 1 | Up to 1.00 ha |
| 2 | 1.01 to 2.00 ha |
| 3 | 2.01 to 4.00 ha |
| 4 | 4.01 to 10.00 ha |
| 5 | Above 10.00 ha |

### 3.5.1.16 Distance of dam

It is operationalized as the distance in kilometers of dam from respondent's field. One score was assign to each kilometer distance. It is categorized as below.

| Sl.No. | Distance (Km) |
|---|---|
| 1 | Up to 10 |
| 2 | 11 – 20 |
| 3 | 21 – 30 |

## 3.5.2 Operationalization, scoring, measurement and categorization of dependent variables

The dependent variable is impact of Wan irrigation project, it was studied in terms of impact on agriculture development and socio-economic development. The operationalization and procedures adopted for scoring and categorization of these dependent variables are presented below.

### 3.5.2.1 Impact of Wan irrigation project

Impact is defined as impression or effect on mind, feelings and effect as result of outcome. Thus, impact means the effect or mental awareness and behavioral outcome of a person.

It is operationally defined as the effect of Wan irrigation project on beneficiary farmers in the command area.

The base year of obtaining data and information from the farmers considered as the year 2004 because the project was started functioning from the year 2005. The year for getting information and data from the farmers after Wan irrigation project was considered as the year of data collection i.e., 2016

Effect was ascertained in terms of agriculture and socio-economic development of beneficiary farmers before the year 2005 and after Wan irrigation project i.e., 2016 the year of data collection.

The score impact of Wan irrigation project was computed by summing up the percent change in agriculture and socio-economic development of beneficiary farmers before and after the Wan irrigation project.

Impact of Wan irrigation project = Agriculture development + Socio-economic development

**3.5.2.1.1 Agriculture development**

It is operationally defined as the agricultural development in terms of change in cropping pattern, cropping intensity and productivity of major kharif, rabi and summer crops of beneficiary farmers before and after WAN irrigation project.

The per cent change in cropping pattern, cropping intensity and productivity of major crops was worked out on the basis of difference between before and after Wan irrigation project.

**a. Change in cropping pattern**

Cropping pattern was studied in terms of hectares covered under various crops in kharif, rabi and summer in the command area of the Wan irrigation project before and after Wan irrigation project.

The beneficiary farmer was asked to state the hectares of land covered under various crops before and after Wan irrigation project. As per the responses of the individual beneficiary farmers, the area in hectare under various crops cultivated by them was taken in to consideration, Thus, total area under various crops in the study area was summed up to know the area under various crops. Then, in totality, per cent change area in kharif, rabbi and summer crops by considering the area before and after Wan irrigation project were calculated as follows.

$$\text{Percent change in CP} = \frac{\text{CP after Wan project} - \text{CP before Wan project}}{\text{CP before Wan project}} \times 100$$

Where,

CP = Cropping pattern

**b. Change in cropping intensity**

It was operationally defined as the change in cropping intensity of beneficiary farmers before and after Wan irrigation project. Cropping intensity means the proportion of the area under different crops including double and triple cropping to the net cultivated area. The percent change in cropping intensity was operationalized or measured on the basis of difference between the mean score of cropping intensity of beneficiary farmers before and after the Wan irrigation project with the help of following formula.

$$\text{Percent change in CI} = \frac{\text{CI after Wan project - CI before Wan project}}{\text{CI before Wan project}} \times 100$$

Where,

CI = Cropping intensity

**c. Change in productivity**

Productivity refers to the economic yield or production of plant product of economic importance, expressed in standard units per unit area. In the present study beneficiary farmers was elicit the response on productivity of different crops before and after Wan irrigation project.

$$\text{Percent change in CP} = \frac{\text{CP after Wan project - CP before Wan project}}{\text{CP before Wan project}} \times 100$$

Where,

CP = Cropping productivity

**3.5.2.1.2 Socio-economic development**

It is operationally defined as the improvement in socio-economic status of beneficiary farmers before and after Wan irrigation project. Socio-economic status was measured with the help of socio-economic status scale developed by Thakare (2004) with slightly modification.The SES scale consists of following parameters.

a) Change in Occupation

b) Change in Land holding

c) Change in Family education

d) Change in Annual income

e) Change in Socio political participation

f) Change in Expenditure pattern

g) Change in Economic empowerment

The score of SES is the composite score of all above parameters.The socio- economic development was measured with the help of following formula.

$$\text{Scio-economic development} = \frac{\text{SES score of beneficiary farmers after Wan irrigation project} - \text{SES score of beneficiary farmers before Wan irrigation project}}{\text{SES score of beneficiary farmers before Wan irrigation project}} \times 100$$

**a) Change in occupation**

Change in occupation was measured on the basis of difference between the mean occupation score of beneficiary farmers before and after Wan irrigation project with the help of following formula.

$$\Delta O = \frac{Oa - Ob}{Ob} \times 100$$

Where,

$\Delta O$ = Percent change in occupation

Oa = Mean occupation score of beneficiary farmers after Wan irrigation project

Ob = Mean occupation score of beneficiary farmers before Wan irrigation project

**b) Change in land holding**

Change in land holding was measured on the basis of difference between the mean land holding score of beneficiary farmers before and after Wan irrigation project with the help of following formula.

$$\Delta LH = \frac{LHa - LHb}{LHb} \times 100$$

Where,

Δ LH = Percent change in land holding

LHa = Mean land holding score of beneficiary farmers after Wan irrigation project

LHb = Mean land holding score of beneficiary farmers before Wan irrigation project

**c) Change in family education**

Change in family education was measured on the basis of difference between the mean family education score of beneficiary farmers before and after Wan irrigation project with the help of following formula.

$$\Delta FE = \frac{FEa - FEb}{FEb} \times 100$$

Where,

Δ FE = Percent change in family education

FEa = Mean family education score of beneficiary farmers after Wan irrigation project

FEb = Mean family education score of beneficiary farmers before Wan irrigation project

**d) Change in annual income**

Change in annual income was worked out on the basis of difference between the mean annual income score of beneficiary farmers before and after Wan irrigation project with the help of following formula.

$$\Delta AI = \frac{AIa - AIb}{AIb} \times 100$$

Where,

Δ AI = Percent change in family education

AIa = Mean annual income score of beneficiary farmers after Wan irrigation project

AIb = Mean annual income score of beneficiary farmers before Wan irrigation project

**e) Change in socio political participation**

Change in socio political participation was worked out on the basis of difference between the mean socio political participation score of beneficiary farmers before and after Wan irrigation project with the help of following formula.

$$\Delta SPP = \frac{SPPa - SPPb}{SPPb} \times 100$$

Where,

Δ SPP = Percent change in socio political participation

SPPa = Mean socio political participation score of beneficiary farmers after Wan irrigation project

SPPb = Mean socio political participation score of beneficiary farmers before Wan irrigation project

**f) Change in expenditure pattern**

Change in expenditure pattern was worked out on the basis of difference between the mean expenditure pattern score of beneficiary farmers before and after Wan irrigation project with the help of following formula.

$$\Delta EP = \frac{EPa - EPb}{EPb} \times 100$$

Where,

ΔEP = Percent change in expenditure pattern

EPa = Mean expenditure pattern score of beneficiary farmers after Wan irrigation project

EPb = Mean expenditure pattern score of beneficiary farmers before Wan irrigation project

**g) Change in economic empowerment**

Change in economic empowerment was worked out on the basis of difference between the mean economic empowerment score of beneficiary farmers before and after Wan irrigation project with the help of following formula.

$$\Delta EE = \frac{EEa - EEb}{EEb} \times 100$$

Where,

Δ EE = Percent change in economic empowerment

EEa = Mean economic empowerment score of beneficiary farmers after Wan irrigation project

EEb = Mean economic empowerment score of beneficiary farmers before Wan irrigation project.

**3.6 Constraints**

The Oxford Dictionary meaning of the word constraint is confinement, restriction of liberty or compulsion of circumstances or compulsion put upon the behavior.

In the present study, constraint have been operationally defined as the problems and difficulties faced by beneficiaries in actual using water for irrigation from Wan irrigation project.

The constraints of beneficiaries were identified by collecting the responses of beneficiaries. The constraints were recorded and the frequency and percentage of each constraint was worked out to find out the intensity of the constraints encountered by the beneficiaries.

**3.7 Suggestions**

Suggestions refer to the opinion of beneficiaries about what action should be taken for better implementation.The responses of the beneficiaries have been noted and their frequencies and percentage were worked out.

### 3.8 Tabulation and analysis of data

The statistical methods used in this study were mean, standard deviation, correlation coefficient, path analysis and 'z' test for the purpose of percentage categorization, distribution, significant relationship between dependent and independent variables.

The data were analyzed on the computer at Computer Center, Dr. Panjabrao Deshmukha Krishi Vidyapeeth, Akola (Maharashtra).

### 3.9 Statistical techniques used

The following statistical techniques and tests were used for analyzing the data in line with the study of objectives.

#### 3.9.1 Arithmetic mean

Arithmetic mean was calculated by sum of all the various score and dividing it by number of cases.

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

$\overline{X}$ = Arithmetic mean

$\sum X$ = Sum of beneficiaries score

N = Number of beneficiaries.

#### 3.9.2 Standard deviation (S.D.)

Standard deviation measure the variability calculated around mean. The usual symbol for "S.D." is the Greek letter "σ" Sigma.

$$\sigma = \frac{\sqrt{N \Sigma X^2 - (\Sigma x)^2}}{N}$$

Where,

σ = Standard deviation

$\Sigma X^2$ = Sum of square of 'X' series

$(\Sigma x)^2$ = Square of summation of 'X' series

N = Number of beneficiaries

### 3.9.3 Coefficient of correlation (r)

The relational analysis comprised of computing relationship between the selected independent variables with the dependent variables.

The coefficients of correlation (r) were worked to find out the relationship of independent variables with dependent variables. The significance of calculated coefficient of correlation (r) was tested against the table value of 'r' at n-2 degrees of freedom. The relationship was considered to be significant, if the calculated value of 'r' was greater than the table value at either 0.01 or 0.05 level of probability.

Coefficient of correlation was calculated with the help of following given formula

$$r = \frac{\sum xy - n(mx)(my)}{\left[\sum x^2 - n(mx)^2\right]\left[\sum x^2 - n(my)^2\right]}$$

Where,

r = Coefficient of correlation

X = Score of independent variable

Y = Score of dependent variable

∑xy = Sum of product 'x 'and 'y series

$\sum x^2$ = Sum of squared 'x' values

$\sum y^2$ = Sum of squared 'y' values

N = Number of respondents

mx = Mean of x series

my = Mean of y series

### 3.9.4 'z' test

'z' test for testing mean difference to make comparison before and after WAN irrigation project and after use of irrigation.

$$z = \frac{|\overline{X_1} - \overline{X_2}|}{\sqrt{\frac{SD_1^2}{n_1} + \frac{SD_2^2}{n_2}}}$$

Where,

$z$ = 'z' value

$\overline{x}_1$ = Mean of impact score of beneficiaries before use of irrigation

$\overline{x}_2$ = Mean of impact score of beneficiaries after use of irrigation

$SD_1$ = Standard deviation of impact score of beneficiaries before use of irrigation

$SD_2$ = Standard deviation of impact score of beneficiaries after use of irrigation

$n_1$ and $n_2$ = number of beneficiaries

**3.9.5 Path analysis**

Path analysis helps us to identify the independent variables affecting the dependent variable directly, as well as, indirectly. Path analysis was employed to isolate the direct and indirect effect of independent variables on each of the dependent variables.

Path coefficient was considered to be significant, if the calculated 't' value was greater than the table 't' value at either 0.01 or 0.05 level of probability.

$$P_{11} = \frac{b_1 (xy) \times SD (x)}{SD(y)}$$

$$r = \frac{cov (x,y)}{SD(x) \times SD(y)}$$

Where,

cov (x,y) = Covariance between dependent (x) and independent (y)

SD(x) = Standard deviation of x

SD(y) = Standard deviation of y

Plate 1. Data collected from WAN beneficiary at village Hingni from Head reach

Plate 2. Data collected from WAN beneficiary at village Malegaon from Middle reach

Plate 3. Data collected from WAN beneficiary at village Paturda (Khurd) from Tail reach

Plate 4. Photo showing WAN irrigation water through canal during data collection

Plate 5. Photo showing use of WAN irrigation water in Banana

Plate 6. Photo showing use of WAN irrigation water in Onion

## CHAPTER IV

# SOCIO-ECONOMIC STATUS OF AKOLA AND BULDHANA DISTRICTS

The finding of any field research study in agriculture at the micro level cannot be generalized at the national level. However, finding of each study can be taken for granted as relevant for those areas having similar condition with regards to other factors. The finding therefore, must follow a clean mention about the socio-economic features of study area to facilitate better understanding of the observation and also to apply same in other areas with similar features. The present chapter is therefore devoted to discuss in brief some of the socio-economic features of Akola and Buldhana districts, just to facilitate comparison and to get better idea of the economy.

Maharashtra state has six revenue divisions viz., Mumbai, Pune, Nasik, Aurangabad, Amravati and Nagpur. Vidarbha area includes Amravati and Nagpur revenue division comprising eleven districts viz., Buldhana, Akola, Washim, Yevatmal, Wardha, Nagpur, Bhandara, Gondia, Chandrapur and Gadchiroli. Washim and Gondia are newly formed districts bifurcating Akola and Bhandara districts, respectively. Nagpur division includes Bhandara, Gondia, chandrapur, Gadchiroli and Wardha are the eastern district of Vidarbha. The Amravati division includes Buldhana, Akola, Amravati and Washim Districts. Buldhana, Akola, Washim and Amravati were comes under Western part of the Vidharbha and known for its cotton crop and the eastern part of Vidarbha region is for good quality of rice. Vidarbha as a whole contributes cotton, rice, jowar, millets, oilseeds, soybean, citrus, forest timber etc.

The present study is confined to Akola and Buldhana districst of Western Vidarbha. The agro-climatic conditions differ from place to place and even in close vicinity also.

### 4.1 Location of district:

Akola district falls in Vidarbha region of Maharashtra. It comprises of 7 tehsils. It lies between $20^0$ 17’ and $21^0$18’ north latitudes and $76^0$ 17’ and $77^0$ 14’ east latitudes. It covers area of 5417 sq.km. accounting for

1.76 % of the total area of Maharashtra. Akola district is surrounded by Amravati district in North, part of Amravati district and Yavatmal district in the East, Washim and Yevatmal district to the South and Buldhana district toward West.

Buldhana district lies between $19^0$ 51'and $21^0$ 17' north latitudes and $76^0$ 38' and $76^0$ 40' east latitude and is to north corner of Maharashtra. It is surrounded by Khandwa district of M.P in north, Jalna district of Marathwada region in south, Akola and Washim in east and Jalgaon in west.

**4.2 Topography and soil**

The northern part of the Akola district lies in Purna valley which itself is a part of Tapi river basin. River Purna has formed fertile basin in Akola, Balapur and Murtizapur tehsils of Akola. Akola district is divided into 7 tehsils for smooth administration. The district ranks fourth in respect of size and fifth in respect of population among the eleven districts of Vidarbha regions of Maharashtra. The soil of the district is basically derived from volcanic trap rock and it is quite fertile. It is classified into categories as coarse soil found in south, medium black soil in the plain and deep black soil found in river valley.

The north portion of district consists of Satpuda mountain ranges. Similarly the west portion of district particularly Chikhali and Mehkar tahsils consist of Ajanta mountain ranges. It is at 360 meter high from mean sea level. The soils are varied in structure and texture. It varies from black soils particularly in Chikhali and Mehkar, deep black cotton soils in Malkapur, Jalgaon jamod and khamgaon tahsils. Other region generally consists of murmad types of soils which are considered as less fertile.

**4.3 Climate and rainfall**

Being away from the sea, the Akola district has extreme climate. The weather during winter is too cool, while in summer it is too hot. The average minimum and maximum temperature extremities observed throughout the year was $10^0$ C and $46.5^0$ C, respectively. Akola district falls is assured rainfall zone of Maharashtra state having on an average rainfall between 750 to 1000 mm.

The climate of Buldhana district is hot and dry although this city is cold and have healthy atmosphere. Some of the tahsils like Malkapur, Nandura, Jalgaon jamod, Sangrampur, Shegaon, Khamgaon are very hot in summer. This district having annual rainfall ranges between 750-800 mm. There were wide variations in average rainfall and number of rainy days within different tahsils of district.

### 4.4 Land use pattern

The details of land use pattern of Akola and Buldhana district are presented in Table 3.

**Table 3 : Land use pattern of Akola and Buldhana districts.**

| Sl. No. | Particular | AKOLA | | BULDHANA | |
|---|---|---|---|---|---|
| | | Area (ha.) | (% ) | Area (ha.) | (%) |
| 1 | Area for land utilization | 5429 | 100.00 | 9671 | 100 |
| 2 | Forest | 299 | 5.51 | 83 | 9.13 |
| 3 | Barren and uncultivable land | 115 | 2.12 | 483 | 4.99 |
| 4 | Land put on non Agricultural use | 300 | 5.52 | 511 | 5.28 |
| 5 | Cultural waste land | 31 | 0.57 | 263 | 2.72 |
| 6 | Permanent pasture and other grazing land | 167 | 3.08 | 13392 | 138.47 |
| 7 | Land under miscellaneous tree crops and groves not included in net area sown. | 12 | 0.22 | 10 | 0.10 |
| 8 | Current fallows | 100 | 1.84 | 174 | 1.80 |
| 9 | Other fallows | 56 | 1.03 | 272 | 2.81 |
| 10 | Net area sown | 4349 | 80.11 | 6684 | 69.11 |
| 11 | Area sown more than once | 911 | 16.78 | 1695 | 17.53 |
| 12 | Gross cropped area | 5260 | 96.89 | 8379 | 86.64 |
| 13 | Cropping intensity | | 120.95 | | 125.36 |

(Source: Agricultural Statistical Information Maharashtra State, 2016)

### 4.5 Crop season and crop rotation

There are two important crop season i.e. kharif and rabi where as in summer season land generally remains fallow and preparatory tillage operations are under taken.

Cotton and jowar are important crops grown in kharif season on large scale. Tur, mung and udid, are also grown in kharif on large scale. Soybean crop is grown by the farmers on large area. Wheat and gram are important rabi crops grown in the area. Linseed, sunflower, safflower, some spices and vegetable and fruit crop are also grown in rabi season wherever the sources of irrigation is mostly through wells and cannel. The manners in which crop rotation are commonly followed is presented in Table 4.

**Table 4 Crop season and crop rotation**

| Sl. No. | Kharif | Rabi |
|---|---|---|
| 1 | Cotton | - |
| 2 | Cotton + tur + jowar | - |
| 3 | Soybean | Gram |
| 4 | Soybean + tur | Wheat |
| 5 | Jowar | Gram |
| 6 | Cotton+ mung / udid | Safflower / wheat |
| 7 | Cotton + tur | Safflower |
| 8 | Cotton+ tur + jowar +mung | Sunflower |
| 9 | Mung | Safflower |
| 10 | Cotton + mung | - |

### 4.6 Input supply

Agricultural inputs like seed, manure, fertilizers, insecticides, pesticides etc. are required to the farmers and made available to them through number of agricultural service centers established at district level and block level.

Maharashtra State Seed Corporation Ltd., Dr. PDKV, Akola and other private seed companies supply the quality seeds to the farmers. The farm inputs are made available to the farmers by co-operative societies and nationalize banks functioning at block level, panchayat samiti also provide credit to the farmers. Co-operative society supply input against the loan sanctioned by the District Central Co-operation Bank to individual cultivator.

### 4.7 Markets

For the marketing of agricultural produce, agricultural produce market committees are functioning in the districts. All the tehsils having facilities of regulated markets functioning in the districts.These sub-markets are connected with roads and having facilities of banking, electricity etc.

## CHAPTER V

# RESULTS AND DISCUSSION

The present chapter deals with the results pertaining to the research project “Impact of Wan irrigation project on agriculture and socio-economic development of beneficiary farmers’’ and discussion thereon. The data were collected from 300 farmers spread over 15 villages across the two districts of Western Vidarbha viz. Akola and Buldhana.

The data obtained from the beneficiaries were suitably organized, scored and classified into qualitative and qualitative classes, tabulated taking into account the objectives of the study. The data were also subjected to statistical treatment and analysis with the help of appropriate statistical techniques and tests. The results obtained from the analysis of data are presented in this chapter. The results are discussed appropriately with the logical reasoning, in light of the findings of previous researches on the topic. The results along with the discussion are described under the following subheads.

5.1 The personal, socio–economic, psychological and situational charectristics of the beneficiaries of Wan irrigation project

5.2 Dependent variable- Impact of Wan irrigation project

A] Impact of Wan irrigation project on agriculture development

B] Impact of Wan irrigation project on socio-economic development

5.3 Total impact of Wan irrigation project on agriculture and socio-economic development

5.4 Relational analysis

5.5 Path analysis

5.6 Constraints experienced by the beneficiaries of Wan irrigation project

5.7 Suggestions of beneficiaries of Wan irrigation project

## 5.1 The personal, socio–economic, psychological and situational characteristics of the beneficiaries of Wan irrigation project

The personal, socio-economic, psychological and situational characteristics of the beneficiaries were studied. The profile of beneficiaries in respect of these characteristics is presented and described in this part.

### 5.1.1 Age

Age is normally an indicator of the maturity, experience, depth of knowledge of the beneficiary. As it is the important factor, it has been considered in the present study.The age wise distribution of beneficiaries is presented in Table 5.

The data in Table 5 revealed that, in head region 55.00 per cent respondents belonged to middle age group, followed by 23.00 per cent in old age category and 22.00 per cent of the respondents found in young age categories.

In middle region, 40.00 per cent respondents belonged to middle age group, followed by 32.00 per cent of respondents belonged to old age category and 28.00 per cent respondents found in young age categories.

In tail region, 40.00 per cent respondents observed in middle age group, followed by 35.00 per cent in old age category and 25.00 per cent of the respondents belong to young age categories.

Overall, out of total respondents 45.00 per cent respondents belonged to middle age group, followed by 30.00 per cent of respondents belonged to old age category and 25.00 per cent of the respondents belonged to young age categories. Thus, it was concluded that majority of respondents belonged to middle age category. It might be due to the reason, that mostly middle age group people shoulder the responsibility of the family. Hence, they were actively engaged in money generating for fulfiling the needs of the family.

These findings also collaborate with the findings of Gawande (2008) and Raghunandan (2004).

**Table 5. Distribution of beneficiaries according to their age**

| Sl. No | Age | Head region (n=100) | | Middle region (n=100) | | Tail region (n=100) | | Total (n=300) | |
|---|---|---|---|---|---|---|---|---|---|
| | | Freq. | Percent | Freq. | Percent | Freq. | Percent | Freq. | Percent |
| 1. | Young | 22 | 22.00 | 28 | 28.00 | 25 | 25.00 | 75 | 25.00 |
| 2. | Middle | 55 | 55.00 | 40 | 40.00 | 40 | 40.00 | 135 | 45.00 |
| 3. | Old | 23 | 23.00 | 32 | 32.00 | 35 | 35.00 | 90 | 30.00 |
| | **Total** | **100** | **100.00** | **100** | **100.00** | **100** | **100.00** | **300** | **100.00** |

### 5.1.2 Land holding

Land holding is the key component of farm occupation. It is indicative of the economic status of an individual, as well as his occupational and income generation capacity. The distribution of the beneficiaries according to their land holding categories is presented in Table 6.

The bird eye view of the Table 6 revealed that, in head region 33.00 per cent of beneficiary farmers were possessing semi medium, followed by small (30.00%) ,marginal (20.00%), large, (09.00%) and medium (08.00%) size of land holding.

In middle region, 39.00 per cent of beneficiary farmers were possessed small, marginal (30.00%) and semi medium (25.00%) category of land holding, followed by medium (06.00%) category of land holding.

In tale region, 44.00 per cent of beneficiary farmers possessed small, marginal (40.00%), semi medium (14.00%) category of land holding, followed by medium (02.00%) category of land holding.

Out of total respondents in study area 37.00 per cent of respondents possessed small, marginal (30.00%), semi medium (24.00%) and medium (05.33%) category of land holding, followed by large (03.00%) category of land holding.

There were very few beneficiaries from large land holding group. It specifies that, the beneficiaries of this irrigation project were mostly from small land holding category but annual income of that beneficiaries were

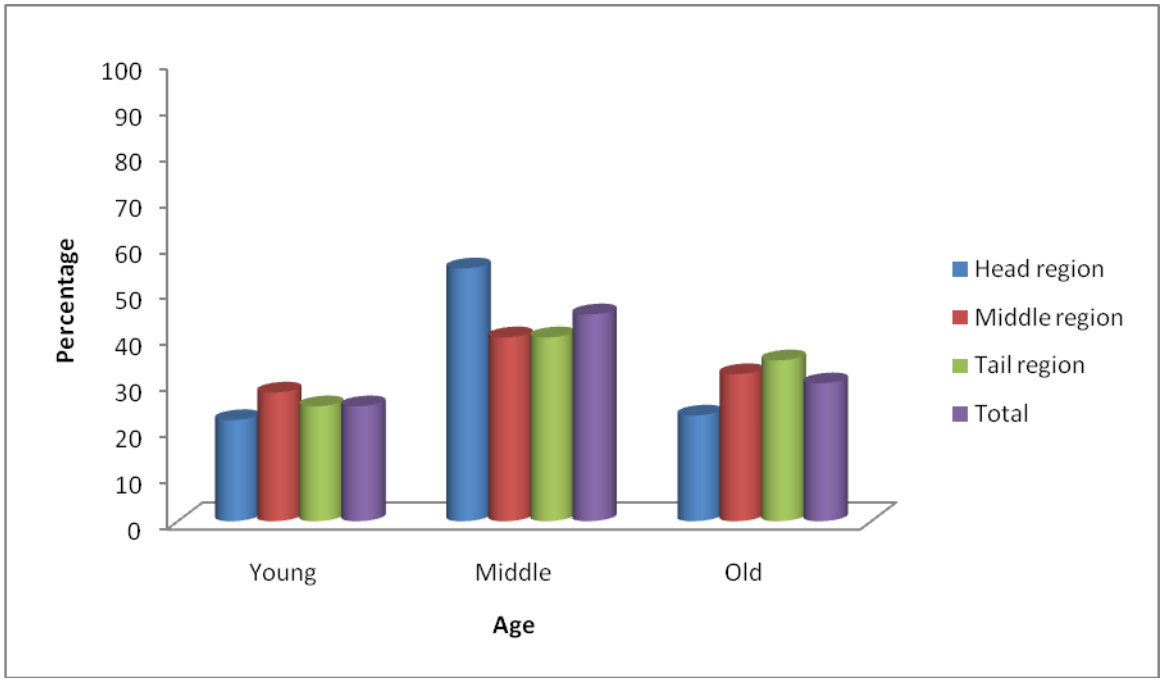



**Fig 3: Distribution of beneficiaries according to their age**

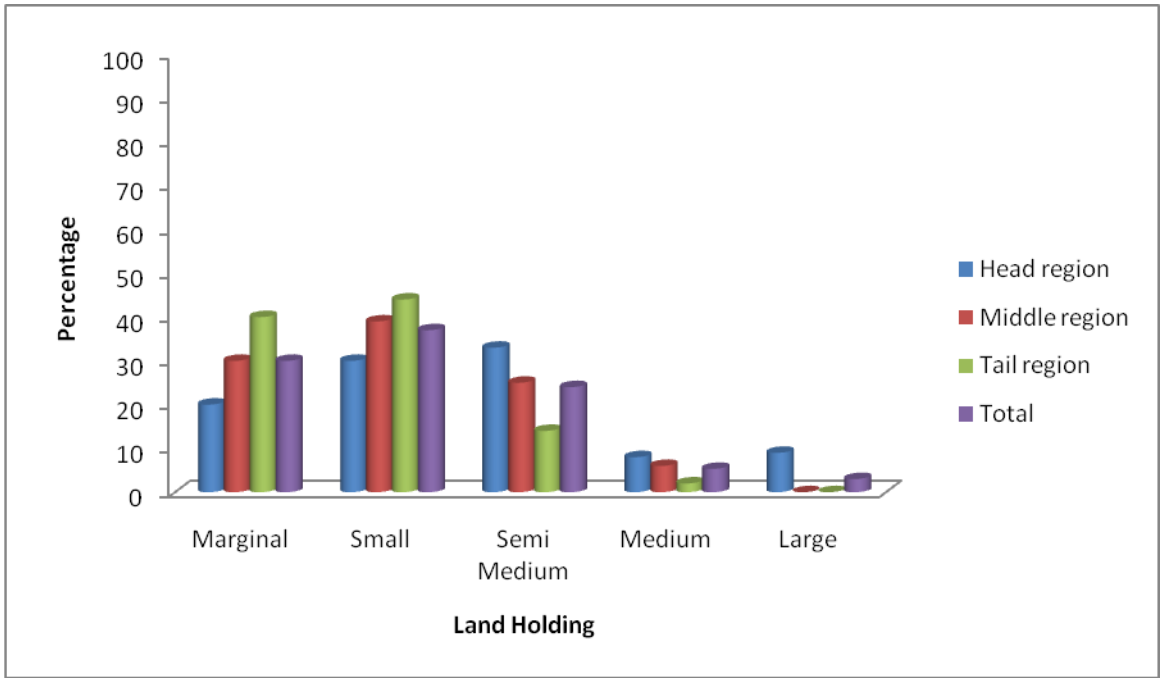



**Fig 4:Distribution of beneficiaries according to land holding**

sufficient for livelihood, because of availability of irrigation on time, although they had small land holding, their farm production was higher.

These findings also collaborate with the findings reported by Shankar *et al.* (2007) and Yadav *et al.* (2013).

**Table 6. Distribution of beneficiaries according to land holding**

| Sl. No. | Land holding | Head region (n=100) | | Middle region (n=100) | | Tail region (n=100) | | Total (n=300) | |
|---|---|---|---|---|---|---|---|---|---|
| | | Freq. | Percent | Freq. | Percent | Freq. | Percent | Freq. | Percent |
| 1. | Marginal | 20 | 20.00 | 30 | 30.00 | 40 | 40.00 | 90 | 30.00 |
| 2. | Small | 30 | 30.00 | 39 | 39.00 | 44 | 44.00 | 113 | 37.00 |
| 3. | Semi Medium | 33 | 33.00 | 25 | 25.00 | 14 | 14.00 | 72 | 24.00 |
| 4. | Medium | 08 | 08.00 | 06 | 06.00 | 02 | 02.00 | 16 | 05.33 |
| 5. | Large | 09 | 09.00 | 00 | 00.00 | 00 | 00.00 | 09 | 03.00 |
| **Total** | **Total** | **100** | **100.00** | **100** | **100.00** | **100** | **100.00** | **300** | **100.00** |

### 5.1.3 Annual income

Family Income is a major determinant of economic status of an individual. Every individual's standard of living is decided to a great extent by his family income. Lower income can create difficulties in managing economic and social affairs of the family (Madan, 1980). Keeping this in view, the annual income of beneficiaries was included as a socio-economic variable in the study. The distribution of the beneficiaries according to annual income is presented in Table 7.

The distribution of beneficiaries according to their annual income in head region, explained that forty per cent were having annual income above Rs.2,00,000/-, followed by 25.00 per cent farmers' having annual income in between Rs. 1,50,001 to 2,00,000/-. The proportion of farmers 20.00 per cent was having annual income in between Rs. 51,001 to 1,00,000/- was followed by 15.00 per cent beneficiary farmers having annual income in between Rs. 1,00,001 to 1,50,000/-.Thus, it could be inferred that higher percentage of farmers (40.00%) were having annual income above Rs.2,00,000/-.

**Table 7. Distribution of beneficiaries according to annual income**

| Sl. No | Annual Income | Head region (n=100) | | Middle region (n=100) | | Tail region (n=100) | | Total (n=300) | |
|---|---|---|---|---|---|---|---|---|---|
| | | Freq. | Percent | Freq. | Percent | Freq. | Percent | Freq. | Percent |
| 1. | 50001 to 100000 | 20 | 20.00 | 10 | 10.00 | 61 | 61.00 | 91 | 30.33 |
| 2. | 100001 to 150000 | 15 | 15.00 | 13 | 13.00 | 12 | 12.00 | 40 | 13.33 |
| 3. | 150001 to 200000 | 25 | 25.00 | 17 | 17.00 | 15 | 15.00 | 57 | 19.00 |
| 4. | Above 200000 | 40 | 40.00 | 60 | 60.00 | 12 | 12.00 | 112 | 37.34 |
| | **Total** | **100** | **100.00** | **100** | **100.00** | **100** | **100.00** | **300** | **100.00** |

In middle region, more than half of the respondents i.e. (60.00%) were having annual income aboveRs. 2,00,000, followed by 17.00 per cent respondents having annual income between Rs. 1,50,001 to 2,00,000/-, 13.00 per cent respondents were having annual income between Rs. 1,00,001 to 1,50,000/-, followed by 10.00 per cent of respondents were having annual income in between Rs. 51,001 to 1,00,000/-. In tail region more than half of the respondents i.e.( 61.00%) were having annual income in between Rs. 51,001 to 1,00,000/-, followed by 15.00 percent of respondents were having annual income in between Rs.1,50,001 to 2,00,000/- and 12.00 percent of respondents were having annual income above Rs. 2,00,000/- and in between Rs. 1,00,001 to 1,50,000/-.

Out of total respondents in study area, 37.34 per cent of respondents were having annual income above Rs. 2,00,000/-, followed by 30.33 per cent of respondents were having annual income in between Rs. 51001 to 100000/-, 19.00 pe rcent of respondents were having annual income in between Rs. 1,50,001 to 2,00,000/- and 13.33 per cent of respondents were having annual income in between Rs.1,00,001 to 1,50,000/- respectively.

It is evident that the beneficiaries belonging to higher income categories had definite benefit and economic support for their livelihood from this irrigation project.

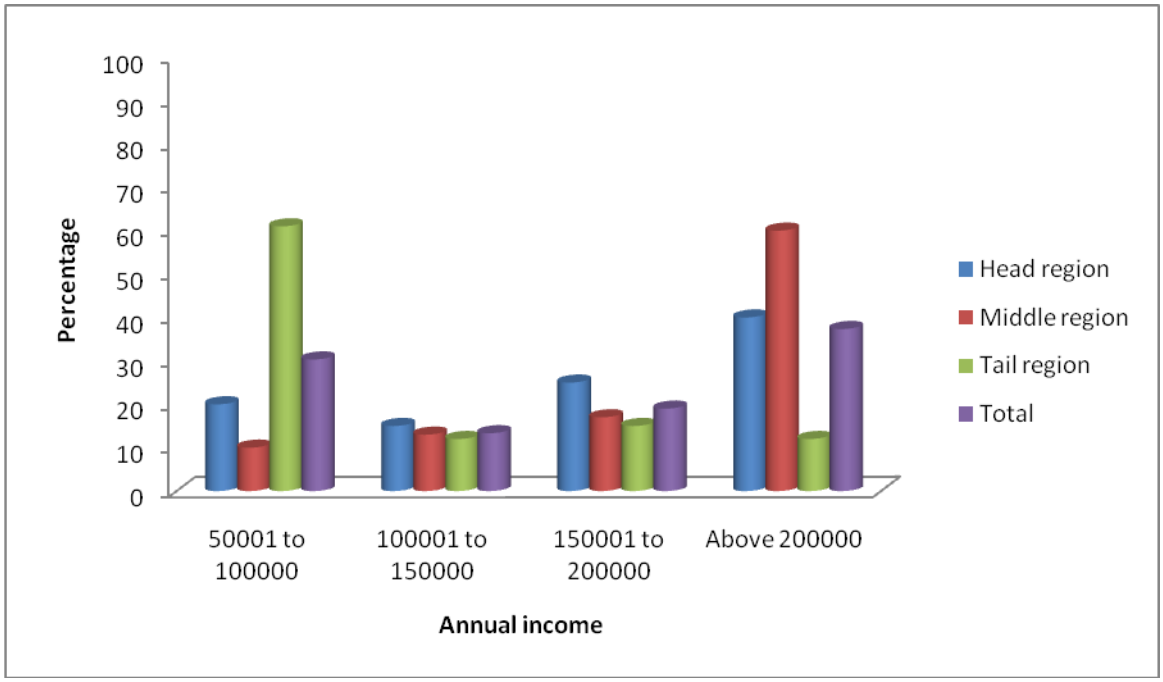



**Fig 5: Distribution of beneficiaries according to annual income**

### 5.1.4 Occupation

Occupation is an important indicator of source of earning and livelihood, hence this variable was considered for the study. The distribution of the beneficiaries according to their occupation has been depicted in Table 8.

Table 8 revealed that, in head region 95.00 per cent of beneficiary farmers were engaged in agriculture as their main occupation, followed by 05.00 per cent were engaged in agriculture plus labour as their main occupation.

In middle region, 80.00 per cent of beneficiary farmers were engaged in agriculture as their main occupation, followed by 10.00 per cent were engaged in agriculture plus labour as their main occupation and only 10.00 per cent were engaged in agriculture plus allied occupation.

In tail region, 30.00 per cent of beneficiary farmres were engaged in agriculture plus business for earning, followed by 25.00 per cent were engaged in agriculture,followed by 25.00 per cent were engaged in agriculture plus labour and 20.00 per cent were engaged in agriculture plus allied occupations for earning.

Out of total respondents in study area, majority of respondents i. e, 66.67 per cent were engaged in agriculture as their main occupation for earning, followed by 13.33 per cent were engaged in agriculture plus labour for wage earning as a support, followed by 10.00 percent were engaged in agriculture plus allied occupation earning as a supportive endeavor to farming, followed by 10.00 per cent were engaged in agriculture plus business and no one was under agri + service category. The above findings revealed that, majority of the beneficiaries were engaged in agriculture as their main occupation.

These findings also collaborate with the findings reported by Karpagam (2000) and Kumar (2000).

**Table 8. Distribution of beneficiaries according to their occupation**

| Sl. No | Occupation | Head region (n=100) | | Middle region (n=100) | | Tail region (n=100) | | Total (n=300) | |
|---|---|---|---|---|---|---|---|---|---|
| | | Freq. | Percent | Freq. | Percent | Freq. | Percent | Freq. | Percent |
| 1. | Agri.+Labour | 05 | 05.00 | 10 | 10.00 | 25 | 25.00 | 40 | 13.33 |
| 2. | Agriculture | 95 | 95.00 | 80 | 80.00 | 25 | 25.00 | 200 | 66.67 |
| 3. | Agri.+A.Occu. | 00 | 00.00 | 10 | 10.00 | 20 | 20.00 | 30 | 10.00 |
| 4. | Agri.+Busi. | 00 | 00.00 | 00 | 00.00 | 30 | 30.00 | 30 | 10.00 |
| 5. | Agri.+ Service | 00 | 00.00 | 00 | 00.00 | 00 | 00.00 | 00 | 00.00 |
| | **Total** | **100** | **100.00** | **100** | **100.00** | **100** | **100.00** | **300** | **100.00** |

### 5.1.5 Farming experience

Conceptually, farming experience refers to the number of years in the farming operation.In the present study, farming experience was operationally defined as the number of years from which the farmer was engaged in farm related operations. Actually, Years of farmer engagement in farm was considered as his score. The distribution of farmer according to their farming experience was done in following four categories by equal interval method.

Farmers with higher experience appear to have often full information and better knowledge and were able to evaluate the benefits of the irrigation project.

Table 9 revealed that, in head region more than half of the beneficiay farmers were having farming experience ranging from 21 to 30 years, followed by 23.00 per cent of respondents were having above 30 years experience, it was followed by 22.00 per cent of respondents were having farming experience ranging from 11 to 20 years and meager, 04.00 per cent of respondents were having farming experience up to 10 years.

In middle region, 31.00 per cent of the beneficiay farmers were having farming experience above 30 years, followed by 30.00 per cent of respondents were having farming experience ranging from 21 to 30 years, followed by 25.00 per cent of respondents were having farming experience

ranging from 11 to 20 years and 12.00 per cent of respondents were having farming experience up to 10 years.

In tail region, 30.00 per cent of the beneficiay farmers were having farming experience above30 years, followed by 30.00 per cent of respondents were having farming experience ranging from 21 to 30 years ,followed by 23.00 per cent of respondents were having farming experience ranging from 11 to 20 years and only 07.00 per cent of respondents were having farming experience up to 10 years.

Out of total respondents in study area, 37.00 per cent respondents were having farming experience ranging from 21 to 30 years, followed by 28.00 per cent were having above 30 years, followed by 23.33 per cent respondents were having farming experience ranging from 11 to 20 years and 11.67 per cent of respondents were having farming experience up to 10 years.

It is inferred from above findings that majority farmers had farming experience in the range of 20 to 30 years. Secondly, it was noticed that the farming experience enhanced the agriculture and socio-economic development of farmers on the basis of their wide experience in farming.

**Table 9. Distribution of the respondents according to their farming experience**

| Sl. No | Farming Expe. | Head region (n=100) | | Middle region (n=100) | | Tail region (n=100) | | Total (n=300) | |
|---|---|---|---|---|---|---|---|---|---|
| | | Freq. | Percent | Freq. | Percent | Freq. | Percent | Freq. | Percent |
| 1. | Up to 10 | 04 | 04.00 | 12 | 12.00 | 07 | 07.00 | 35 | 11.67 |
| 2. | 11 to 20 | 22 | 22.00 | 25 | 25.00 | 23 | 23.00 | 70 | 23.33 |
| 3. | 21 to 30 | 51 | 51.00 | 30 | 30.00 | 30 | 30.00 | 111 | 37.00 |
| 4. | Above 30 | 23 | 23.00 | 31 | 31.00 | 30 | 30.00 | 84 | 28.00 |
| | **Total** | **100** | **100.00** | **100** | **100.00** | **100** | **100.00** | **300** | **100.00** |

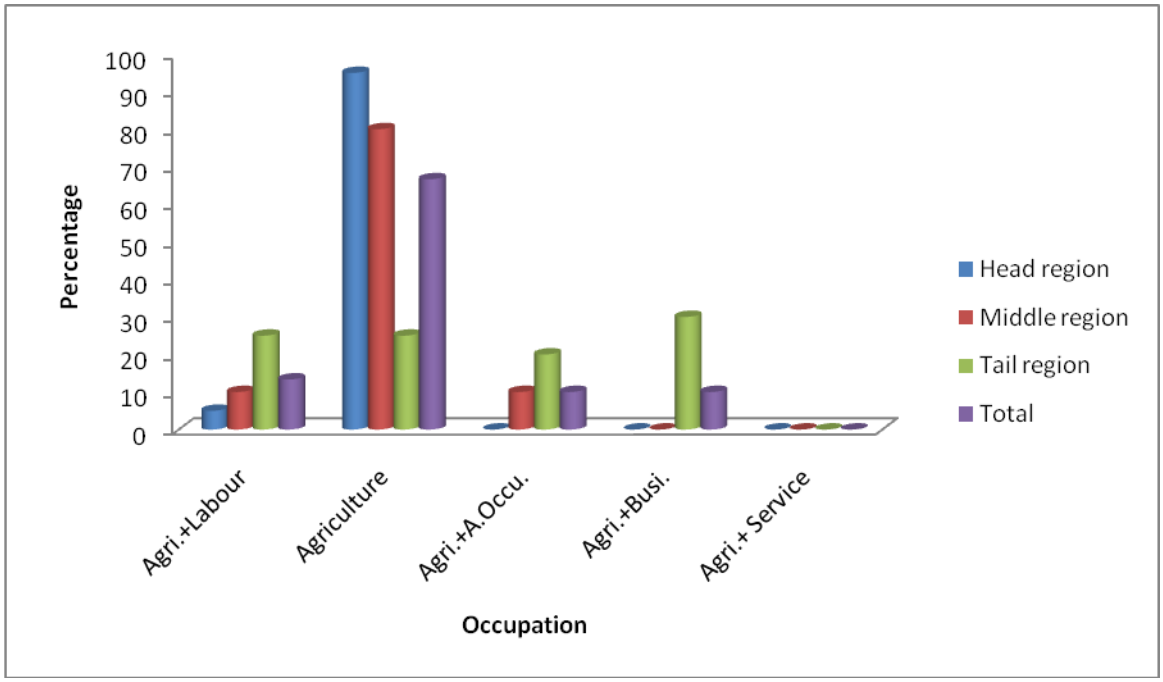



**Fig 6: Distribution of beneficiaries according to their occupation**

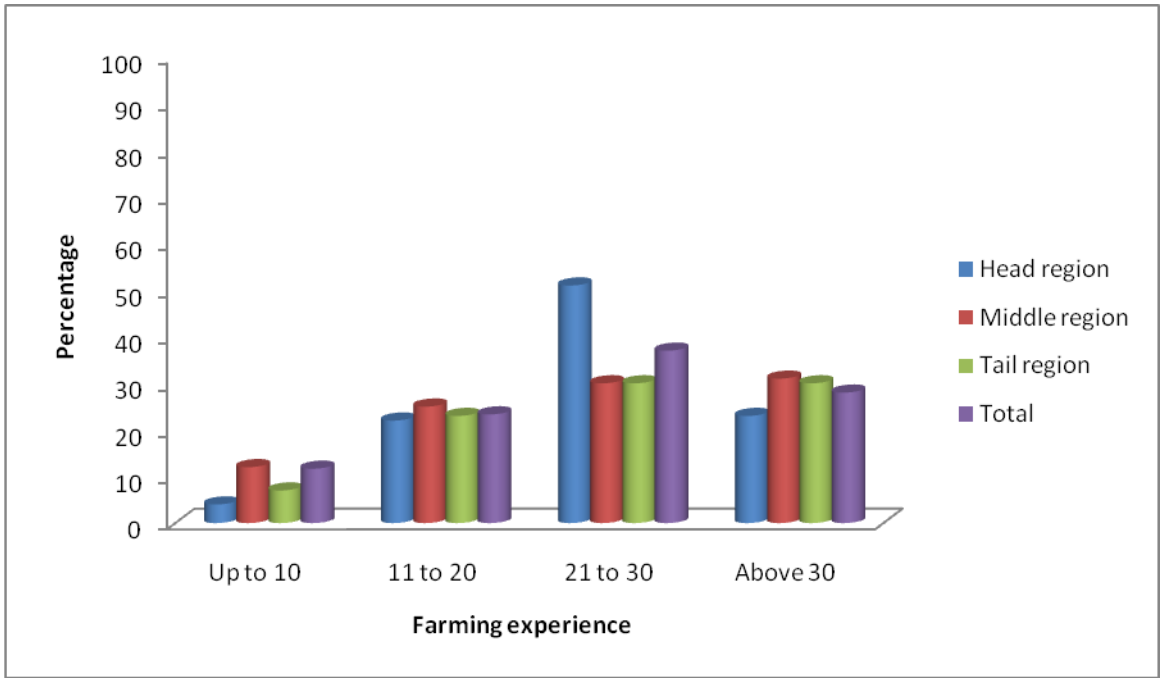



**Fig 7: Distribution of the respondents according to their farming experience**

### 5.1.6 Sources of information

The timely and appropriate use of available information sources is essential for progress. Farmers mostly come from poor segment of the rural community and they have limited access to the sources of information. The extent of use of information sources for seeking information and its functioning by the beneficiaries was studied and the findings are presented as below.

#### 5.1.6.1 Sources of information in head region

In head region, amongst the formal sources majority of the respondents (80.00%) always contacted to gramsevak, followed by Agriculture Assistant and Agriculture Supervisor (60.00%). 55.00 per cent respondents (used sometimes contacted with State agriculture officers and 80.00 per cent of them never contacted to University scientist.

In case of informal agencies, 100.00 per cent of the beneficiary farmers had always contct with friends and agri. Input dealers. The 30.00 per cent of respondents had sometime contact with opinion leader and award winning farmers and 25.00 per cent of respondents had never contact with opinion leader.

**Table 10. Distribution of beneficiaries according to their sources of information in head region**

| Sl. No. | Institution | Respondents n=(100) | | |
|---|---|---|---|---|
| | | Always | Sometimes | Never |
| **A. Formal Agencies** | | | | |
| 1. | Gramsevak | 80 (80.00) | 10 (10.00) | 10 (10.00) |
| 2. | Agricultural Assistant of State Agril. Dept. | 60 (60.00) | 30 (30.00) | 10 (10.00) |
| 3. | Agricultural Supervisor of State Agril. Dept. | 60 (60.00) | 40 (40.00) | 00 (00.00) |
| 4. | Agriculture Officer of State Agril. Dept. | 35 (35.00) | 55 (55.00) | 10 (10.00) |
| 5. | Extension Officer of Panchayat Samiti | 00 (00.00) | 30 (30.00) | 70 (70.00) |
| 6. | University Scientist | 00 (00.00) | 20 (20.00) | 80 (80.00) |
| 7. | KVK Scientist | 30 (30.00) | 20 (20.00) | 50 (50.00) |
| 8. | Others | 00 (00.00) | 00 (00.00) | 100 (100.00) |
| **B. Informal Agencies** | | | | |
| 1. | Friends | 100 (100.00) | 00 (00.00) | 00 (00.00) |
| 2. | Neighbours | 80 (80.00) | 20 (20.00) | 00 (00.00) |
| 3. | Progressive Farmers | 60 (60.00) | 20 (20.00) | 20 (20.00) |
| 4. | Opinion Leader | 45 (45.00) | 30 (30.00) | 25 (25.00) |
| 5. | Relatives | 90 (90.00) | 10 (10.00) | 00 (00.00) |
| 6. | Agril. Input dealers | 100 (100.00) | 00 (00.00) | 00 (00.00) |
| 7. | Award Winning Farmers | 50 (50.00) | 30 (30.00) | 20 (20.00) |

(* Figures in parenthesis indicates percentage)

### 5.1.6.2 Sources of information in middle region

In middle region, amongst the formal sources majority of the respondents (70.00%) always contacted to Agriculture Assistant followed by Gramsevak (60.00%). 35.00 per cent respondents sometimes contaced with

State Agriculture Officers and 70.00 per cent of them never contacted to Extension Officers of Panchayat Samiti.

In case of informal agencies, 90.00 per cent of the beneficiary farmers had always contact with Agri. Input Dealers, followed by 25.00 per cent of respondents had sometime contacted with friends and neighbours, 15.00 per cent of respondents had never contacted with friends and progressive farmers.

**Table 11.Distribution of respondents according to their different sources of information in middle region**

| Sl. No. | Institution | Respondents n=(100) | | |
|---|---|---|---|---|
| | | Always | Sometimes | Never |
| **A. Formal Agencies** | | | | |
| 1. | Gramsevak | 60 (60.00) | 30 (30.00) | 10 (10.00) |
| 2. | Agricultural Assistant of State Agril. Dept. | 70 (70.00) | 10 (10.00) | 20 (20.00) |
| 3. | Agricultural Supervisor of State Agril. Dept. | 40 (40.00) | 30 (30.00) | 30 (30.00) |
| 4. | Agriculture Officer of State Agril. Dept. | 25 (25.00) | 35 (35.00) | 40 (40.00) |
| 5. | Extension Officer of Panchayat Samiti | 10 (10.00) | 20 (20.00) | 70 (70.00) |
| 6. | University Scientist | 00 (00.00) | 00 (00.00) | 100 (100.00) |
| 7. | KVK Scientist | 25 (25.00) | 10 (10.00) | 65 (65.00) |
| 8. | Others | 00 (00.00) | 00 (00.00) | 100 (100.00) |
| **B. Informal Agencies** | | | | |
| 1. | Friends | 75 (75.00) | 25 (25.00) | 00 (00.00) |
| 2. | Neighbours | 60 (60.00) | 25 (25.00) | 15 (15.00) |
| 3. | Progressive Farmers | 65 (65.00) | 20 (20.00) | 15 (15.00) |
| 4. | Opinion Leader | 70 (70.00) | 25 (25.00) | 05 (05.00) |
| 5. | Relatives | 80 (80.00) | 15 (15.00) | 05 (05.00) |
| 6. | Agril. Input dealers | 90 (90.00) | 10 (10.00) | 00 (00.00) |
| 7. | Award Winning Farmers | 60 (60.00) | 10 (10.00) | 30 (30.00) |

(* Figures in parenthesis indicates percentage)

**Table 12. Distribution of respondents according to their different sources of information in tail region**

| Sl. No. | Institution | Respondents n=(100) | | |
|---|---|---|---|---|
| | | Always | Sometimes | Never |
| **A. Formal Agencies** | | | | |
| 1. | Gramsevak | 55 (55.00) | 20 (20.00) | 25 (25.00) |
| 2. | Agricultural Assistant of State Agril. Dept. | 45 (45.00) | 30 (30.00) | 25 (25.00) |
| 3. | Agricultural Supervisor of State Agril. Dept. | 30 (30.00) | 30 (30.00) | 40 (40.00) |
| 4. | Agriculture Officer of State Agril. Dept. | 20 (20.00) | 35 (35.00) | 45 (45.00) |
| 5. | Extension Officer of Panchayat Samiti | 05 (05.00) | 10 (10.00) | 85 (85.00) |
| 6. | University Scientist | 00 (00.00) | 00 (00.00) | 100 (100.00) |
| 7. | KVK Scientist | 20 (20.00) | 20 (20.00) | 40 (40.00) |
| 8. | Others | 00 (00.00) | 00 (00.00) | 100 (100.00) |
| **B. Informal Agencies** | | | | |
| 1. | Friends | 90 (90.00) | 10 (10.00) | 00 (00.00) |
| 2. | Neighbours | 80 (80.00) | 10 (10.00) | 10 (10.00) |
| 3. | Progressive Farmers | 50 (50.00) | 10 (10.00) | 40 (40.00) |
| 4. | Opinion Leader | 80 (80.00) | 10 (10.00) | 10 (10.00) |
| 5. | Relatives | 95 (95.00) | 05 (05.00) | 00 (00.00) |
| 6. | Agril. Input dealers | 90 (90.00) | 10 (10.00) | 00 (00.00) |
| 7. | Award Winning Farmers | 40 (40.00) | 20 (20.00) | 40 (40.00) |

(* Figures in parenthesis indicates percentage)

### 5.1.6.3 Sources of information in tail region

In tail region amongst the formal sources majority of the respondents (55.00%) always contacted to Gramsevak, followed by Agriculture Assistant (45.00%). The respondents sometimes contacted with Agriculture Assistant were 30.00 per cent and Supervisors. 85.00 per cent of them never contacted to Extension Officers of Panchayat Samiti.

In case of informal agencies 95.00 per cent of the beneficiary farmers had always contacted with relatives followed by friend and Agri. Input Dealers (90.00%). It was followed by 25.00 per cent of respondents had

sometime contacted with friends and neighbours, 15.00 per cent of respondents had never contacted with friends and progressive farmers.

**Table 13. Distribution of respondents according to their different sources of information in study area**

| Sl. No. | Institution | Respondents n=(300) | | |
|---|---|---|---|---|
| | | Always | Sometimes | Never |
| **A. Formal Agencies** | | | | |
| 1. | Gramsevak | 195 (65.00) | 60 (20.00) | 45 (15.00) |
| 2. | Agricultural Assistant of State Agril. Dept. | 175 (58.33) | 70 (23.33) | 55 (18.34) |
| 3. | Agricultural Supervisor of State Agril. Dept. | 130 (43.33) | 100 (33.33) | 70 (23.34) |
| 4. | Agriculture Officer of State Agril. Dept. | 80 (26.66) | 125 (41.67) | 95 (31.67) |
| 5. | Extension Officer of PanchayatSamiti | 15 (05.00) | 60 (20.00) | 225 (75.00) |
| 6. | University Scientist | 00 (00.00) | 20 (06.67) | 280 (93.33) |
| 7. | KVK Scientist | 75 (25.00) | 50 (16.67) | 175 (58.33) |
| 8. | Others | 00 (00.00) | 00 (00.00) | 300 (100.00) |
| **B. Informal Agencies** | | | | |
| 1. | Friends | 265 (88.33) | 35 (11.66) | 00 (00.00) |
| 2. | Neighbours | 220 (73.33) | 55 (18.33) | 25 (08.34) |
| 3. | Progressive Farmers | 175 (58.33) | 50 (16.67) | 75 (25.00) |
| 4. | Opinion Leader | 195 (65.00) | 65 (21.67) | 40 (13.33) |
| 5. | Relatives | 265 (88.33) | 30 (10.00) | 05 (01.67) |
| 6. | Agril. Input dealers | 280 (93.33) | 20 (06.67) | 00 (00.00) |
| 7. | Award Winning Farmers | 150 (50.00) | 60 (20.00) | 90 (30.00) |

(* Figures in parenthesis indicates percentage)

### 5.1.6.4 Sources of information in study area

In study area, amongst the informal sources majority of the respondents (65.00%) always in contacted with Gramsevak followed by Agriculture Assistant (58.33%). It was followed by 41.60 per cent sometimes contacted with Agriculture Officers of State Department, where 75.00 per cent of them never contacted to Extension officers of Panchayat Samiti.

In case of informal agencies 93.33 per cent of the beneficiary farmers had always contacted with Agri. Input Dealers followed by friends and relatives (88.33%). Where as 21.67 per cent of respondents had sometime contacted with opinion leaders and 30.00 per cent of respondents had never contacted with award winning farmers

### 5.1.6.5 Sources of information level

In study area, out of total 300 resondents more than half of the respondents (i.e. 53.67%) had medium level of sources of information followed by high level of information (46.36%) and no one found in low sources of information category.

**Table 14. Distribution of the respondents according to their of sources of information level**

| Sl. No. | Sources of information | Head region (n=100) | | Middle region (n=100) | | Tail region (n=100) | | Total (n=300) | |
|---|---|---|---|---|---|---|---|---|---|
| | | Freq. | Percent | Freq. | Percent | Freq. | Percent | Freq. | Percent |
| 1. | Low | 00 | 00.00 | 00 | 00.00 | 00 | 00.00 | 00 | 00.00 |
| 2. | Medium | 52 | 52.00 | 45 | 45.00 | 64 | 64.00 | 161 | 53.67 |
| 3. | High | 48 | 48.00 | 55 | 55.00 | 36 | 36.00 | 139 | 46.33 |
| | **Total** | **100** | **100.00** | **100** | **100.00** | **100** | **100.00** | **300** | **100.00** |

The findings indicated that the Gramsevak, Agriculture Assistants, Agriculture Input Dealers, friends and relatives of the beneficiaries were mostly used for seeking information.

The findings of the study are in conformity with the findings of Kulhal (2004) and Dhakane (2005).

### 5.1.7 Sources of irrigation

Table 15 revealed that, in all the three regions i.e. head, middle and tail all the respondents were using canal water for irrigation (100%), it was followed by 42.00 per cent of the respondents were using well and tubewell as source of irrigation to irrigate their field.

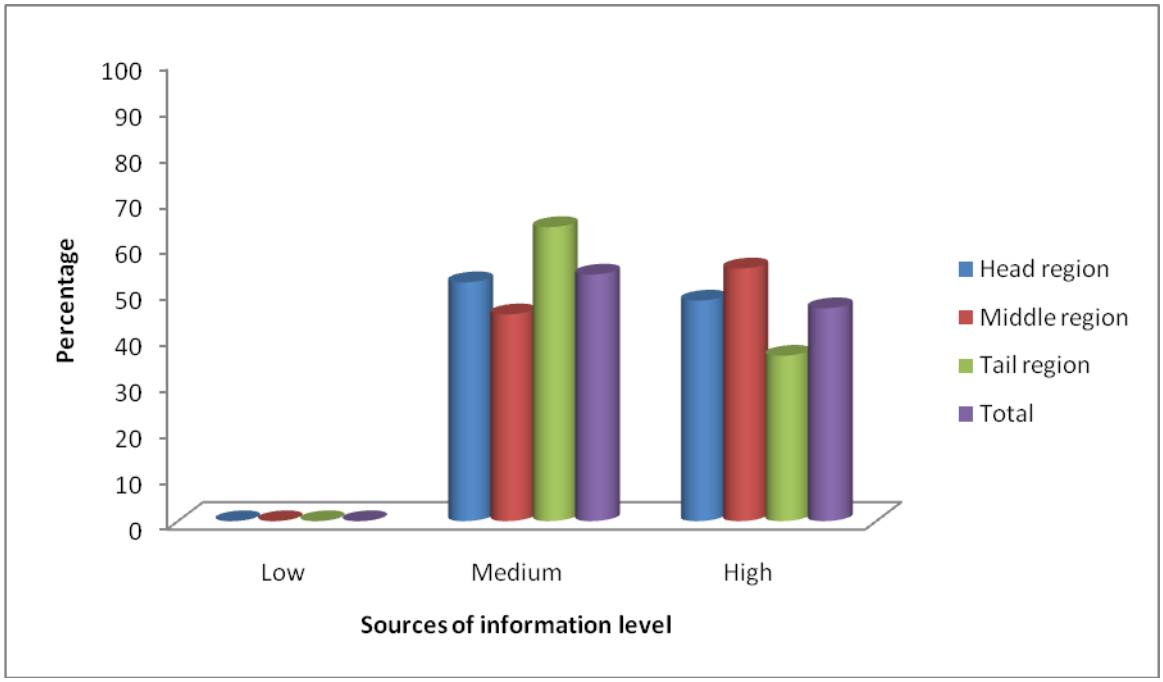



**Fig 8: Distribution of the respondents according to their of sources of information level**

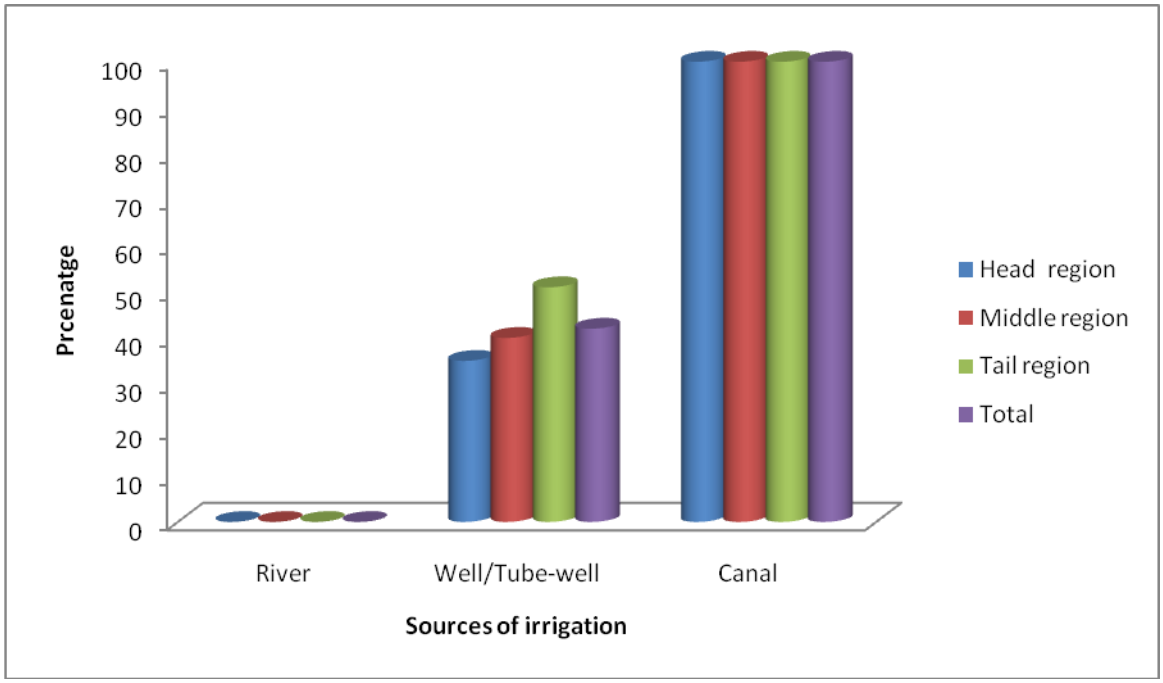



**Fig 9: Distribution of the respondents according to their sources of irrigation**

**Table 15. Distribution of the respondents according to their sources of irrigation**

| Sl. No | Sources of irrigation | Head region (n=100) | | Middle region (n=100) | | Tail region (n=100) | | Total (n=300) | |
|---|---|---|---|---|---|---|---|---|---|
| | | Freq. | Percent | Freq. | Percent | Freq. | Percent | Freq. | Percent |
| 1. | River | 00 | 00.00 | 00 | 00.00 | 00 | 00.00 | 00 | 00.00 |
| 2. | Well/Tube-well | 35 | 35.00 | 40 | 40.00 | 51 | 51.00 | 126 | 42.00 |
| 3. | Canal | 100 | 100.00 | 100 | 100.00 | 100 | 100.00 | 300 | 100.00 |
| | **Total** | **100** | **100.00** | **100** | **100.00** | **100** | **100.00** | **426** | **142.00** |

### 5.1.8 Method of irrigation

Table 16 revealed that, in head region 38.00 per cent of respondents were using sprinkler method of irrigation, followed by drip (33.00%) and flood irrigation method (29.00%).

**Table 16. Distribution of the respondents according to their method of irrigation**

| Sl. No | Method of irrigation | Head region (n=100) | | Middle region (n=100) | | Tail region (n=100) | | Total (n=300) | |
|---|---|---|---|---|---|---|---|---|---|
| | | Freq. | Percent | Freq. | Percent | Freq. | Percent | Freq. | Percent |
| 1. | Sprinkler | 38 | 38.00 | 60 | 60.00 | 56 | 56.00 | 154 | 51.33 |
| 2. | Drip | 33 | 33.00 | 36 | 36.00 | 44 | 30.00 | 113 | 37.67 |
| 3. | Flood | 29 | 29.00 | 04 | 04.00 | 00 | 00.00 | 33 | 11.00 |
| | **Total** | **100** | **100.00** | **100** | **100.00** | **100** | **100.00** | **300** | **100.00** |

In middle region, 60.00 per cent of respondents were using sprinkler method of irrigation, followed by drip (36.00%) and flood irrigation method (04.00%).

In tail region, 56.00 per cent of respondents were using sprinkler method of irrigation, followed by drip method of irrigation (44.00%).

In study region, out of total respondents more than half of respondents (i, e. 51.33%) were using sprinkler irrigation method followed by drip (37.67%) and flood irrigation method (11.00%).

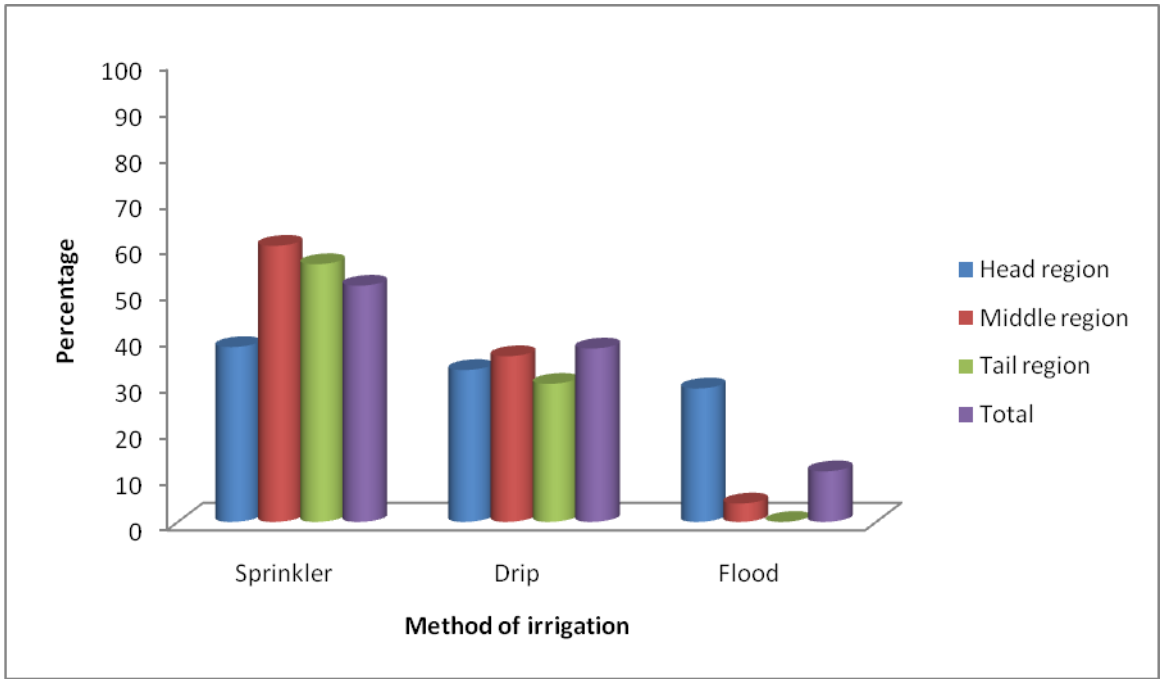



**Fig 10: Distribution of the respondents according to their method of irrigation**

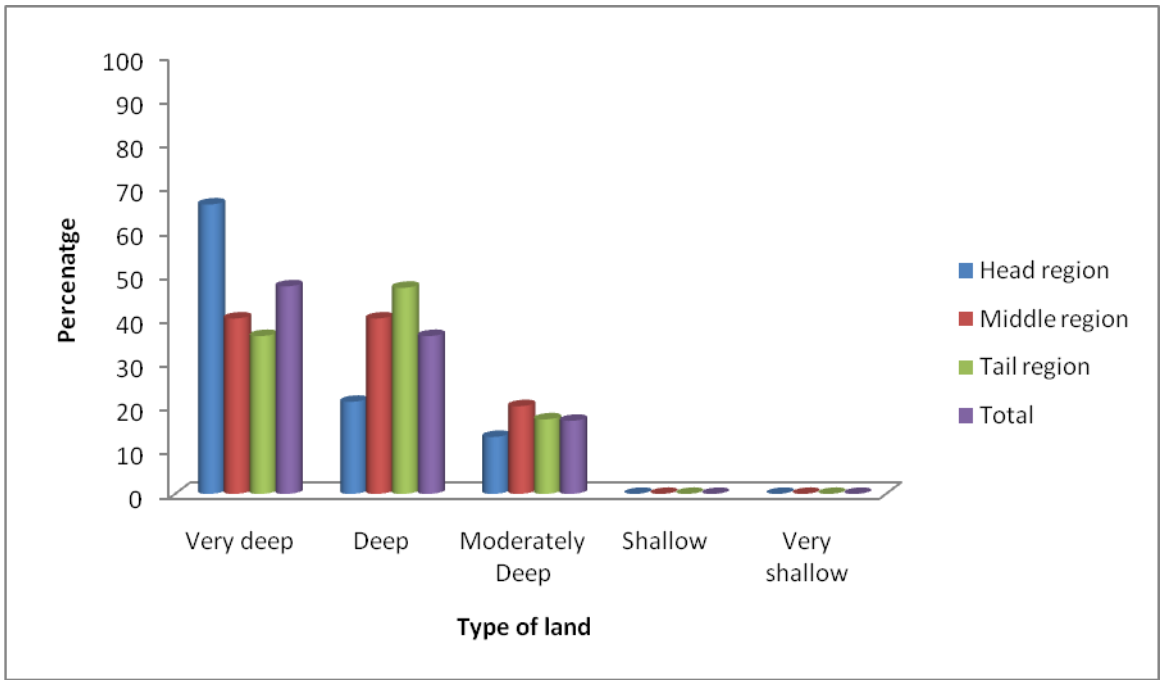



**Fig 11: Distribution of the respondents according to their type of land**

The findings of the study are in conformity with the findings of Shambharkar *et al.* (2013).

### 5.1.9 Type of land

Table 17 revealed that, in head region more than half of the respondents (66.00%) were possessed very deep type of land, followed by deep land (21.00%) and moderately deep (13.00%).

In middle region, 40.00 per cent of respondents were possessed very deep and deep type of land, followed by moderately deep land (20.00%).

In tail region, 47.00 per cent of respondents were possessed deep type of land, followed by very deep land (36.00%) and moderately deep (17.00%).

**Table 17. Distribution of the respondents according to their type of land**

| Sl. No | Type of land | Head region (n=100) | | Middle region (n=100) | | Tail region (n=100) | | Total (n=300) | |
|---|---|---|---|---|---|---|---|---|---|
| | | Freq. | Percent | Freq. | Percent | Freq. | Percent | Freq. | Percent |
| 1. | Very deep | 66 | 66.00 | 40 | 40.00 | 36 | 36.00 | 142 | 47.33 |
| 2. | Deep | 21 | 21.00 | 40 | 40.00 | 47 | 47.00 | 108 | 36.00 |
| 3. | Moderately Deep | 13 | 13.00 | 20 | 20.00 | 17 | 17.00 | 50 | 16.67 |
| 4. | Shallow | 00 | 00.00 | 00 | 00.00 | 00 | 00.00 | 00 | 00.00 |
| 5. | Very shallow | 00 | 00.00 | 00 | 00.00 | 00 | 00.00 | 00 | 00.00 |
| | **Total** | **100** | **100.00** | **100** | **100.00** | **100** | **100.00** | **300** | **100.00** |

In study area, 47.33 per cent of respondents were possessed very deep type of land, followed by deep type of land (36.00%) and moderately deep (16.67%).

It is concluded that, soil type of the study area was very deep and deep type.

### 5.1.10 Land under irrigation

Table 18 revealed that, in head region 33.00 per cent of beneficiary farmers were having 2.01 to 4.00 ha area under canal irrigation, 30.00 per cent respondents having 1.01 to 2.00 ha area under canal irrigation, 20.00 per cent up to 1.00 ha area where as 08.00 per cent and 09.00 per cent

respondents having 4.01 to 10.00 ha and above 10.00 ha area under canal irrigation, respectively.

In middle region, 39.00 per cent of beneficiary farmers were having 1.01 to 2.00 ha area under canal irrigation, followed by 30.00 per cent up to 1.00 ha area under canal irrigation, 25.00 per cent 2.01 to 4.00 ha under canal irrigation and 06.00 per cent respondents were having 4.01 to 10.00 ha area under canal irrigation.

In tail region, 44.00 per cent of beneficiary farmers were having 1.01 to 2.00 ha area under canal irrigation,it was followed by 40.00 per cent were having up to 1.00 ha area under canal irrigation,14.00 per cent having 2.01 to 4.00 ha area under canal irrigation and 02.00 per cent were having 4.01 to 10.00 ha area under canal irrigation.

**Table 18. Distribution of the respondents according to their land under canal irrigation**

| Sl. No | Land under irrigation | Head region (n=100) | | Middle region (n=100) | | Tail region (n=100) | | Total (n=300) | |
|---|---|---|---|---|---|---|---|---|---|
| | | Freq. | Percent | Freq. | Percent | Freq. | Percent | Freq. | Percent |
| 1. | Up to 1.00 ha | 20 | 20.00 | 30 | 30.00 | 40 | 40.00 | 90 | 30.00 |
| 2. | 1.01 to 2.00 ha | 30 | 30.00 | 39 | 39.00 | 44 | 44.00 | 113 | 37.00 |
| 3. | 2.01 to 4.00 ha | 33 | 33.00 | 25 | 25.00 | 14 | 14.00 | 72 | 24.00 |
| 4. | 4.01 to 10.00 ha | 08 | 08.00 | 06 | 06.00 | 02 | 02.00 | 16 | 05.33 |
| 5. | Above 10.00 ha | 09 | 09.00 | 00 | 00.00 | 00 | 00.00 | 09 | 03.00 |
| | **Total** | **100** | **100.00** | **100** | **100.00** | **100** | **100.00** | **300** | **100.00** |

In study area, 37.00 per cent of respondents were having 1.01 to 2.00 ha area under canal irrigation, followed by 30.00 per cent were having up to 1.00 ha area under canal irrigation, 24.00 per cent were having 2.01 to 4.00 ha area under canal irrigation, 05.33 per cent were having 4.01 to 10.00 ha area under canal irrigation and only 03.00 per cent were having above 10.00 ha area under canal irrigation.

### 5.1.11 Economic motivation

Table 19 revealed that, in head region majority (98.00%) of the respondents were found in the high category of economic motivation, followed

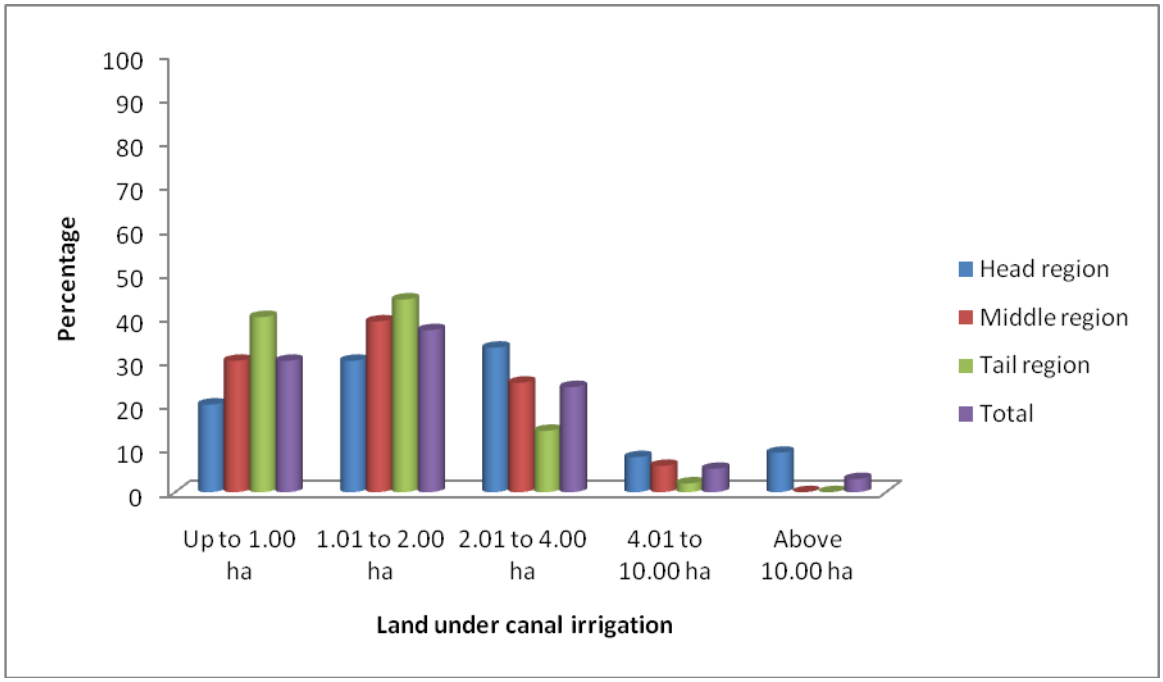



**Fig 12:Distribution of the respondents according to their land under canal irrigation**

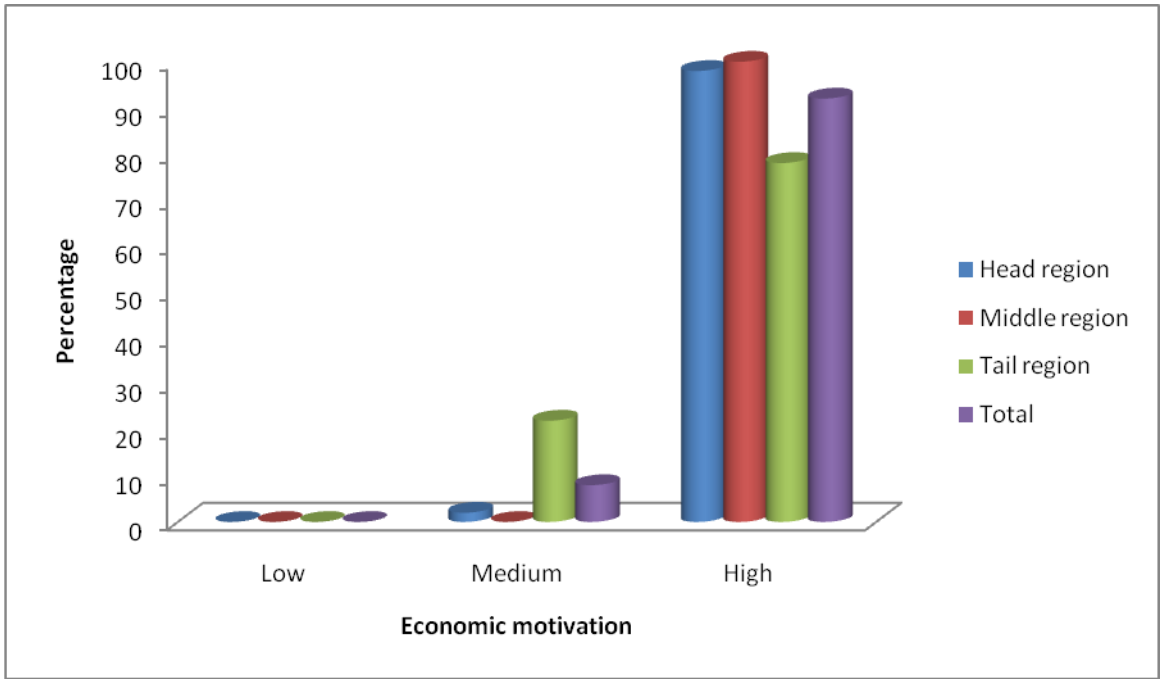



**Fig 13: Distribution of the respondents according to their economic motivation**

meagre (02.00%) of them were found in medium category of economic motivation.

In middle region, cent percent (100.00%) of the respondents were found in the high category of economic motivation.

**Table 19. Distribution of the respondents according to their economic motivation**

| Sl. No | Economic Motivation level | Head region (n=100) | | Middle region (n=100) | | Tail region (n=100) | | Total (n=300) | |
|---|---|---|---|---|---|---|---|---|---|
| | | Freq. | Percent | Freq. | Percent | Freq. | Percent | Freq. | Percent |
| 1. | Low | 00 | 00.00 | 00 | 00.00 | 00 | 00.00 | 00 | 00.00 |
| 2. | Medium | 02 | 02.00 | 00 | 00.00 | 22 | 22.00 | 24 | 08.00 |
| 3. | High | 98 | 98.00 | 100 | 100.00 | 78 | 78.00 | 276 | 92.00 |
| | **Total** | **100** | **100.00** | **100** | **100.00** | **100** | **100.00** | **300** | **100.00** |

**Mean = 85.11** **S.D. = 6.52**

In tail region, majority (78.00%) of the respondents were found in the high category of economic motivation, whereas 22.00 per cent of them found in medium category of economic motivation.

In study area, 92.00 percent of respondents were found in high category of economic motivation followed by 08.00 per cent in medium category of economic motivation

These findings collaborate with the findings of Shrinivasa Reddy (1995).

### 5.1.12 Scientific orientation

Table 20 revealed that, in head region majority (68.00%) of the respondents were found in the medium category of scientific orientation followed by 30.00 per cent in high category of scientific orientation and only 02.00 per cent were observed in low level of scientific orientation.

In middle region, 88.00 per cent of the respondents were found in the medium category of scientific orientation followed by 10.00 per cent found in high category of scientific orientation and only 02.00 per cent of the respondents were observed in low level of scientific orientation.

In tail region, 69.00 per cent of the respondents were found in the medium category of scientific orientation, followed by low (28.00%) and high (03.00%) category of scientific orientation.

**Table 20. Distribution of the respondents according to their scientific orientation**

| Sl. No | Scientific orientation | Head region (n=100) | | Middle region (n=100) | | Tail region (n=100) | | Total (n=300) | |
|---|---|---|---|---|---|---|---|---|---|
| | | Freq. | Percent | Freq. | Percent | Freq. | Percent | Freq. | Percent |
| 1. | Low | 02 | 02.00 | 02 | 02.00 | 28 | 28.00 | 32 | 10.66 |
| 2. | Medium | 68 | 68.00 | 88 | 88.00 | 69 | 69.00 | 225 | 75.00 |
| 3. | High | 30 | 30.00 | 10 | 10.00 | 03 | 03.00 | 43 | 14.34 |
| | **Total** | **100** | **100.00** | **100** | **100.00** | **100** | **100.00** | **300** | **100.00** |

**Mean = 73.57** **S. D. = 7.37**

In study area, 75.00 per cent of the respondents were found in the medium category of scientific orientation followed by high (14.34%) and low (10.66%) level of scientific orientation.

These findings also collaborate with the findings of Chandran (1997).

### 5.1.13 Innovativeness

Table 21 revealed that, in head region 68.00 per cent of the respondents were found in high category of innovativeness, followed by medium (32.00%) category of innovativeness.

In middle region, 78.00 per cent of the respondents were found in the medium category of innovativeness followed by 22.00 per cent in high category of innovativeness.

In tail region, 96.00 per cen tof the respondents were found to be included in the medium category of innovativeness, followed by 04.00 per cent in high category of innovativeness.

In study area, 68.67 per cent of the respondents were found in the medium category of innovativeness, followed by high (31.33%) category of innovativeness.

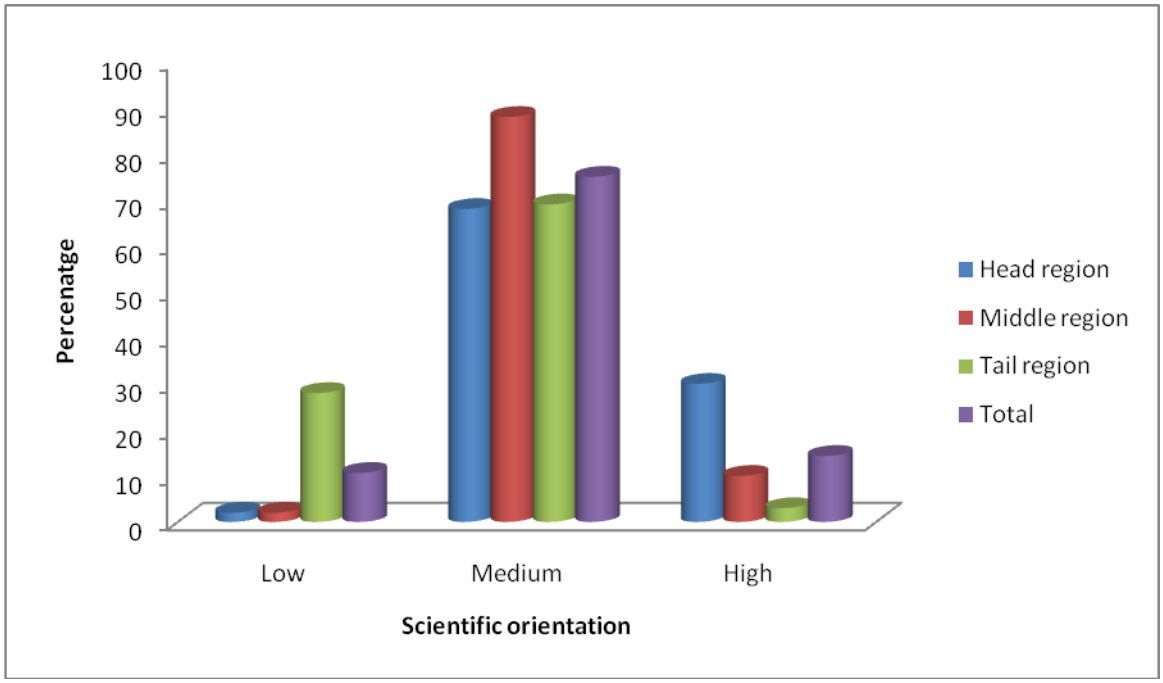



**Fig 14: Distribution of the respondents according to their scientific orientation**

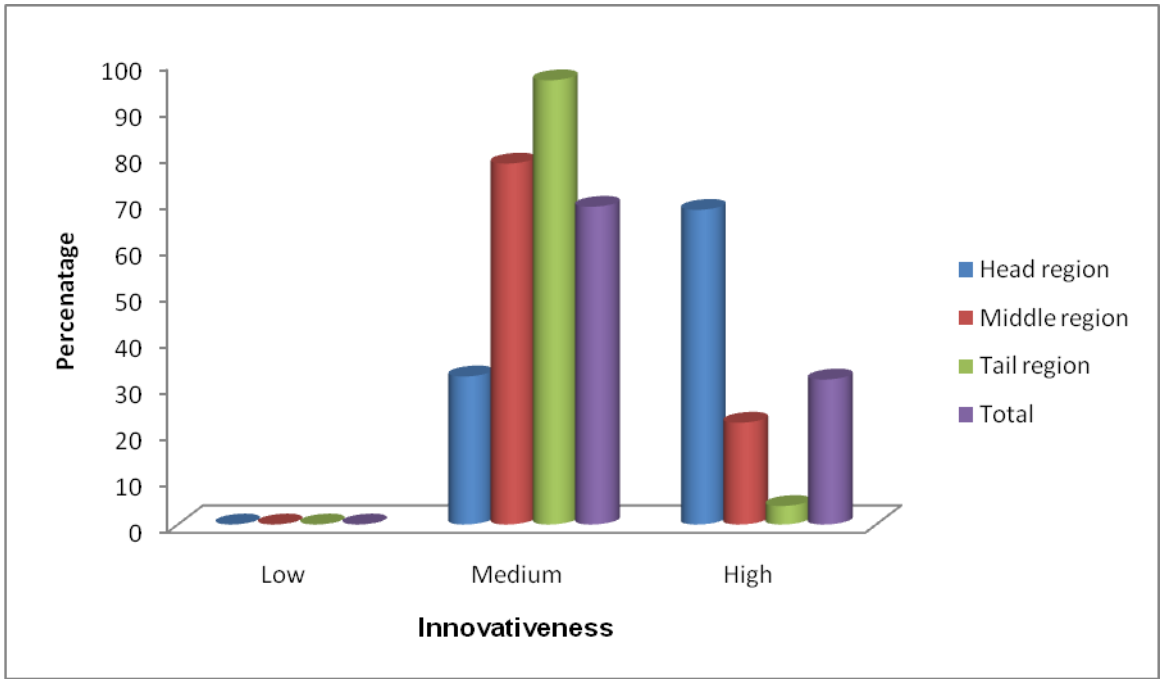



**Fig 15: Distribution of the respondents according to their innovativeness**

These findings also collaborate wth the findings of Chikhale *et al.* (2002), Mapari (2005) and Tamilselvi *et al.* (2008).

**Table 21. Distribution of the respondents according to their innovativeness**

| Sl. No | Innovativeness | Head region (n=100) | | Middle region (n=100) | | Tail region (n=100) | | Total (n=300) | |
|---|---|---|---|---|---|---|---|---|---|
| | | Freq. | Percent | Freq. | Percent | Freq. | Percent | Freq. | Percent |
| 1. | Low | 00 | 00.00 | 00 | 00.00 | 00 | 00.00 | 00 | 00.00 |
| 2. | Medium | 32 | 32.00 | 78 | 78.00 | 96 | 96.00 | 206 | 68.67 |
| 3. | High | 68 | 68.00 | 22 | 22.00 | 04 | 04.00 | 94 | 31.33 |
| | **Total** | **100** | **100.00** | **100** | **100.00** | **100** | **100.00** | **300** | **100.00** |

### 5.1.14 Frequency of irrigation in a year

Table 22 revealed that, in head region, majority (75.00%) of the respondents were utilising 4 to 6 irrigation of canal water in a year, 25.00 per cent utilizing above 6 irrigation of canal water for irrigating their crop.

In middle region, 37.00 per cent of the respondents were using 4 to 6 irrigation of canal water, 35.00 per cent were using above 6 irrigation and 28.00 per cent of respondents were using up to 3 number of irrigation for irrigating the crop.

In tail region, 89.00 per cent of the respondents were using up to 3 number of irrigation, followed by 4 to 6 irrigation by 11.00 per cent of the respondents.

**Table 22. Distribution of the respondents according to frequency of irrigation in a year**

| Sl. No | Frequency of irrigation (No. of ittigation /year) | Head region (n=100) | | Middle region (n=100) | | Tail region (n=100) | | Total (n=300) | |
|---|---|---|---|---|---|---|---|---|---|
| | | Freq. | Percent | Freq. | Percent | Freq. | Percent | Freq. | Percent |
| 1. | Up to 3 | 00 | 00.00 | 28 | 28.00 | 89 | 89.00 | 117 | 39.00 |
| 2. | 4 – 6 | 75 | 75.00 | 37 | 37.00 | 11 | 11.00 | 123 | 41.00 |
| 3. | Above 6 | 25 | 25.00 | 35 | 35.00 | 00 | 00.00 | 60 | 20.00 |
| | **Total** | **100** | **100.00** | **100** | **100.00** | **100** | **100.00** | **300** | **100.00** |

In study area, 41.00 per cent of respondents were using 4 to 6 irrigation for irrigating their crop, it was followed by 39.00 per cent up to 3 irrigation and remaining 20.00 per cent of respondents were using above 6 number of irrigation to their crop.

These findings also collaborate with the findings of Pawar and Patil (2013).

### 5.1.15 Irrigation potential

Table 23 revealed that, in head region 33.00 per cent of respondents were having irrigation potential to irrigate 2.01 to 4.00 ha of land. It was followed by 30.00 per cent respondent having the irrigation potential to irrigate 1.01 to 2.00 ha. Further 20.00 per cent, 09.00 per cent and 08.00 per cent were having the potential to irrigate up to 1.00 ha, above 10.00 ha and 4.01 to 10.00 ha area of land, respectively.

In middle region, 36.00 per cent of respondents were having the irrigation potential to irrigate 1.01 to 2.00 ha area. It was followed by 30.00 per cent, 25.00 per cent and 06.00 per cent to irrigate up to 1.00 ha, 2.01 to 4.00 ha and 4.01 to 10.00 ha area of land, respectively.

In tail region, 44.00 per cent of respondents were having the irrigation potential to irrigate 1.01 to 2.00 ha area of their land. It was followed by 40.00 per cent,14.00 per cent and 02.00 per cent of respondents having were irrigation potential to irrigate up to 1.00 ha, 2.01 to 4.00 ha and 4.01 to 10.00 ha area of land, respectively.

**Table 23. Distribution of the respondents according to irrigation potential**

| Sl. No | Irrigation Potential (ha) | Head region (n=100) | | Middle region (n=100) | | Tail region (n=100) | | Total (n=300) | |
|---|---|---|---|---|---|---|---|---|---|
| | | Freq. | Percent | Freq. | Percent | Freq. | Percent | Freq. | Percent |
| 1. | Upto 1.00 | 20 | 20.00 | 30 | 30.00 | 40 | 40.00 | 90 | 30.00 |
| 2. | 1.01to 2.00 | 30 | 30.00 | 39 | 36.00 | 44 | 44.00 | 113 | 37.00 |
| 3. | 2.01to 4.00 | 33 | 33.00 | 25 | 25.00 | 14 | 14.00 | 72 | 24.00 |
| 4. | 4.01to 10.00 | 08 | 08.00 | 06 | 06.00 | 02 | 02.00 | 16 | 05.33 |
| 5. | Above 10.00 | 09 | 09.00 | 00 | 00.00 | 00 | 00.00 | 09 | 03.00 |
| | **Total** | **100** | **100.00** | **100** | **100.00** | **100** | **100.00** | **300** | **100.00** |

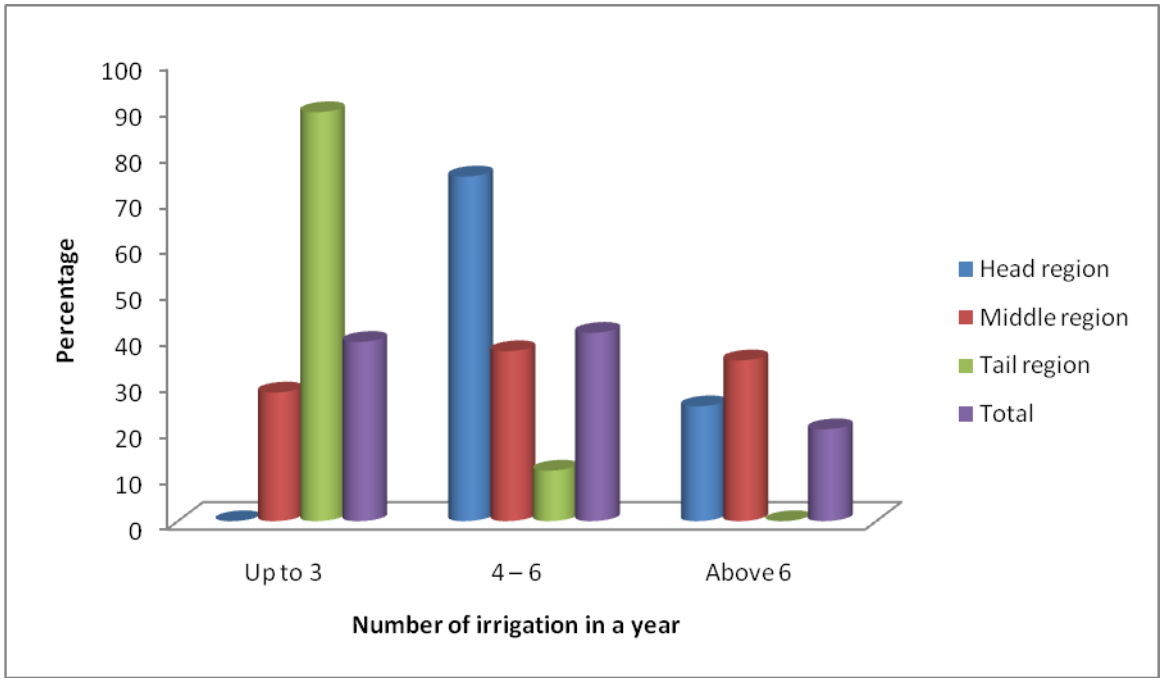



**Fig 16: Distribution of the respondents according to frequency of irrigation in a year**

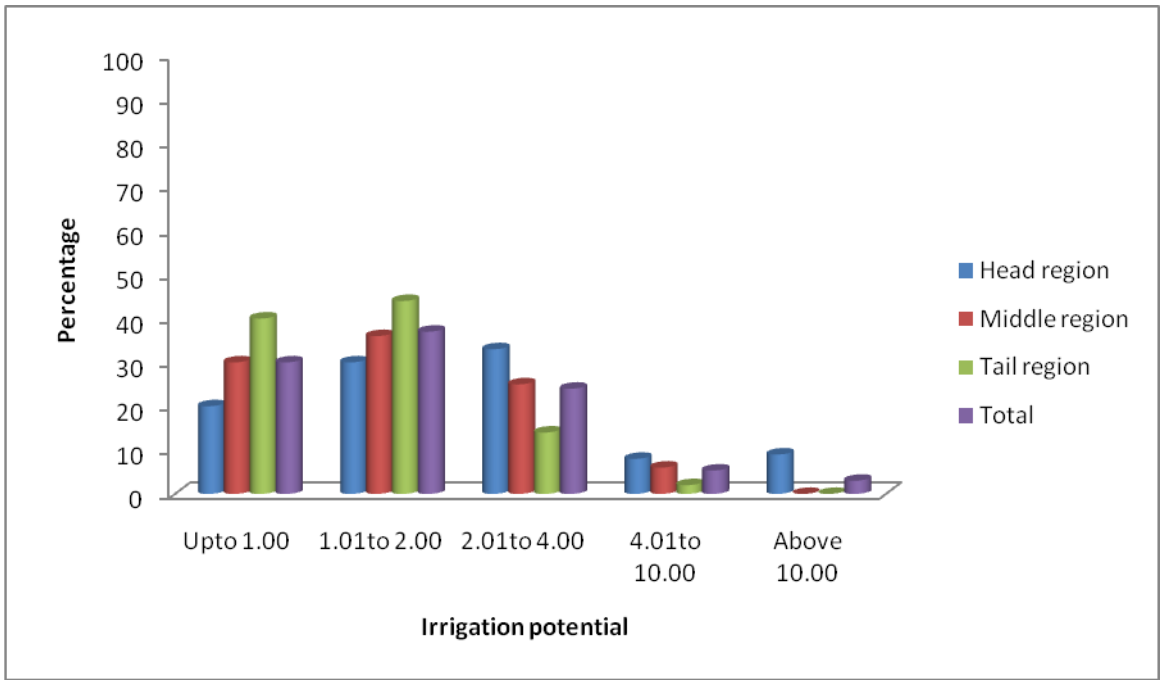



**Fig 17: Distribution of the respondents according to irrigation potential**

In tail region, 44.00 per cent of respondents were having the irrigation potential to irrigate 1.01 to 2.00 ha area of their land. It was followed by 40.00 per cent 14.00 per cent and 02.00 per cent of respondent were having the irrigation potential to irrigate up to 1.00 ha, 2.01 to 4.00 ha and 4.01 to 10.00 ha area of land, respectively.

In study area, 37.00 per cent of respondents were having irrigation potential up to 1.01 to 2.00 ha area of their land.It was followed by 30.00 per cent (up to 1.00 ha), 24.00 per cent (2.01 to 4.00 ha), 05.33 per cent (4.00 to 10.00 ha) and 03.00 per cent (above 10.00 ha) respectively.

These findings also collaborate with the findings of Pawar and Patil (2013).

### 5.1.16 Distance of dam

Table 24 revealed that, in head region, 40.00 per cent of the respondents land was in between 21 to 30 km distance from the dam, followed by 35.00 per cent of respondent land was in between 11 to 20 km and 25.00 per cent of the respondents land was up to 10 km distance from the dam.

In middle region, 45.00 per cent of the respondents land in between 11 to 20 km and 21 to 30 km distance from the dam, followed by 10.00 per cent of the respondents land up to 10 km distance from the dam.

**Table 24. Distribution of the respondents according to distance of dam**

| Sl. No. | Distance of dam (Km) | Head region (n=100) | | Middle region (n=100) | | Tail region (n=100) | | Total (n=300) | |
|---|---|---|---|---|---|---|---|---|---|
| | | Freq. | Percent | Freq. | Percent | Freq. | Percent | Freq. | Percent |
| 1. | Up to 10 | 25 | 25.00 | 10 | 10.00 | 08 | 08.00 | 43 | 14.33 |
| 2. | 11 – 20 | 35 | 35.00 | 45 | 45.00 | 34 | 34.00 | 114 | 38.00 |
| 3. | 21 – 30 | 40 | 40.00 | 45 | 45.00 | 58 | 58.00 | 143 | 47.67 |
| | **Total** | **100** | **100.00** | **100** | **100.00** | **100** | **100.00** | **300** | **100.00** |

In tail region, 58.00 per cent of the respondents land in between 21 to 30 km distance from the dam, followed by 34.00 per cent of the

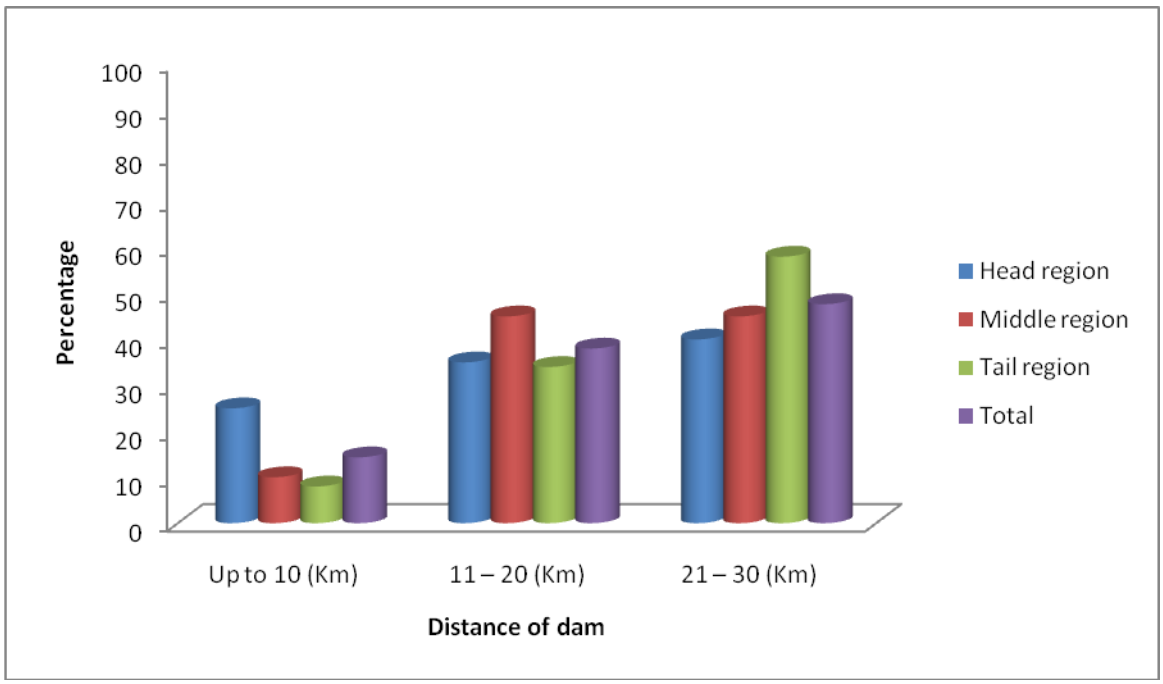



**Fig 18: Distribution of the respondents according to distance of dam**

respondents land in between 11 to 20 km and 08.00 per cent of the respondents land up to 10 km distance from the dam.

In study area, nearly fifty per cent of the respondents (47.67%), whose land was found in between 21 to 30 km distance from the dam followed by 38.00 per cent of the respondents whose land was found in between 11 to 20 km and 14.33 per cent of the respondents land observe up to 10 km distance from the dam.

These findings also collaborate with the findings of Ramakrishnan and Sivananatham (1989).

**5.2 Dependent variable**

The dependent variable for the present study is impact of Wan irrigation project.

**Impact of Wan irrigation project**

It is operationally defined as the effect of Wan irrigation project on beneficiary farmers of the command area.

The base year for obtaining data and information from the farmers considered as the base year 2004 because the project was started functioning from the year 2005. The year for collection of information and data from the farmers after Wan irrigation project was considered as year 2016-2017 i.e. the year of data collection.

The effect was ascertained in terms of agriculture and socio-economic development of beneficiary farmers before (year 2005) and after 10 years of Wan irrigation i.e. in the year 2016-2017. The results pertaining to this, is given in the following part

**A] Agriculture development**

The first component of impact was agriculture development and it was studied in terms of change in cropping pattern, change in cropping intensity and change in productivity of major kharif, rabi and other crops.

**a) Change in cropping pattern and cropping intensity**

Cropping pattern was studied in terms of hectares covered under various crops before and after Wan irrigation project. Cropping intensity means the proportion of the area under different crops including double and triple cropping to the net cultivated area. The per cent change in cropping intensity was measured on the basis of difference between mean score of cropping intensity of beneficiary farmers before and after Wan irrigation project

Cropping pattern and cropping intensity of major kharif and rabi crop in head, middle, tail and total study area were studied saperately in order to know the segmentwise effect of Wan irrigation project on the beneficiary farmers and presented in this part.

**i) Change in cropping pattern and cropping intensity in head region**

It is observed from Table 25, in case of head region in kharif season there was no change in the total area under kharif crop. However, there was change in area under cotton, tur and it was found increased by 21.78 per cent and 12.24 per cent respectively.The area under soybean and Hy. Jowar reduced by 06.25 per cent and 41.66 per cent, respectively.

In case of rabi crop, the area under wheat, gram, ground nut and in total were found to be increased by 125.45 per cent, 200.00 per cent, 127.27 percent and in total 139.50 per cent respectively. The gross cropped area was increased which may help farmers to bring more area under rabi crops. As with the availability of water for irrigation resulted in increase in area under crop in rabi season.

When we calculate the cropping intensity in total before and after Wan irrigation project, it was found that there was increase in cropping intensity in the head region from 120.09 to 156.82. It means that, it was increased by 36.73 per cent.

From these findings, it can be inferred that there was definite impact of Wan irrigation project in respect of change in area under various crops and change in cropping intensity, which may help beneficiary for the socio-economic upliftment.

**Table 25. Change in cropping pattern and cropping intensity before and after Wan irrigation project in head region**

| Sl. No. | Crops | Head region (n=100) | | | | | |
|---|---|---|---|---|---|---|---|
| | | Area before Wan project (ha.) | Per-cent | Area after Wan project (ha.) | Per-cent | Change in area (ha.) | Percent change (%) |
| **A.** | **Kharif** | | | | | | |
| 1. | Soybean | 144 | 35.73 | 135 | 33.50 | -09 | -06.25 |
| 2. | Cotton | 101 | 25.07 | 123 | 30.52 | +22 | 21.78 |
| 3. | Tur | 98 | 24.31 | 110 | 27.30 | +12 | 12.24 |
| 4. | Hy.Jowar | 60 | 14.89 | 35 | 08.68 | -25 | -41.66 |
| | **Kharif Total** | **403** | **100.00** | **403** | **100.00** | - | - |
| **B.** | **Rabi** | | | | | | |
| 1. | Wheat | 55 | 67.90 | 124 | 63.92 | +69 | 125.45 |
| 2. | Gram | 15 | 18.51 | 45 | 23.19 | +30 | 200.00 |
| 3. | Ground nut | 11 | 13.59 | 25 | 12.89 | +14 | 127.27 |
| | **Rabi Total** | **81** | **100.00** | **194** | **100.00** | 113 | 139.50 |
| **C** | **Other** | | | | | | |
| 1. | Onion | 00 | 00.00 | 00 | 00.00 | 00 | 00.00 |
| 2. | Banana | 00 | 00.00 | 35 | 35.00 | 35 | 100.00 |
| | **Other Total** | 00 | 00.00 | 35 | 100.00 | - | - |
| | Gross cropped area (A+B+C) | 484 | 100.00 | 632 | 100.00 | 148 | 30.57 |
| | Net cultivated area (ha) | 403 | | | | | |
| | **Cropping Intensity** | **120.09** | | **156.82** | | | **36.73%** |

**ii) Change in cropping pattern and cropping intensity in middle region**

It is observed from Table 26, in case of middle region in kharif season there was no change in the total area under kharif crop. However, there was change in area under cotton, tur and it was found to increase by 13.15 per cent and 12.00 per cent respectively.

The area under soybean and Hy. Jowar reduced by 14.44 per cent and 42.85 per cent, respectively.

**Table 26. Change in cropping pattern and cropping intensity before and after Wan irrigation project in middle region**

| Sl. No. | Crops | Middle region (n=100) | | | | | |
|---|---|---|---|---|---|---|---|
| | | Area before Wan project (ha.) | Per-cent | Area after Wan project (ha.) | Per-cent | Change in area (ha.) | Percent change (%) |
| **A.** | **Kharif** | | | | | | |
| 1. | Soybean | 103 | 43.10 | 90 | 37.66 | -13 | -14.44 |
| 2. | Cotton | 76 | 31.80 | 86 | 35.98 | +10 | 13.15 |
| 3. | Tur | 50 | 20.92 | 56 | 23.43 | +06 | 12.00 |
| 4. | Hy.Jowar | 10 | 04.18 | 07 | 02.93 | -03 | -42.85 |
| | **Kharif Total** | **239** | **100** | **239** | **100** | - | - |
| **B.** | **Rabi** | | | | | | |
| 1. | Wheat | 35 | 14.64 | 53 | 22.17 | +18 | 51.42 |
| 2. | Gram | 17 | 07.11 | 27 | 11.29 | +10 | 58.82 |
| 3. | Ground nut | 08 | 03.34 | 10 | 04.18 | +02 | 25.00 |
| | **Rabi Total** | **60** | **100** | **90** | **100** | **30** | **50.00** |
| **C** | **Other** | | | | | | |
| 1. | Onion | 00 | 00.00 | 39 | 39.00 | 39 | 100.00 |
| 2. | Banana | 00 | 00.00 | 00 | 00.00 | 00 | 00.00 |
| | **Other Total** | **00** | **00.00** | **39** | **100.00** | - | - |
| | Gross cropped area (A+B+C) | 299 | 100.00 | 368 | 100.00 | 69 | 23.07 |
| | Net cultivated area (ha) | 239 | | | | | |
| | **Cropping Intensity** | **125.10** | | **153.97** | | | **28.07%** |

In case of rabi crop, the area under wheat, gram, ground nut and in total were found to be increased by 51.42 per cent, 58.82 per cent, 25.00 percent and in total 50.00 per cent, respectively. The gross cropped area was increased which may help farmers to bring more area under rabi crops. As with the availability of water for irrigation resulted in increased in area under crop in rabi season.

When we calculate the cropping intensity in total before and after Wan irrigation project, it was found that there was increase in cropping intensity in the middle region from 125.10 to 153.97. It means that, it was increased by 28.07 per cent.

In middle region, excess water loss was not seen and therefore there was sufficient availability of water for irrigation as compared to head region.

From the above findings it can be inferred that Wan irrigation was profitable for beneficiary farmers.

**iii) Change in cropping pattern and cropping intensity in tail region**

It is observed from Table 27, in case of tail region in kharif season there was no change in the total area under kharif crop. However, there was change in area under soybean and tur increase by 11.81 per cent and 25.00 per cent, respectively.The area under cotton and Hy. Jowar reduced by 13.04 per cent and 100.00 per cent, respectively.

In case of rabi crop, the area under wheat, gram, ground nut and in total were found to be increased by 63.63 per cent, 75.00 per cent, 28.82 percent and in total 61.65 per cent respectively. The gross cropped area was increased which may help farmers to bring more area under rabi crops. As with the availability of water for irrigation resulted in increased in area under crop in rabi season.

It was found that, as compared to head and middle region there was less availability of water for irrigation in tail region.Irrigation water was not properly reached upto the end of the tail area. Hence there was less change in cropping intensity as compared to head and middle region.

**Table 27. Change in cropping pattern and cropping intensity before and after Wan irrigation project in tail region**

| Sl. No. | Crops | Tail region (n=100) | | | | | |
|---|---|---|---|---|---|---|---|
| | | Area before Wan project (ha.) | Per-cent | Area after Wan project (ha.) | Per-cent | Change in area (ha.) | Percent change (%) |
| **A.** | **Kharif** | | | | | | |
| 1. | Soybean | 110 | 58.51 | 123 | 65.43 | +13 | 11.81 |
| 2. | Cotton | 46 | 24.47 | 40 | 21.27 | -06 | -13.04 |
| 3. | Tur | 20 | 10.64 | 25 | 13.30 | +05 | 25.00 |
| 4. | Hy.Jowar | 12 | 06.38 | 00 | 00.00 | -12 | -100.00 |
| | **Kharif Total** | **188** | **100.00** | **188** | **100.00** | - | - |
| **B.** | **Rabi** | | | | | | |
| 1. | Wheat | 22 | 14.64 | 36 | 55.39 | +14 | 63.63 |
| 2. | Gram | 12 | 07.11 | 21 | 32.30 | +09 | 75.00 |
| 3. | Ground nut | 06.21 | 03.34 | 08 | 12.31 | +1.79 | 28.82 |
| | **Rabi Total** | **40.21** | **100.00** | **65** | **100.00** | **24.79** | **61.65** |
| **C** | **Other** | | | | | | |
| 1. | Onion | 00 | 00.00 | 00 | 00.00 | 00 | 00.00 |
| 2. | Banana | 00 | 00.00 | 00 | 00.00 | 00 | 00.00 |
| | **Other Total** | **00** | **00.00** | **00** | **00.00** | - | - |
| | Gross cropped area (A+B+C) | 228.21 | 100.00 | 253 | 100.00 | 24.79 | **10.86** |
| | Net cultivated area (ha) | 188 | | | | | |
| | Cropping Intensity | **121.38** | | **134.57** | | | **13.19%** |

**iv) Change in cropping pattern and cropping intensity in study area**

It is observed from Table 28 that, in case of study area in kharif season there was no change in the total area under kharif crop. However, there was change in area under cotton, tur and it was increase by 11.65 per cent and 13.69 per cent respectively.The area under soybean and Hy. Jowar reduced by 02.52 per cent and 48.78 per cent.

In case of rabi crop, the area under wheat, gram, ground nut and in total were found to be increased by 63.63 per cent, 75.00 per cent, 28.82 percent and in total 92.59 per cent respectively. The gross cropped area was increased which may help farmers to bring more area under rabi crops. As with the availability of water for irrigation resulted in increase in area under crop in rabi season.

**Table 28. Change in cropping pattern and cropping intensity before and after Wan irrigation project of study area**

| Sl. No. | Crops | Study area (n=300) | | | | | |
|---|---|---|---|---|---|---|---|
| | | Area before Wan project (ha.) | Per-cent | Area after Wan project (ha.) | Per-cent | Change in area (ha.) | Percent change (%) |
| **A.** | **Kharif** | | | | | | |
| 1. | Soybean | 357 | 36.07 | 348 | 34.22 | -09 | -2.52 |
| 2. | Cotton | 223 | 30.20 | 249 | 35.55 | +26 | 11.65 |
| 3. | Tur | 168 | 24.04 | 191 | 26.54 | +23 | 13.69 |
| 4. | Hy.Jowar | 82 | 09.69 | 42 | 03.69 | -40 | -48.78 |
| | **Kharif Total** | **830** | **100.00** | **830** | **100.00** | - | - |
| **B.** | **Rabi** | | | | | | |
| 1. | Wheat | 112 | 70.56 | 213 | 76.37 | +14 | 63.63 |
| 2. | Gram | 44 | 11.82 | 93 | 10.18 | +09 | 75.00 |
| 3. | Ground nut | 25.21 | 17.62 | 43 | 13.45 | +1.79 | 28.82 |
| | **Rabi Total** | **181.21** | **100.00** | **349** | **100.00** | **167.79** | **92.59** |
| **C** | **Other** | | | | | | |
| 1. | Onion | 00 | 00.00 | 39 | 52.70 | 39 | 100.00 |
| 2. | Banana | 00 | 00.00 | 35 | 47.30 | 35 | 100.00 |
| | **Other Total** | **00** | **00.00** | **74** | **100.00** | - | - |
| | Gross cropped area (A+B+C) | 1011.21 | 100.00 | 1253 | 100.00 | 141.79 | 23.91 |
| | Net cultivated area (ha) | 830 | | | | | |
| | **Cropping Intensity** | **121.81** | | **150.96** | | | **29.15%** |

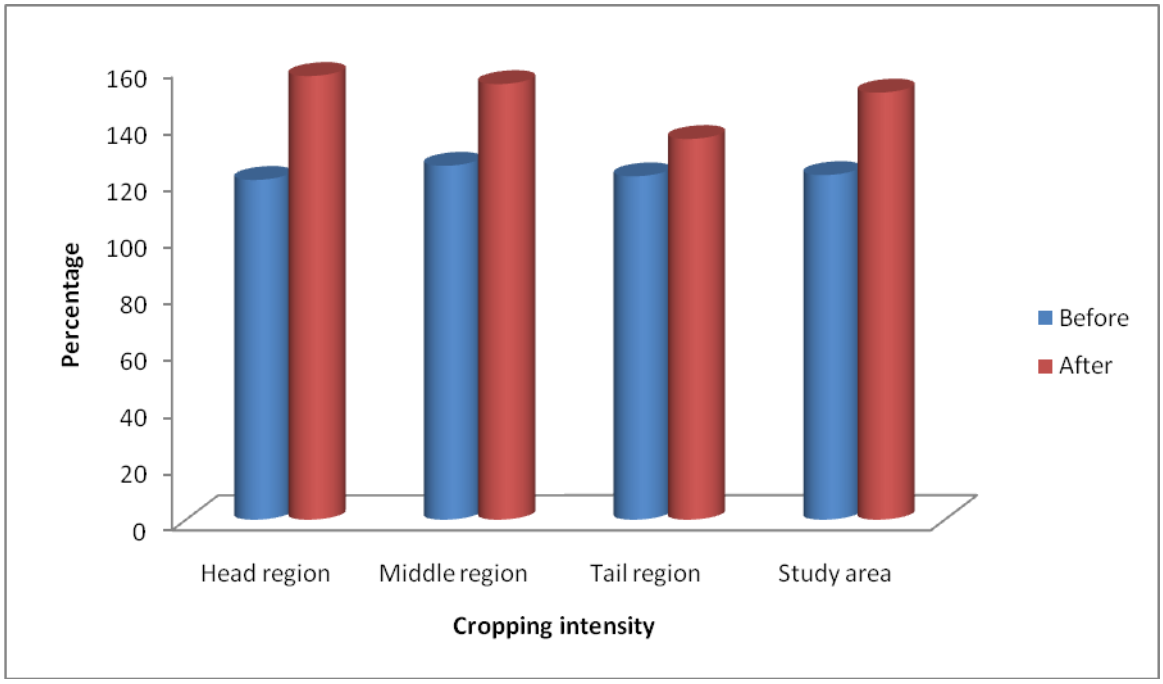



**Fig 19: Change in cropping intensity before and after Wan irrigation project in Head region, Middle region, Tail region and Study area**

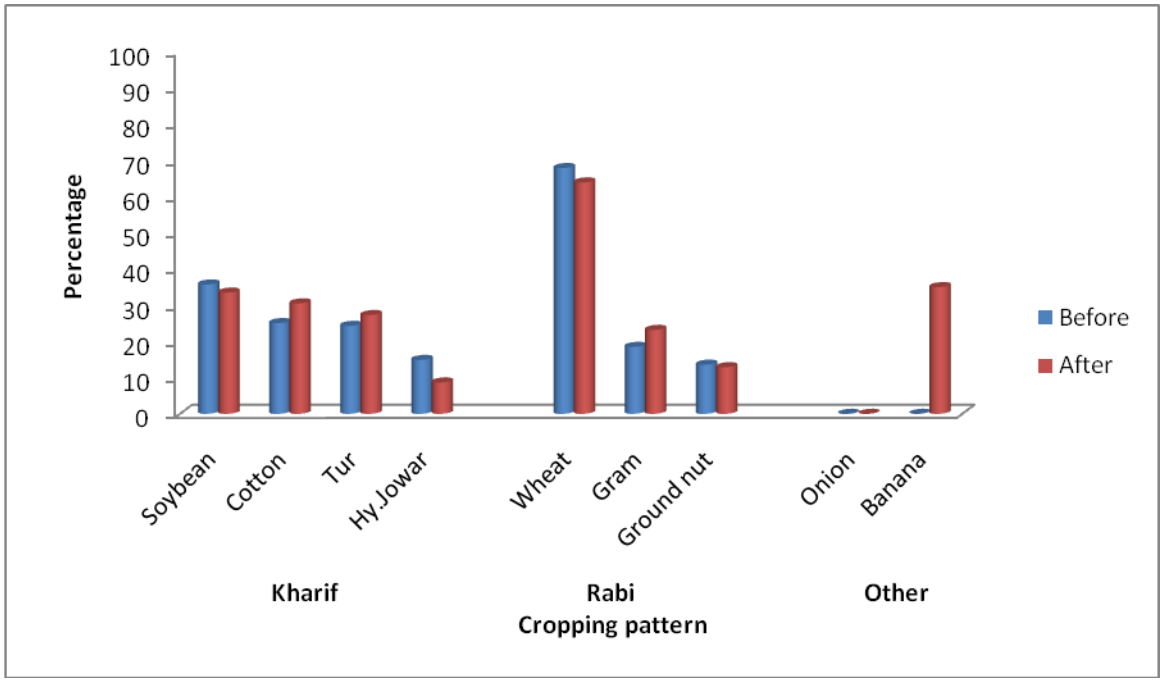



**Fig 20: Change in cropping pattern before and after Wan irrigation project in head region**

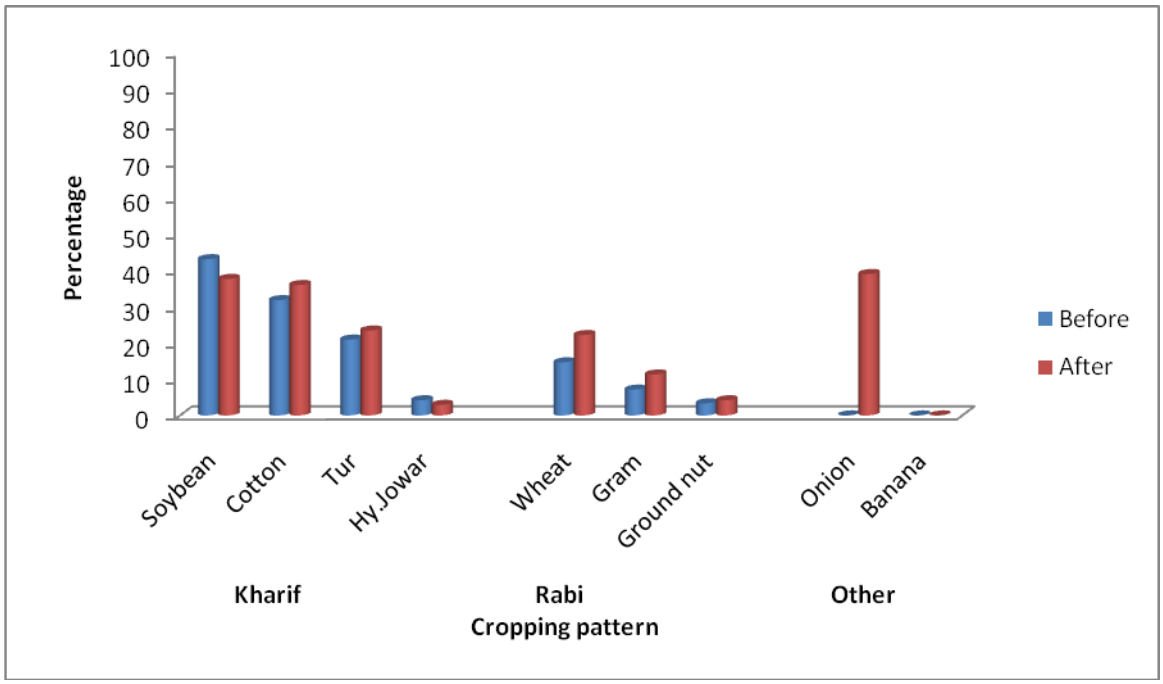



**Fig 21: Change in cropping pattern before and after Wan irrigation project in middle region**

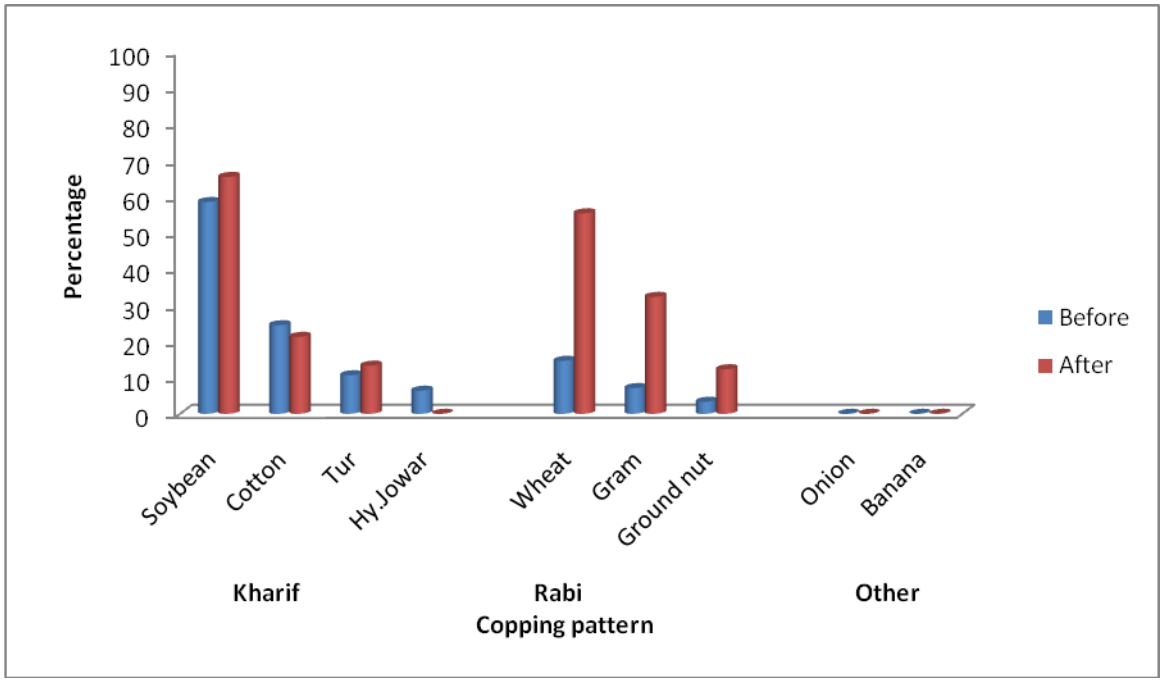



**Fig 22: Change in cropping pattern before and after Wan irrigation project in tail region**

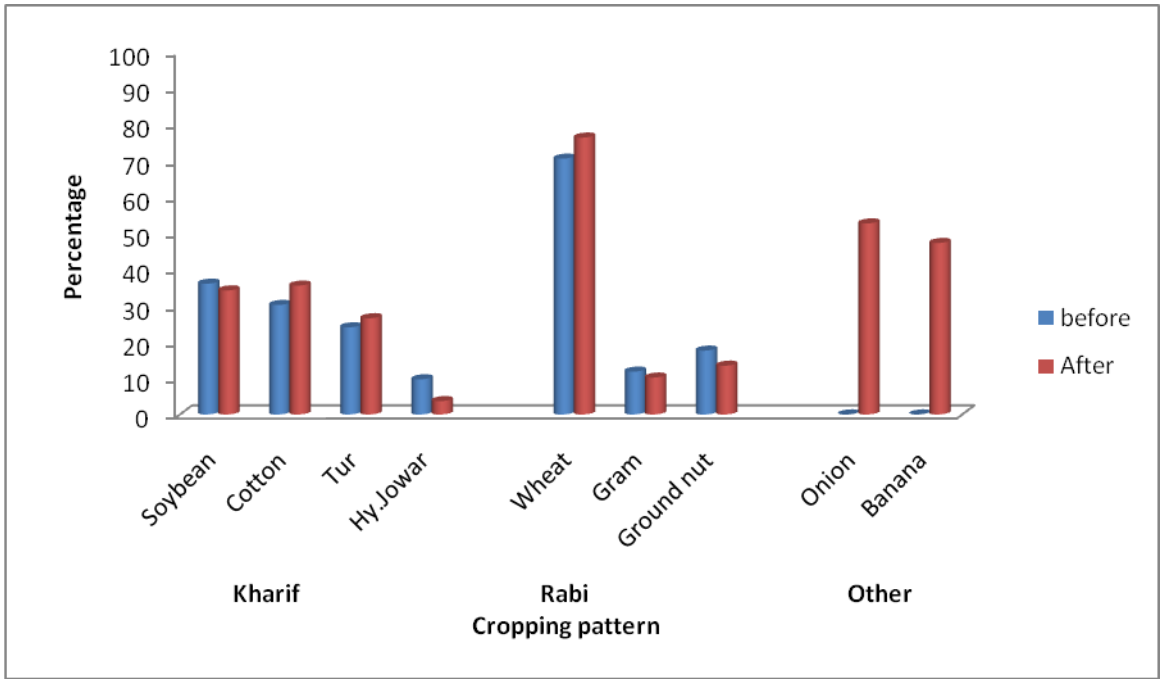



**Fig 23: Change in cropping pattern before and after Wan irrigation project of study area**

When we calculate the cropping intensity in total before and after wan irrigation project, it was found that there was increase in cropping intensity in the study area from 121.81 to 150.96. It means that, it was increased by 29.15 per cent.

From the above findings it can be inferred that there was definite impact of Wan irrigation project in changing cropping intensity, change in area under various crops which may help beneficiary for the socio-economic upliftment.

Similar types of findings were observed by Anonymous (2001), Bhople *et al*. (2004) and Bhange *et al*. (2005).

**b) Change in productivity**

Productivity refers to the economic yield or production of plant produced of economic importance, expressed in standard unit area.The per cent change in productivity of crop were measured on the basis of difference between the average productivity of different crop in q/ha during the study year and base year.

The productivity of major kharif and rabi crop in head, middle, tail and total study area were studied separetly in order to know the segmentwise effect of Wan irrigation project on the beneficiary farmers.

**i) Change in productivity in head region**

Table 29 revealed that, in head region the productivity of all the major crops of kharif and rabi found increased. After the Wan irrigation project the productivity of soybean increased by 16.66 per cent, cotton 27.27 per cent, tur 33.33 per cent, Hy. jowar 50.00 per cent.

In case of rabi crop the productivity of wheat increased by 50.00 per cent, gram 33.33 per cent, ground nut 16.66 per cent after the Wan irrigation project.

**Table 29. Change in productivity of kharif, rabi and summer crops in head region before and after Wan irrigation project**

| Sl. No. | Crops | Head region (n=100) | | | |
|---|---|---|---|---|---|
| | | Before Wan project | After Wan project | Change in productivity | Percentage change |
| | | Qt/ha | Qt/ha | Qt/ha | (%) |
| **A.** | **Kharif** | | | | |
| 1. | Soybean | 12 | 14 | +02 | 16.66 |
| 2. | Cotton | 11 | 14 | +03 | 27.27 |
| 3. | Tur | 09 | 12 | +03 | 33.33 |
| 4. | Hy.Jowar | 08 | 12 | +04 | 50.00 |
| **B.** | **Rabi** | | | | |
| 1. | Wheat | 26 | 39 | +13 | 50.00 |
| 2. | Gram | 15 | 20 | +05 | 33.33 |
| 3. | Ground nut | 180 | 210 | +30 | 16.66 |
| **C.** | **Other** | | | | |
| 1. | Banana | 00 | 19 | +19 | 100.00 |

**ii) Change in productivity in middle region**

Table 30 revealed that, in middle region the productivity of all the major crops of kharif and rabi were found increased. After the Wan irrigation project the productivity of soybean increased by 27.27 per cent, cotton 33.33 per cent, tur 35.07 per cent, Hy. jowar 28.57 per cent.

In case of rabi crop, the productivity of wheat increased by 50.00 per cent, gram 38.46 per cent, ground nut 26.66 per cent after the Wan irrigation project

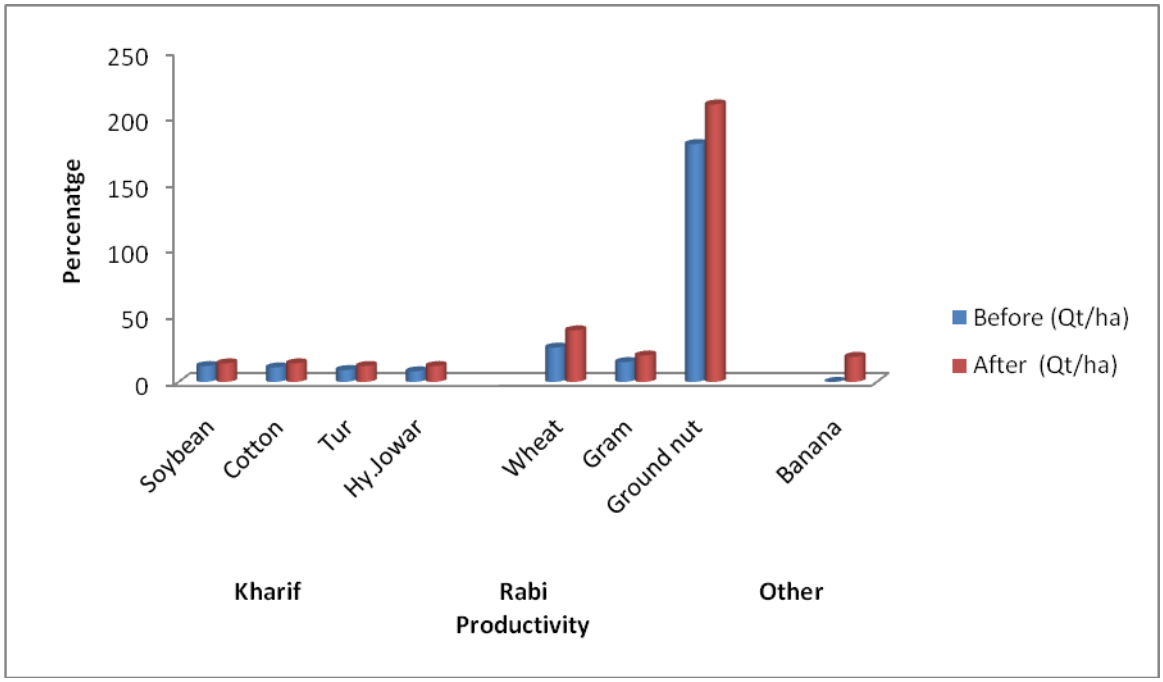



**Fig 24: Change in productivity of kharif, rabi and summer crops in head region before and after Wan irrigation project**

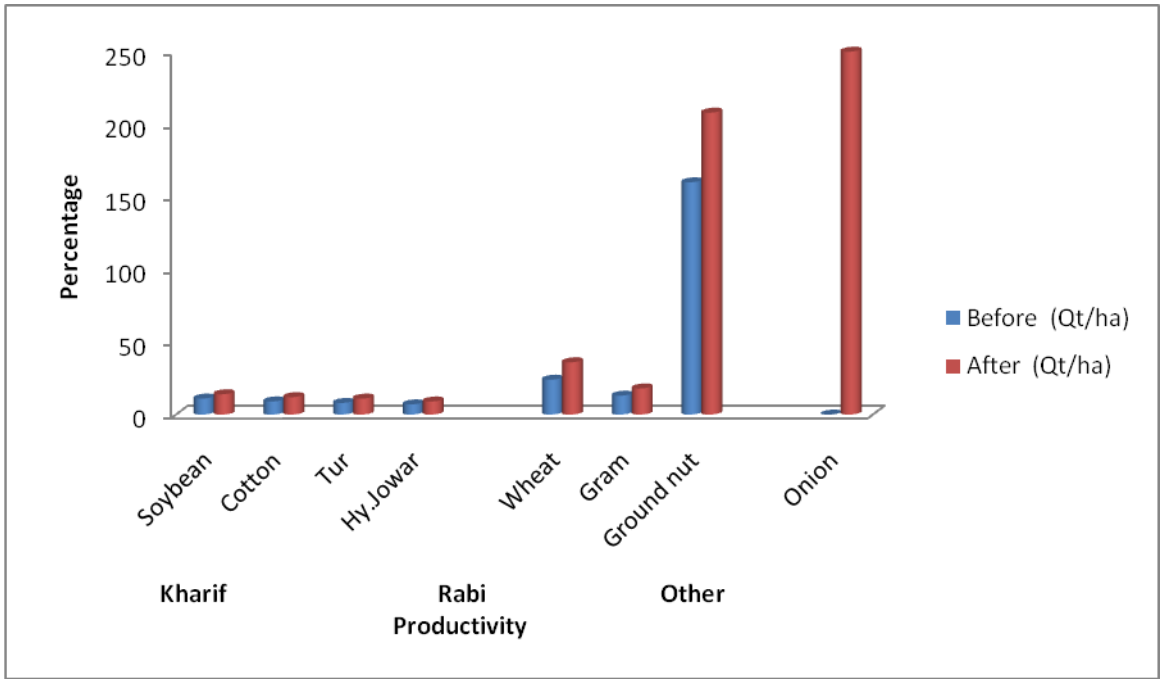



**Fig 25: Change in productivity of kharif, rabi and summer crops in middle region before and after Wan irrigation project**

**Table 30. Change in productivity of kharif, rabi and summer crops in middle region before and after Wan irrigation project**

| Sl. No. | Crops | Middle region (n=100) | | | |
|---|---|---|---|---|---|
| | | Before Wan project | After Wan project | Change in productivity | Percentage change |
| | | Qt/ha | Qt/ha | Qt/ha | (%) |
| **A.** | **Kharif** | | | | |
| 1. | Soybean | 11 | 14 | +03 | 27.27 |
| 2. | Cotton | 09 | 12 | +03 | 33.33 |
| 3. | Tur | 08 | 11 | +03 | 37.05 |
| 4. | Hy.Jowar | 07 | 09 | +02 | 28.57 |
| **B.** | **Rabi** | | | | |
| 1. | Wheat | 24 | 36 | +12 | 50.00 |
| 2. | Gram | 13 | 18 | +05 | 38.46 |
| 3. | Ground nut | 160 | 208 | +48 | 26.66 |
| **C.** | **Other** | | | | |
| 1. | Onion | 00 | 250 | + 250 | 100.00 |

**iii) Change in productivity in tail region**

Table 31 revealed that, in tail region the productivity of all the major crops of kharif and rabi were found increased. After the Wan irrigation project the productivity of soybean increased by 40.00 per cent, cotton 33.33 per cent, tur 25.00 per cent, Hy. jowar 50.00 per cent.

**Table 31. Change in productivity of kharif, rabi and summer crops in tail region before and after Wan irrigation project**

| Sl. No. | Crops | Tail region (n=100) | | | |
|---|---|---|---|---|---|
| | | Before Wan project | After Wan project | Change in productivity | Percentage change |
| | | Qt/ha | Qt/ha | Qt/ha | (%) |
| **A.** | **Kharif** | | | | |
| 1. | Soybean | 10 | 14 | +04 | 40.00 |
| 2. | Cotton | 09 | 12 | +03 | 33.33 |
| 3. | Tur | 08 | 10 | +02 | 25.00 |
| 4. | Hy.Jowar | 06 | 09 | +03 | 50.00 |
| **B.** | **Rabi** | | | | |
| 1. | Wheat | 23 | 33 | +10 | 43.47 |
| 2. | Gram | 11 | 16 | +05 | 45.45 |
| 3. | Ground nut | 140 | 206 | +66 | 47.14 |

In case of rabi crop, the productivity of wheat increased by 43.47 per cent, gram 45.45 per cent, ground nut 47.14 per cent after the Wan irrigation project.

**iv) Change in productivity in study area**

Table 32 revealed that, in study area the productivity of all the major crops of kharif and rabi were found to be increased. After the Wan irrigation project the productivity of soybean increased by 27.27 per cent, cotton 25.00 per cent, tur 22.22 per cent, Hy. jowar 42.85 per cent.

In case of rabi crop the productivity of wheat increased by 05.00 per cent, gram 38.46 per cent, ground nut 03.00 per cent after the Wan irrigation project.

**Table 32. Change in productivity of kharif, rabi and summer crops in study area before and after Wan irrigation project**

| Sl. No. | Crops | Study area (n=300) | | | |
|---|---|---|---|---|---|
| | | Before Wan project | After Wan project | Change in productivity | Percentage change |
| | | Qt/ha | Qt/ha | Qt/ha | (%) |
| **A.** | **Kharif** | | | | |
| 1. | Soybean | 11 | 14 | +03 | 27.27 |
| 2. | Cotton | 10 | 12.05 | +2.05 | 25.00 |
| 3. | Tur | 09 | 11 | +02 | 22.22 |
| 4. | Hy.Jowar | 07 | 10 | +03 | 42.85 |
| **B.** | **Rabi** | | | | |
| 1. | Wheat | 24 | 36 | +12 | 50.00 |
| 2. | Gram | 13 | 18 | +05 | 38.46 |
| 3. | Ground nut | 160 | 208 | +48 | 30.00 |
| **C.** | **Other** | | | | |
| 1. | Banana | 00 | 19 | + 19 | 100.00 |
| 2. | Onion | 00 | 250 | + 250 | 100.00 |

From the above findings it could be concluded that there was definite impact of Wan irrigation project on productivity of kharif, rabi and other crops. These findings are accordance with the findings of Suvarna Ingole (2013).

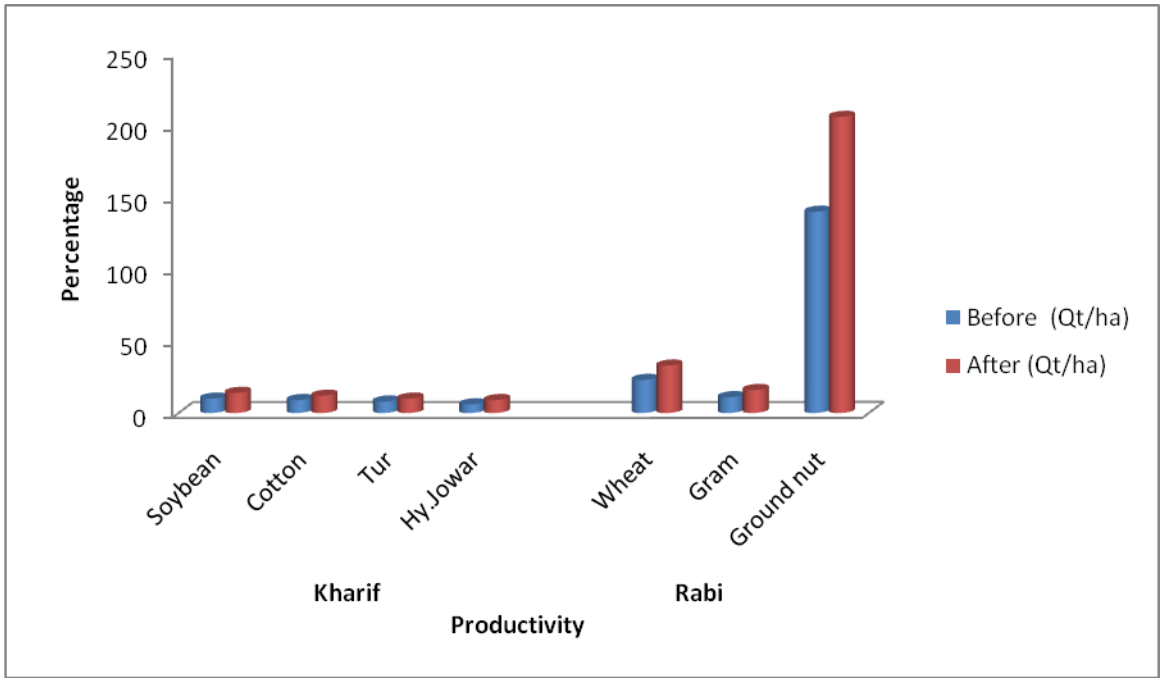



**Fig 26: Change in productivity of kharif, rabi and summer crops in tail region before and after Wan irrigation project**

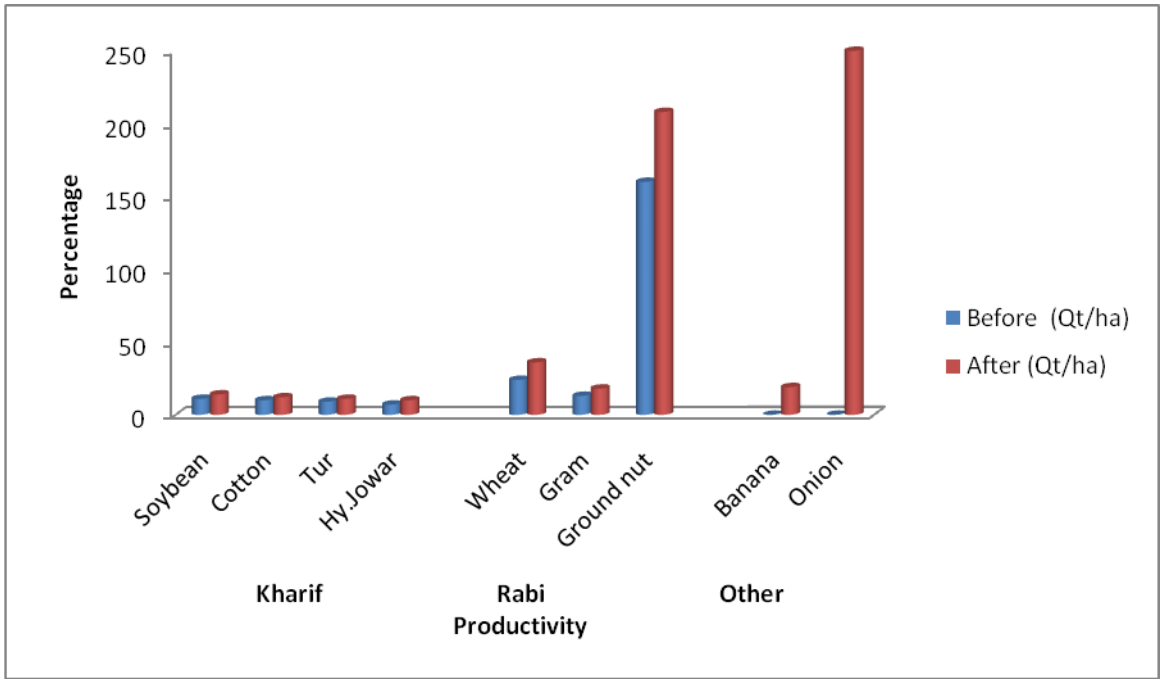



**Fig 27: Change in productivity of kharif, rabi and summer crops in study area before and after Wan irrigation project**

**B] Socio-economic development**

The second component of impact is socio-economic development of beneficiary farmers.It was studied in terms of change in socio-economic status of the beneficiary farmers before and after the Wan iriigation project. It is the composite measure of its score paremeters viz. change in occupation, change in land holding, change in family education, change in annual income, and change in socio political participation, change in expenditure pattern and change in economic empowerment of beneficiary farmers before and after Wan irrigation project.

**a) Change in occupation**

The per cent change in occupation was measured on the basis of difference between the mean occupation score of beneficiary farmers before and after Wan irrigation project. Change in occupation of beneficiary farmers in head, middle, tail and total study area were studied saperately in order to know the segmentwise effect of Wan irrigation project on the beneficiary farmers

**i) Change in occupation in head region**

In head region from Table 33, it may be noted that prior to Wan irrigation project maximum number of respondents (54.00%) were having agriculture + labour as their main occupation followed by agriculture (42.00%) and agriculture + allied occupation (04.00%). After Wan irrigation project most of the beneficiaries (95.00%) were engage in agriculture as their occupation throughout the year with the availability of irrigation water and no need to go on another field as labour.

There was significant difference in occupation among the beneficiaries before and after Wan irrigation project as indicated by the ‘z’ value. The ‘z’ value was found to be significant at 0.05 level of probability.

From above findings it can be concluded that there was definite change in occupation in head region.

**Table 33. Distribution of respondents according to their change in occupation in head region**

| Sl. No | Occupation | Respondents ( n = 100) | | | | |
|---|---|---|---|---|---|---|
| | | Before Wan project | | After Wan project | | Percent change |
| | | Freq. | Percent | Freq. | Percent | (%) |
| 1. | Agriculture + Labour | 54 | 54.00 | 05 | 05.00 | -90.74 |
| 2. | Agriculture | 42 | 42.00 | 95 | 95.00 | 126.19 |
| 3. | Agriculture+Allied occupation | 04 | 04.00 | 00 | 00.00 | -100.00 |
| 4. | Agriculture+ Business | 00 | 00.00 | 00 | 00.00 | 00.00 |
| 5. | Agriculture + Service | 00 | 00.00 | 00 | 00.00 | 00.00 |
| | **Total** | 100 | 100.00 | 100 | 100.00 | |
| | **Mean** | **1.29** | | **2.33** | | |
| | **S. D.** | **1.11** | | **1.99** | | |
| | **'z' Value** | **5.331*** | | | | |

* Significant at 0.05 level of probability

**ii) Change in occupation in middle region**

In middle region, from Table 34, it may be noted that, before the Wan irrigation project most of the respondents having agriculture and labour as their occupation (61.00%), followed by agriculture (31.00%) and agriculture plus allied occupation 08.00 per cent.

**Table 34. Distribution of respondents according to their change in occupation in middle region**

| Sl. No | Occupation | Respondents ( n = 100) | | | | |
|---|---|---|---|---|---|---|
| | | Before Wan project | | After Wan project | | Percent change |
| | | Freq. | Percent | Freq. | Percent | (%) |
| 1. | Agriculture + Labour | 61 | 61.00 | 10 | 10.00 | -83.60 |
| 2. | Agriculture | 31 | 31.00 | 80 | 80.00 | 158.06 |
| 3. | Agriculture+Allied occupation | 08 | 08.00 | 10 | 10.00 | 25.00 |
| 4. | Agriculture + Business | 00 | 00.00 | 00 | 00.00 | 00.00 |
| 5. | Agriculture + Service | 00 | 00.00 | 00 | 00.00 | 00.00 |
| | **Total** | 100 | 100.00 | 100 | 100.00 | |
| | **Mean** | **1.16** | | **2.00** | | |
| | **S. D.** | **1.06** | | **0.98** | | |
| | **'z' Value** | **4.333*** | | | | |

* Significant at 0.05 level of probability

However, after Wan irrigation project, it was found that majority of the respondents were having agriculture as their main occupation (80.00%), followed by agriculture plus labour 10.00 per cent and 10.00 per cent agriculture plus allied occupation.There was significant difference in

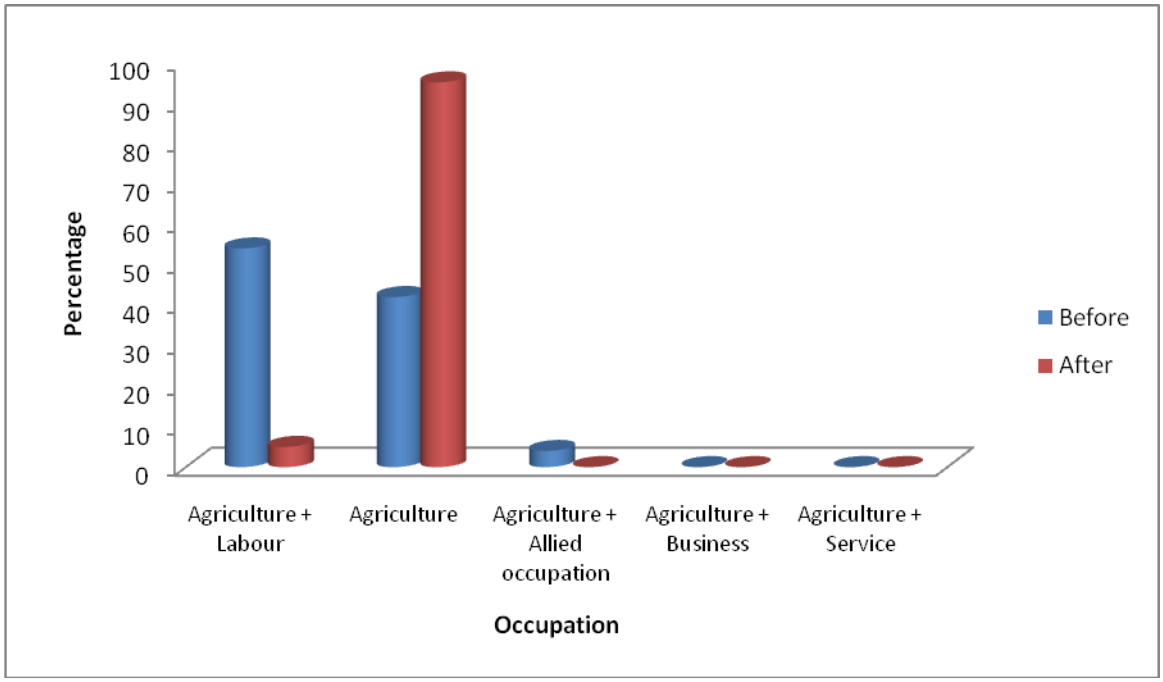



**Fig 28: Distribution of respondents according to their change in occupation in head region**

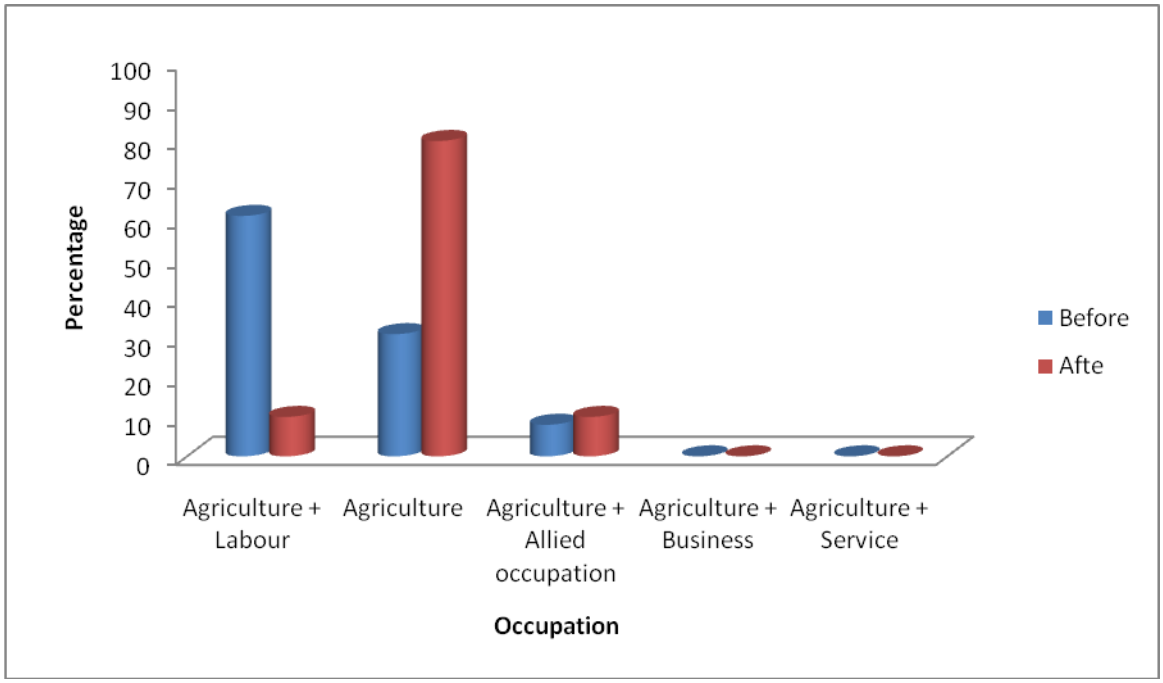



**Fig 29: Distribution of respondents according to their change in occupation in middle region**

occupation among the beneficiaries before and after Wan irrigation project as indicated by the 'z' value. The 'z' value was found to be significant at 0.05 level of probability.

From above findings it can be concluded that there was definite change in occupation in middle region.

**iii) Change in occupation in tail region**

In tail region, from Table 35, it may be noted that, before the Wan irrigation project most of the respondents having agriculture and labour as their occupation (63.00%), followed by agriculture (28.00%), agriculture plus allied occupation (06.00%) and agriculture plus business (03.00%).

**Table 35. Distribution of respondents according to their change in occupation in tail region**

| Sl. No. | Occupation | Respondents ( n = 100) | | | | |
|---|---|---|---|---|---|---|
| | | Before Wan project | | After Wan project | | Percent change |
| | | Freq. | Percent | Freq. | Percent | (%) |
| 1. | Agriculture + Labour | 63 | 63.00 | 25 | 25.00 | -60.31 |
| 2. | Agriculture | 28 | 28.00 | 25 | 25.00 | -10.71 |
| 3. | Agriculture+Allied occupation | 06 | 06.00 | 20 | 20.00 | 233.33 |
| 4. | Agriculture + Business | 03 | 03.00 | 30 | 30.00 | 900 |
| 5. | Agriculture + Service | 00 | 00.00 | 00 | 00.00 | 00.00 |
| | **Total** | 100 | 100.00 | 100 | 100.00 | |
| | **Mean** | **1.05** | | **1.97** | | |
| | **S. D.** | **1.01** | | **0.89** | | |
| | **'z' Value** | **3.888*** | | | | |

* Significant at 0.05 level of probability

However, after Wan irrigation project, it was found that , 30.00 per cent of the respondents were having agriculture plus business for income followed by agriculture (25.00%), agriculture plus labour (25.00%) and agriculture plus allied occupation (20.00%). There was significant difference in occupation among the beneficiaries before and after Wan irrigation project as indicated by the 'z' value. The 'z' value was found significant at 0.05 per cent level of probability.

From above findings it can be concluded that there was definite change in occupation in tail region.

**iv) Change in occupation in study area**

In study area, from Table 36, it may be noted that, before the Wan irrigation project most of the respondents having agriculture and labour as their occupation (59.00%), followed by agriculture (34.00%), agriculture plus allied occupation (06.00%) and agriculture plus business 01.00 per cent.

**Table 36. Distribution of respondents according to their change in occupation in study area**

| Sl. No. | Occupation | Respondents ( n = 300) | | | | |
|---|---|---|---|---|---|---|
| | | Before Wan project | | After Wan project | | Percent change |
| | | Freq. | Percent | Freq. | Percent | (%) |
| 1. | Agriculture + Labour | 178 | 59.00 | 40 | 13.33 | -77.52 |
| 2. | Agriculture | 101 | 34.00 | 200 | 66.67 | 98.01 |
| 3. | Agriculture+Allied occupation | 18 | 06.00 | 30 | 10.00 | 66.66 |
| 4. | Agriculture + Business | 03 | 01.00 | 30 | 10.00 | 900 |
| 5. | Agriculture + Service | 00 | 00.00 | 00 | 00.00 | 00.00 |
| | **Total** | **300** | **100.00** | **300** | **100.00** | |
| | **Mean** | **1.29** | | **2.33** | | **80.62** |
| | **S. D.** | **0.45** | | **0.66** | | |
| | **'z' Value** | **9.81**** | | | | |

** Significant at 0.01 level of probability

However, after Wan irrigation project, it was found that majority (66.67%) of the respondents were having agriculture as their main occupation followed by agriculture plus labour (13.33%), agriculture plus allied occupation and agriculture plus business 10.00 per cent. The 'z' value was found significant at 0.01 per cent level of probability.

From above findings it can be concluded that there was definite positive impact of the Wan irrigation project in changing the occupation of the beneficiary farmers in the study area.

The above findings are supported by the findings of Suvarna Ingole (2013).

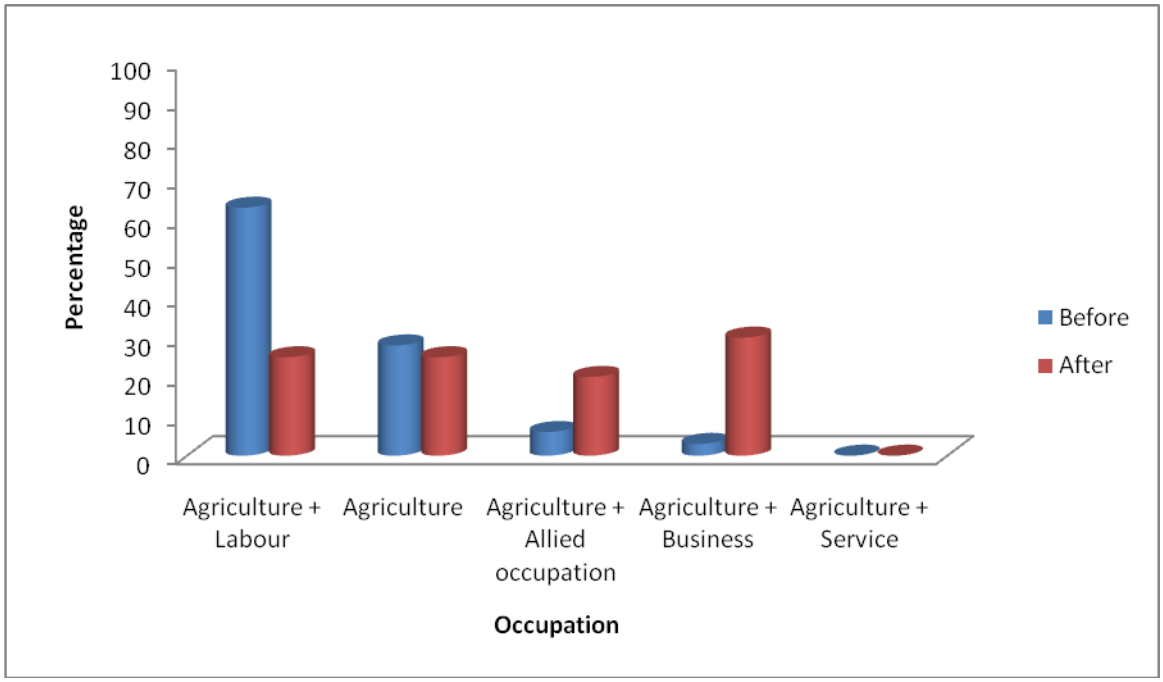



**Fig 30: Distribution of respondents according to their change in occupation in tail region**

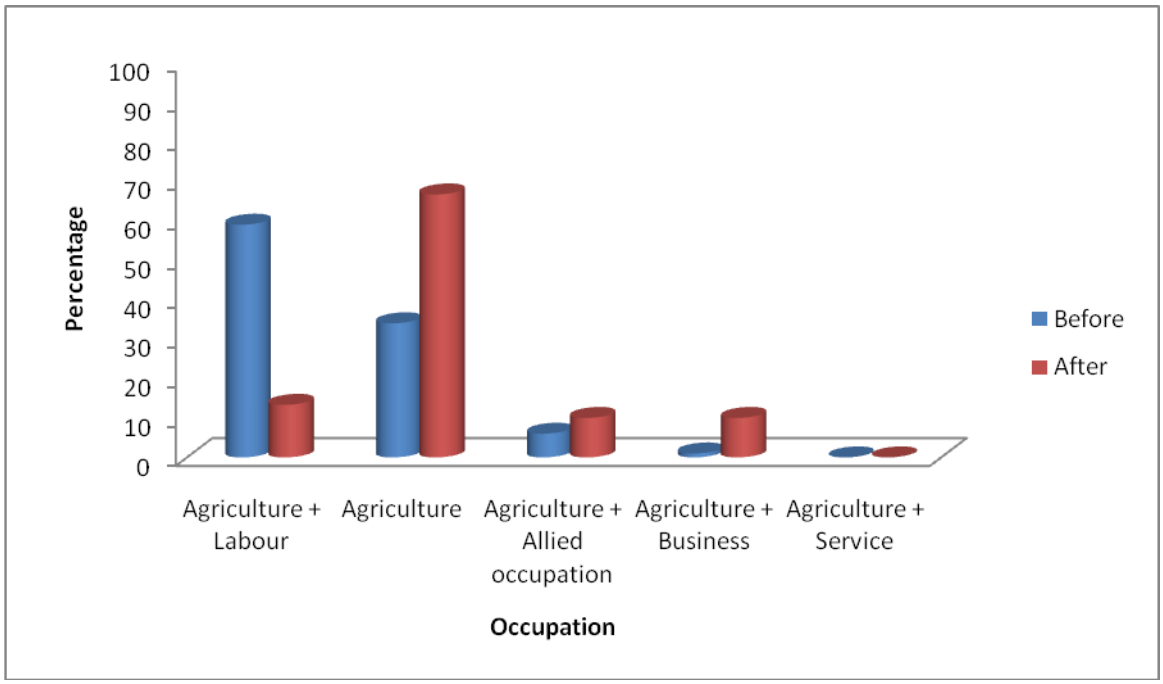



**Fig 31: Distribution of respondents according to their change in occupation in study area**

**b) Change in land holding**

Change in land holding of beneficiary farmers in head, middle, tail and total study area were studied saperately in order to know the segmentwise effect of Wan irrigation project on the beneficiary farmers and presented as below.

**i) Change in land holding in head region**

Table 37 revealed that, distribution of respondents according to their change in land holding in head region, prior to Wan irrigation project, it was found that 35.00 per cent of respondents were possessed marginal land holding, it was followed by small and semi medium land holding (30.00%). Only 03.00 per cent and 02.00 per cent possessed medium and large type of land holding. Whereas after Wan irrigation project 33.00 per cent respondents possessed semi medium land holding, followed by small (30.00%), marginal (20.00%),large (09.00%) and medium (08.00%) category of land holding.

**Table 37. Distribution of respondents according to their change in land holding in head region**

| Sl. No. | Land holding (Ha) | Respondents ( n = 100 ) | | | | |
|---|---|---|---|---|---|---|
| | | Before Wan project | | After Wan project | | Percent change |
| | | Freq. | Percent | Freq. | Percent | (%) |
| 1. | Marginal | 35 | 35.00 | 20 | 20.00 | -42.85 |
| 2. | Small | 30 | 30.00 | 30 | 30.00 | 00.00 |
| 3. | Semi medium | 30 | 30.00 | 33 | 33.00 | 10.00 |
| 4. | Medium | 03 | 03.00 | 08 | 08.00 | 166.66 |
| 5. | Large | 02 | 02.00 | 09 | 09.00 | 350.00 |
| | **Total** | 100 | 100.00 | 100 | 100.00 | |
| | **Mean** | **1.89** | | **3.12** | | |
| | **S. D.** | **1.78** | | **2.89** | | |
| | **'z' Value** | **3.644*** | | | | |

* Significant at 0.05 level of probability

There was significant difference in land holding among the beneficiaries before and after Wan irrigation project as indicated by the 'z' value. The 'z' value found to be significant at 0.05 per cent level of probability.

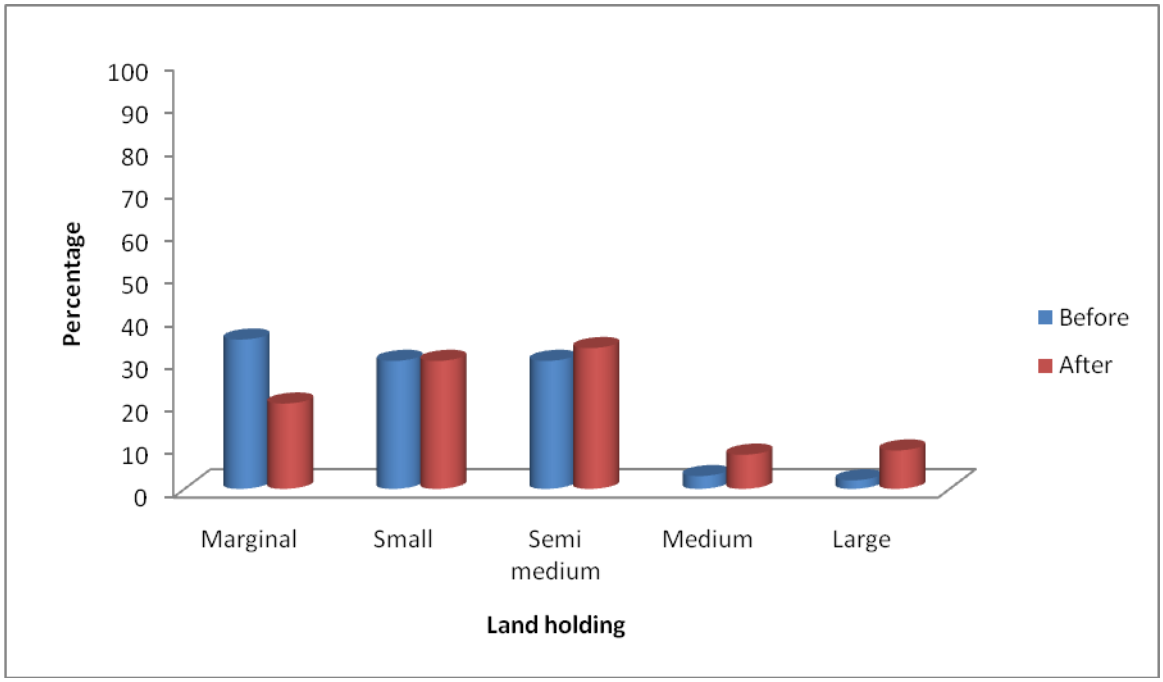



**Fig 32: Distribution of respondents according to their change in land holding in head region**

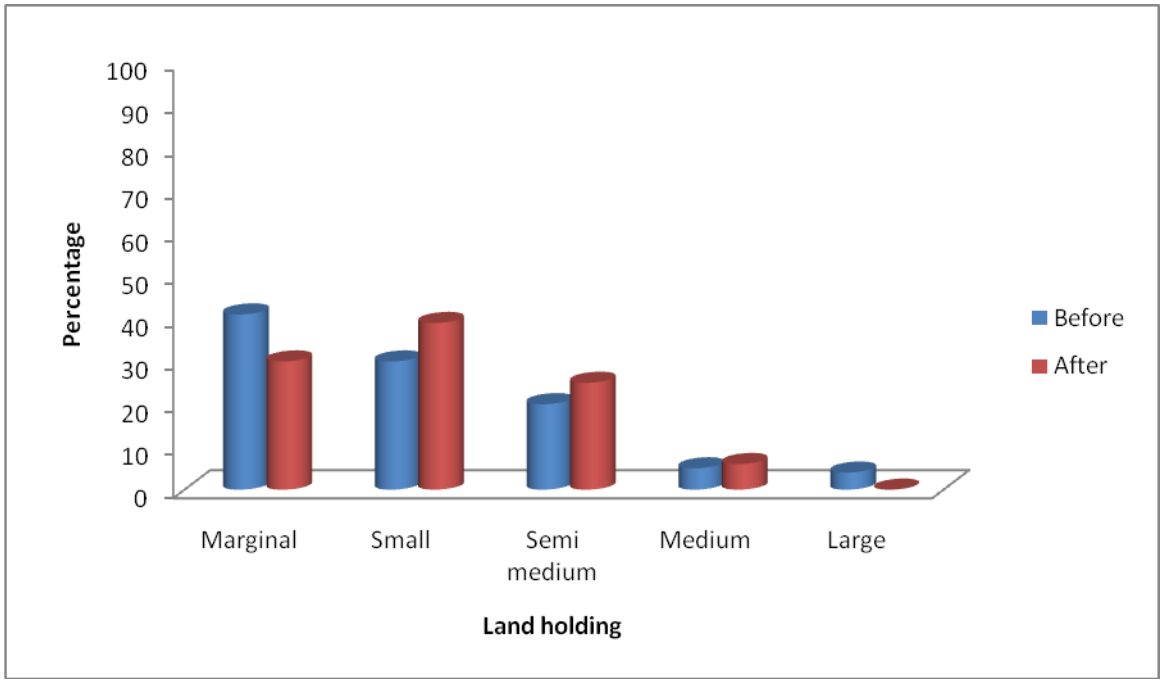



**Fig 33: Distribution of respondents according to their change in land holding in middle region**

### ii) Change in land holding in middle region

Table 38 revealed that, distribution of respondents according to their change in land holding in middle region prior to Wan irrigation project, it was found that 41.00 per cent of respondents were possessed marginal land, it was followed by small land holding (30.00%),followed by semi medium land holding (20.00%). Only 05.00 per cent and 04.00 per cent possessed medium and large type of land holding. Whereas after Wan irrigation project, 39.00 per cent of respondents possessed small type of land holding, it was followed by marginal land holding (30.00%), followed by semi medium (25.00%) and medium (06.00%).

**Table 38. Distribution of respondents according to their change in land holding in middle region**

| Sl. No | Land holding(Ha) | Respondents ( n = 100 ) | | | | |
|---|---|---|---|---|---|---|
| | | Before WAN project | | After WAN project | | Percent change |
| | | Freq. | Percent | Freq. | Percent | (%) |
| 1. | Marginal | 41 | 41.00 | 30 | 30.00 | -26.82 |
| 2. | Small | 30 | 30.00 | 39 | 39.00 | 30.00 |
| 3. | Semi medium | 20 | 20.00 | 25 | 25.00 | 25.00 |
| 4. | Medium | 05 | 05.00 | 06 | 06.00 | 20.00 |
| 5. | Large | 04 | 04.00 | 00 | 00.00 | -100.00 |
| | **Total** | 100 | 100.00 | 100 | 100.00 | |
| | **Mean** | **2.34** | | **3.41** | | |
| | **S. D.** | **3.27** | | **3.37** | | |
| | **'z' Value** | **2.299NS** | | | | |

NS - Non significant

### iii) Change in land holding in tail region

Table 39 revealed that, distribution of respondents according to their change in land holding in tail region prior to Wan irrigation project, it was found that 54.00 per cent of respondents possessed marginal land holding, it was followed by small land holding (24.00%), semi medium land holding (20.00%).Only 02.00 per cent possessed medium type of land holding.Whereas after Wan irrigation project, 44.00 per cent of respondents possessed small type of land holding, it was followed by marginal (40.00%) semi medium (14.00%) and medium (02.00%) type of land holding.

**Table 39. Distribution of respondents according to their change in land holding in tail region**

| Sl. No | Land holding(Ha) | Respondents ( n = 100 ) | | | | |
|---|---|---|---|---|---|---|
| | | Before Wan project | | After Wan project | | Percent change |
| | | Freq. | Percent | Freq. | Percent | % |
| 1. | Marginal | 54 | 54.00 | 40 | 40.00 | -25.92 |
| 2. | Small | 24 | 24.00 | 44 | 44.00 | 83.83 |
| 3. | Semi medium | 20 | 20.00 | 14 | 14.00 | -30.00 |
| 4. | Medium | 02 | 02.00 | 02 | 02.00 | 00.00 |
| 5. | Large | 00 | 00.00 | 00 | 00.00 | 00.00 |
| | **Total** | 100 | 100.00 | 100 | 100.00 | |
| | **Mean** | **1.32** | | **1.85** | | |
| | **S. D.** | **1.04** | | **1.01** | | |
| | **'z' Value** | **1.777NS** | | | | |

NS - Non significant

**iv) Change in land holding in study area**

Table 40 revealed that, distribution of respondents according to their change in land holding in study region prior to Wan irrigation project, it was found that 43.33 per cent of respondents possessed marginal land holding, it was followed by small land holding (28.00%), semi medium (23.34%). Only 03.00 per cent and 02.00 per cent possessed medium and large type of land holding. Whereas, after Wan irrigation project 37.66 per cent of respondents possessed small type of land holding, it was followed by marginal land holding (30.00%), semi medium land holding (24.00%).

**Table 40. Distribution of respondents according to their change in land holding in study area**

| Sl. No | Land holding Ha) | Respondents ( n = 300 ) | | | | |
|---|---|---|---|---|---|---|
| | | Before Wan project | | After Wan project | | Percent change |
| | | Freq. | Percent | Freq. | Percent | % |
| 1. | Marginal | 130 | 43.33 | 90 | 30.00 | -30.76 |
| 2. | Small | 84 | 28.00 | 113 | 37.66 | 34.52 |
| 3. | Semi medium | 70 | 23.34 | 72 | 24.00 | 02.85 |
| 4. | Medium | 10 | 03.33 | 16 | 05.33 | 60.00 |
| 5. | Large | 06 | 02.00 | 09 | 03.00 | 50.00 |
| | **Total** | **300** | **100** | **300** | **100** | |
| | **Mean** | **2.00** | | **2.85** | | **42.50** |
| | **S. D.** | **5.69** | | **3.67** | | |
| | **'z' Value** | **1.08NS** | | | | |

NS - Non significant

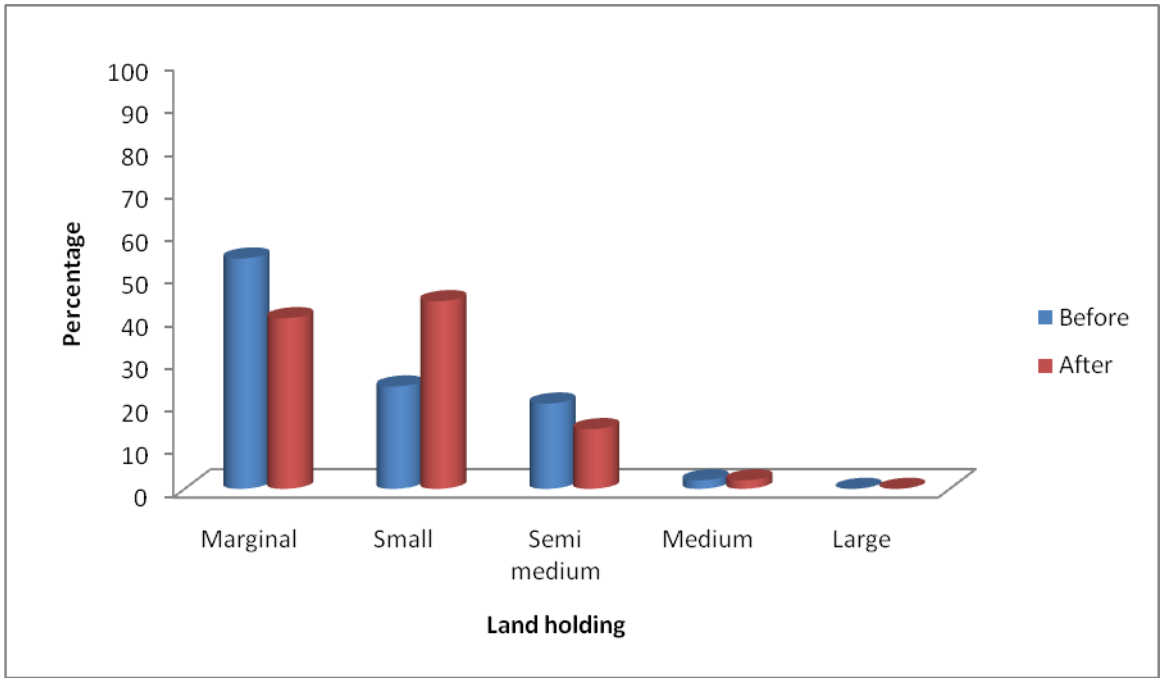



**Fig 34: Distribution of respondents according to their change in land holding in tail region**

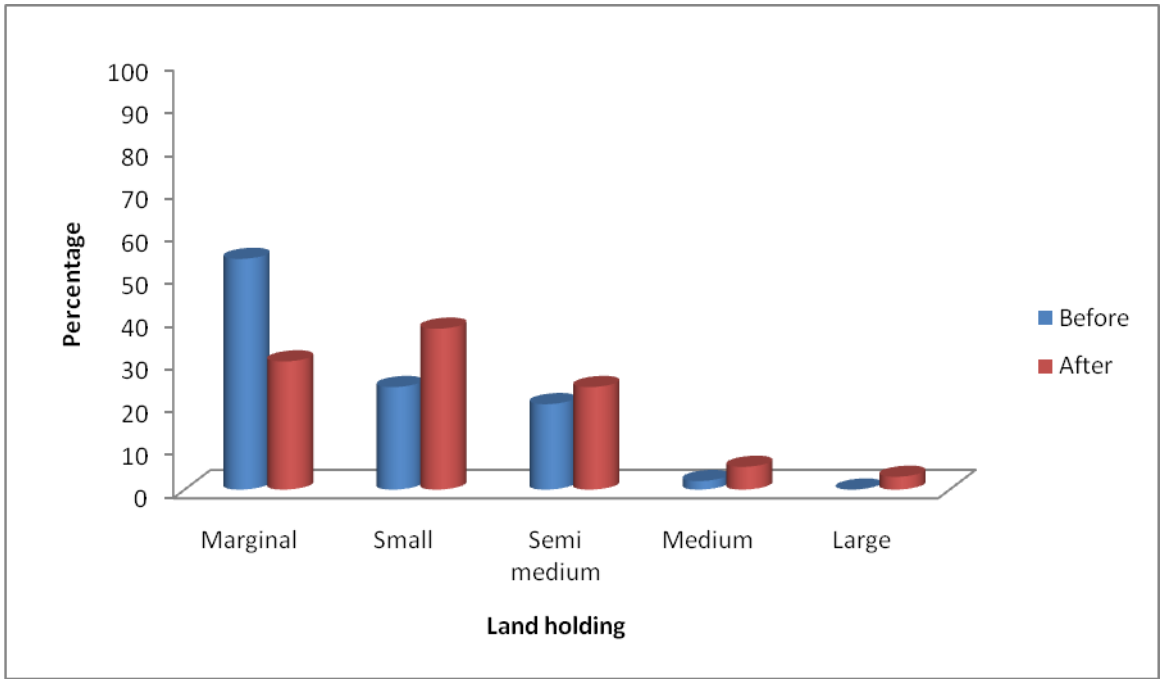



**Fig 35: Distribution of respondents according to their change in land holding in study area**

Only 05.33 per cent and 03.00 per cent possessed medium and large type of land holding.

In overall there was no significant change was seen in change in land holding in study area.

**c) Change in family education**

Education has been considered as one of the most important variable with the help of which social change can be achieved. Change in family education of beneficiary farmers in head, middle, tail and total study area were studied saperately in order to know the segmentwise effect of Wan irrigation project on the beneficiary farmers and presented as below.

**i) Change in family education in head region**

In case of family education in head region, from Table 41, it was seen that, there was increase in above 12 std. education by 200.00 per cent, 150.00 percent change was noticed in 8 to 10 std. education, 100.00 per cent change in up to 4 std. education and 53.84 per cent change in 5 to 7 std. education of the respondents family. There was found reduction in illiteracy by (100.00%) and also reduction in 11 to 12 std. education by (50.00%) after Wan irrigation project.

There was significant difference in family education among the beneficiaries before and after Wan irrigation project as indicated by the 'z' value, which was found significant at 0.05 level of probability.

**Table 41. Distribution of respondents according to their change in family education in head region**

| Sl. No. | Level of education | Head region (n=100) | | |
|---|---|---|---|---|
| | | Before Wan project | After Wanproject | Percent change |
| | | Freq. | Freq. | (%) |
| 1. | Illiterate | 20 | 00 | -100.00 |
| 2. | Up to 4 std. | 100 | 200 | 100.00 |
| 3. | 5 to 7 std. | 65 | 100 | 53.84 |
| 4. | 8 to 10 std. | 40 | 100 | 150.00 |
| 5. | 11 to 12 std. | 20 | 10 | -50.00 |
| 6. | Above 12 | 10 | 30 | 200.00 |
| | **Mean** | **73.3** | **92.5** | |
| | **S. D.** | **7.80** | **15.91** | |
| | **'z' Value** | **7.234*** | | |

* Significant at 0.05 level of probability

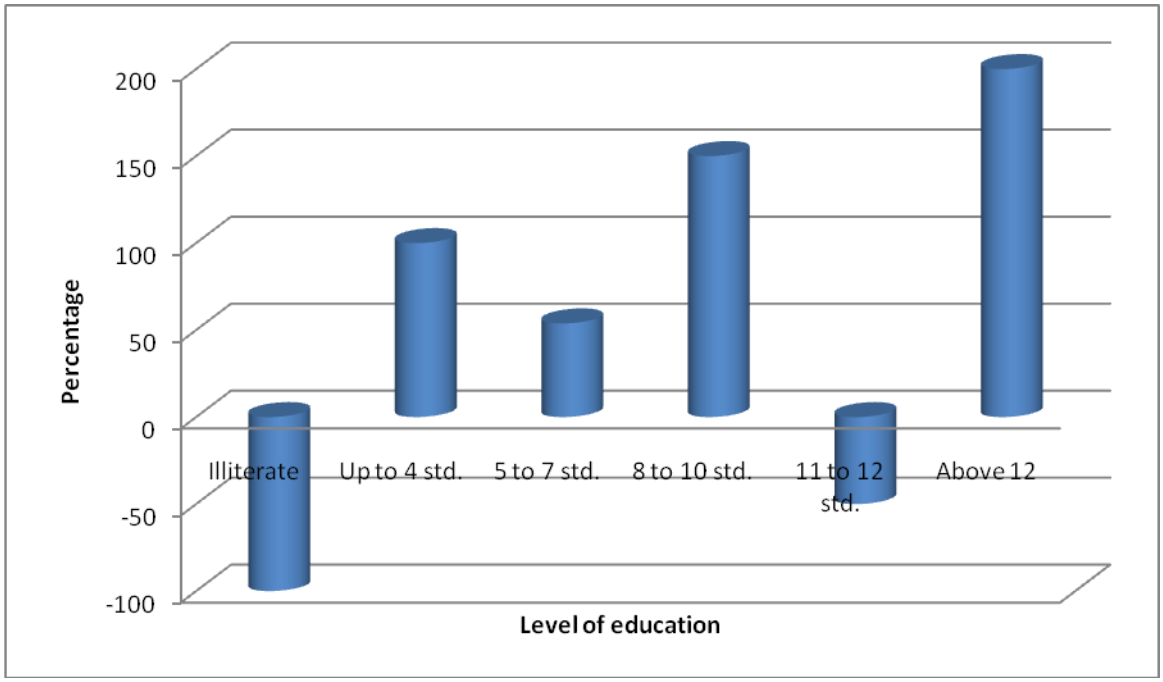



**Fig 36: Distribution of respondents according to their change in family education in head region**

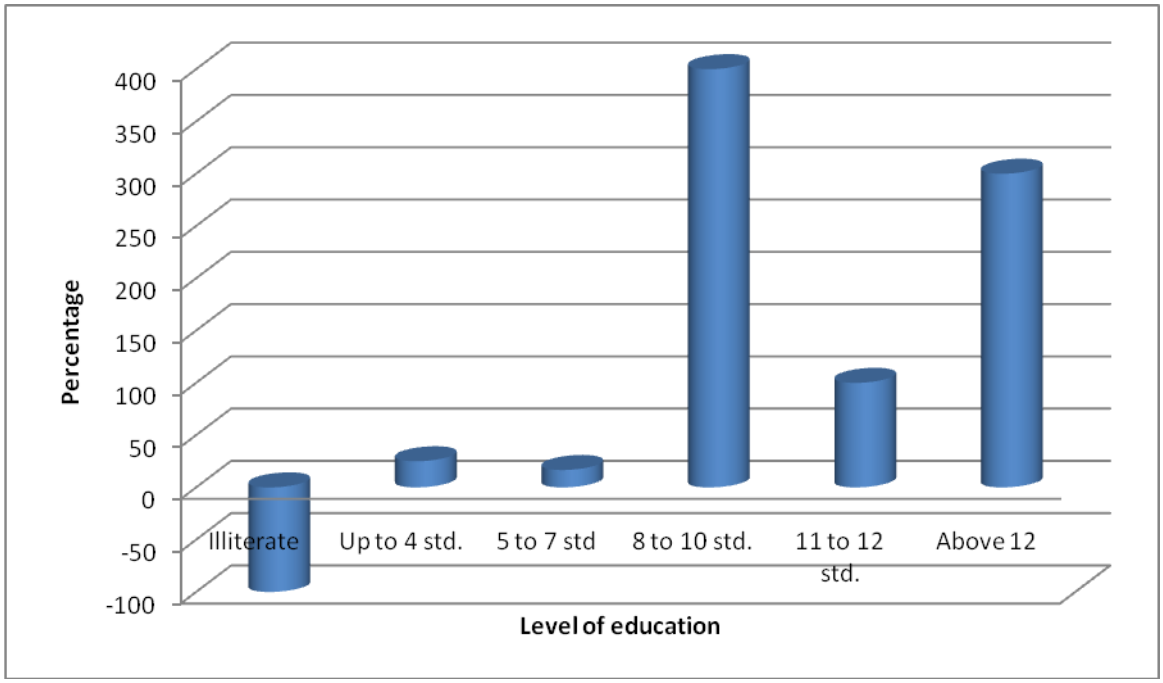



**Fig 37: Distribution of respondents according to their change in family education in middle region**

### ii) Change in family education in middle region

In case of family education in middle region, from Table 42, it was seen that, there was increase in 8 to 10 std. education by 400.00 per cent, followed by 300.00 percent change was noticed in above 12 std. education, followed by 100.00 per cent change in 11 to 12 std. education, followed by 25.00 per cent in up to 4 std education and 16.66 per cent change in 5 to 7 std. education of the respondents family. There was reduction in illiteracy after Wan irrigation project in middle region.

There was significant difference in family education among the beneficiaries before and after Wan irrigation project as indicated by the 'z' value, which was found significant at 0.05 level of probability.

**Table 42. Distribution of respondents according to their change in family education in middle region**

| Sl. No. | Level of education | Middle region (n=100) | | |
|---|---|---|---|---|
| | | Before Wan project | After Wan project | Percent change |
| | | Frequency | Frequency | (%) |
| 1. | Illiterate | 20 | 00 | -100.00 |
| 2. | Up to 4 std. | 100 | 125 | 25.00 |
| 3. | 5 to 7 std | 60 | 70 | 16.66 |
| 4. | 8 to 10 std. | 30 | 150 | 400.00 |
| 5. | 11 to 12 std. | 15 | 30 | 100.00 |
| 6. | Above 12 | 10 | 40 | 300.00 |
| | **Mean** | **70.10** | **88.01** | |
| | **S. D.** | **6.01** | **12.1** | |
| | **'z' Value** | **6.017*** | | |

* Significant at 0.05 level of probability

### iii) Change in family education in tail region

In case of family education in tail region, from Table 43, it was seen that, there was increase above 12 std. education by 100.00 per cent, followed by 25.00 percent change was noticed in up to 4 std. education, followed by 20.00 per cent change in 5 to 7 std. education of the respondents family. There was found reduction in illiteracy (100.00%) and also reduction in 11 to 12 std. education (33.33%) after Wan irrigation project.

There was significant difference in family education among the beneficiaries before and after Wan irrigation project as indicated by the 'z' value. The 'z' value was found significant at 0.01 level of probability.

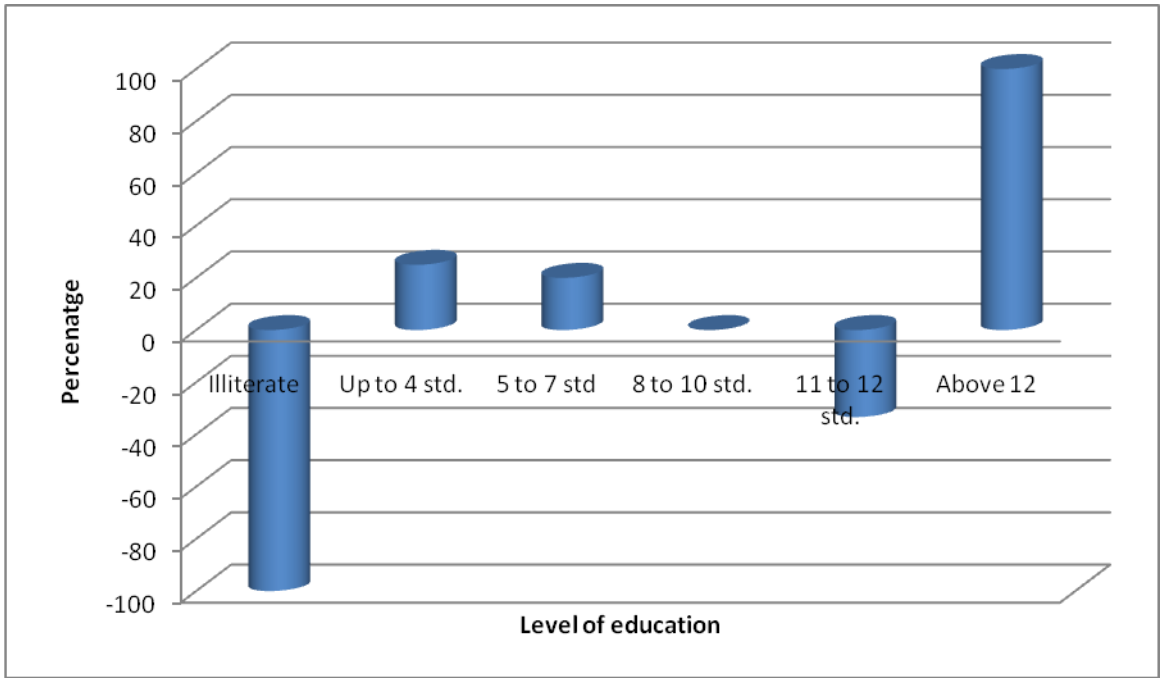



**Fig 38: Distribution of respondents according to their change in family education in tail region**

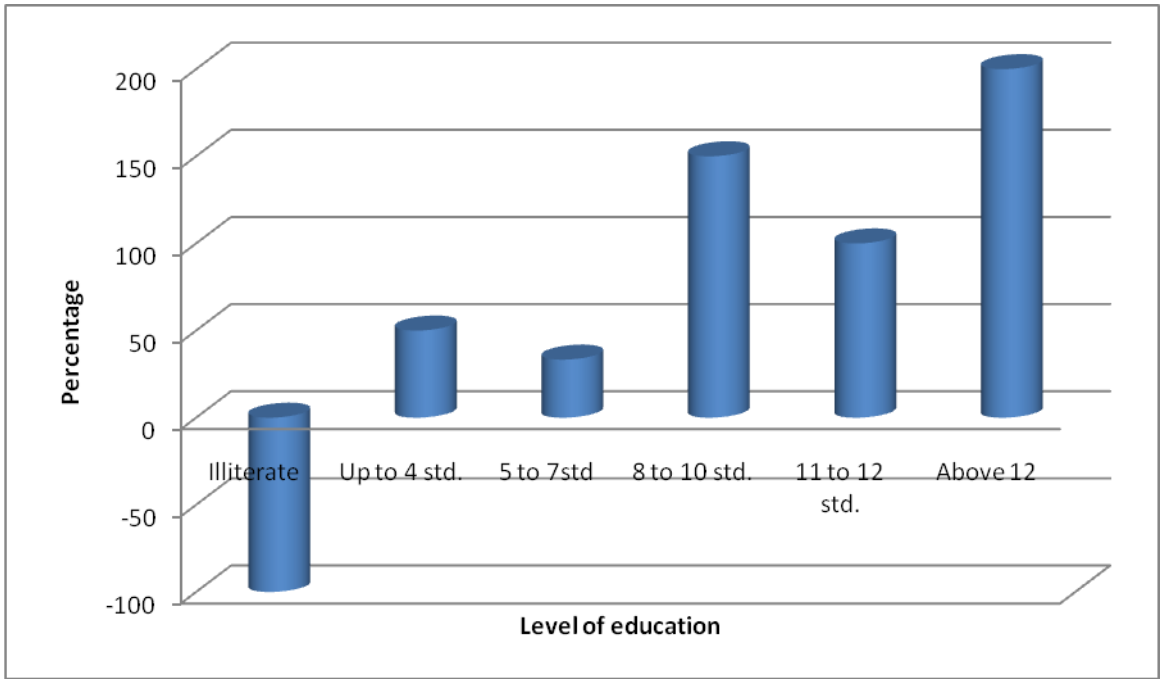



**Fig 39: Distribution of respondents according to their change in family education in study area**

**Table 43. Distribution of respondents according to their change in family education in tail region**

| Sl. No. | Level of education | Tail region (n=100) | | |
|---|---|---|---|---|
| | | Before Wan project | After Wan project | Percent change |
| | | Freq. | Freq. | % |
| 1. | Illiterate | 20 | 00 | -100 |
| 2. | Up to 4 std. | 100 | 125 | 25.00 |
| 3. | 5 to 7 std | 25 | 30 | 20.00 |
| 4. | 8 to 10 std. | 30 | 30 | 00.00 |
| 5. | 11 to 12 std. | 15 | 10 | -33.33 |
| 6. | Above 12 | 10 | 20 | 100.00 |
| | **Mean** | **74.08** | **79.01** | |
| | **S. D.** | **8.3** | **5.7** | |
| | **'z' Value** | **4.123**** | | |

** Significant at 0.01 level of probability

**iv) Change in family education in study area**

In case of family education in study region, from Table 44, it was revealed that, after Wan irrigation project the percent change of education level was relatively in above 12 std. (200.00%), 150.00 per cent was noticed in 8 to 10 std. education, 100.00 per cent in 11 to 12 std. education, 50.00 per cent in up to 4 std. and 33.33 per cent in 5 to 7 std. education of the respondents family.

The 'z' value was found significant at 0.05 level of probability.

**Table 44. Distribution of respondents according to their change in family education in study area**

| Sl. No | Level of education | Respondents ( n = 300 ) | | | | |
|---|---|---|---|---|---|---|
| | | Before Wan project | | After Wan project | | Percent change |
| | | Freq. | Percent | Freq. | Percent | (%) |
| 1. | Illiterate | 60 | 20 | 00 | 00.00 | -100.00 |
| 2. | Up to 4 std. | 300 | 100 | 450 | 150.00 | 50.00 |
| 3. | 5 to 7std | 150 | 50 | 200 | 66.67 | 33.33 |
| 4. | 8 to 10 std. | 100 | 33.33 | 250 | 83.33 | 150.00 |
| 5. | 11 to 12 std. | 50 | 16.67 | 100 | 33.33 | 100.00 |
| 6. | Above 12 | 30 | 10 | 90 | 30.00 | 200.00 |
| | **Mean** | **2.29** | | **4.20** | | **83.40** |
| | **S.D.** | **0.93** | | **1.16** | | |
| | **'z' Value** | **10.24*** | | | | |

* Significant at 0.05 level of probability

From above findings it can be stated that, there was increase in education level as their income level increased they moved towards education.There was definite socio-economic impact of Wan irrigation project on beneficiaries.

**d) Change in annual income**

Annual income plays an important role in the life of people. Change in annual incomeof beneficiary farmers in head, middle, tail and total study area were studied saperately in order to know the segmentwise effect of Wan irrigation project on the beneficiary farmers and presented as below.

**i) Change in annual income in head region**

Table 45 revealed the change in annual income of beneficiary farmers before and after Wan irrigation project. From the Table 45, it is concluded that, 300.00 per cent change was observed in the annual income category of above Rs. 2,00,000/-, followed by 66.66 per cent in the annual income category of Rs.1,00,00 to 1,50,000/-, followed by 33.33 per cent in the annual income category of Rs. 51,000 to 1,00,000/-. 25.00 per cent change in the annual income category of Rs. 1,51,000 to 2,00,000/-.

The 'z' value was found significant at 0.01 level of probability.

**Table 45. Distribution of respondents according to their change in annual income of head region**

| Sl. No | Annual Income (Rs.) | Respondents ( n =100) | | | | |
|---|---|---|---|---|---|---|
| | | Before Wan project | | After Wan project | | Percent change |
| | | Freq. | Percent | Freq. | Percent | (%) |
| 1. | Up to 50,000 | 10 | 10.00 | 00 | 00.00 | -100.00 |
| 2. | 50,001 to 1,00,000 | 15 | 15.00 | 20 | 20.00 | 33.33 |
| 3. | 1,00,001 to 1,50,000 | 45 | 45.00 | 15 | 15.00 | 66.66 |
| 4. | 1,51,000 to 2,00,000 | 20 | 20.00 | 25 | 25.00 | 25.00 |
| 5. | Above 2,00,000 | 10 | 10.00 | 40 | 40.00 | 300.00 |
| | **Total** | 100 | 100.00 | 100 | 100.00 | |
| | **Mean** | **1.08** | | **3.37** | | |
| | **S. D.** | **64.6** | | **22.7** | | |
| | **'z' value** | **3.152**** | | | | |

** Significant at 0.01 level of probability

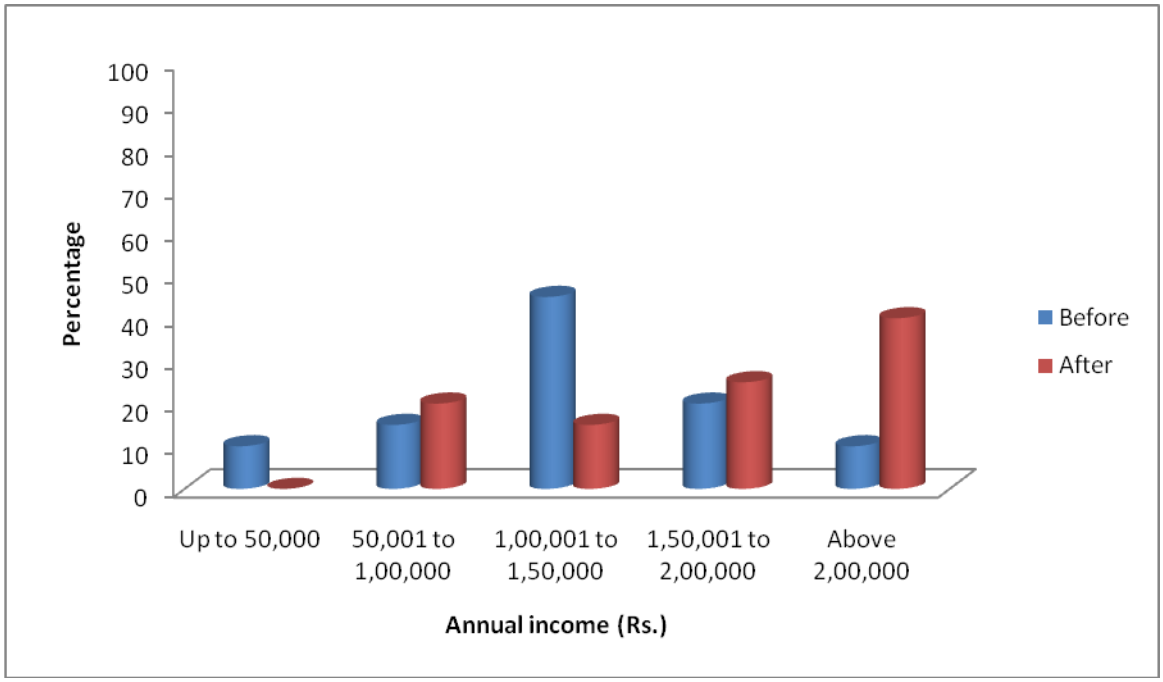



**Fig 40: Distribution of respondents according to their change in annual income of head region**

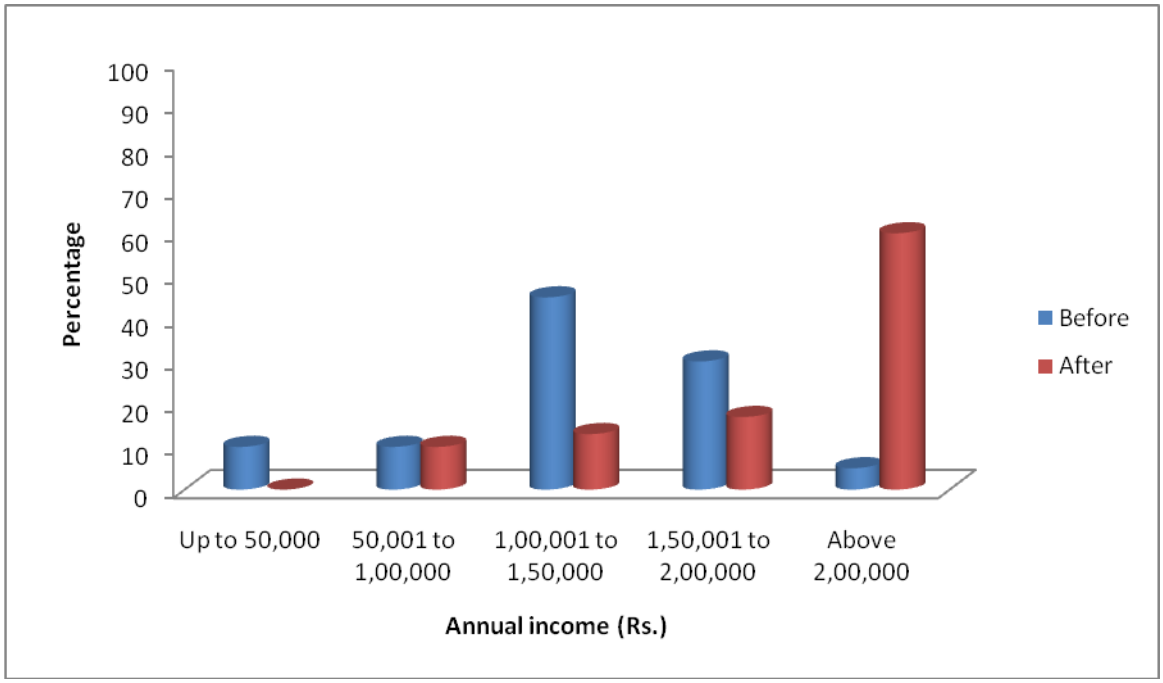



**Fig 41: Distribution of respondents according to their change in annual income of middle region**

### ii) Change in annual income in middle region

From the Table 46, it is concluded that, 1100.00 per cent change was observed in the annual income category of above Rs. 2,00,000/-. There was reduction (100.00%) in the annual income category up to 50,000/-, followed by (71.11%) in the annual income category of Rs.1,00,00 to 1,50,000/-, followed by (43.33%) in the annual income category of Rs. 1,51,000 to 2,00,000/-. The 'z' value was found significant at 0.01 level of probability.

**Table 46. Distribution of respondents according to their change in annual income of middle region**

| Sl. No | Annual Income (Rs.) | Respondents ( n =100) | | | | |
|---|---|---|---|---|---|---|
| | | Before Wan project | | After Wan project | | Percent change |
| | | Freq. | Percent | Freq. | Percent | % |
| 1. | Up to 50,000 | 10 | 10.00 | 00 | 00.00 | -100.00 |
| 2. | 50,001 to 1,00,000 | 10 | 10.00 | 10 | 10.00 | 00.00 |
| 3. | 1,00,001 to 1,50,000 | 45 | 45.00 | 13 | 13.00 | -71.11 |
| 4. | 1,51,000 to 2,00,000 | 30 | 30.00 | 17 | 17.00 | -43.33 |
| 5. | Above 2,00,000 | 05 | 05.00 | 60 | 60.00 | 1100.00 |
| | **Total** | 100 | 100.00 | 100 | 100.00 | |
| | **Mean** | **1.43** | | **3.37** | | |
| | **S. D.** | **51.8** | | **22.7** | | |
| | **'z' value** | **3.996**** | | | | |

** Significant at 0.01 level of probability

### iii) Change in annual income in tail region

Table 47 revealed the change in annual income of beneficiary farmers before and after Wan irrigation project. From the Table 47, it is concluded that, 500.00 per cent change was observed in the annual income category of above Rs. 2,00,000/-, 74.28 per cent change was observed in the annual income category of Rs. 51,001 to 1,50,000/-. There was found reduction (-100.00%) in the annual income category up to 50,000 /-.,followed by (60.00%) in the annual income category of Rs.1,00,00 to 1,50,000/-, followed by (16.66%) in the annual income category of Rs. 1,51,000 to 2,00,000/-.

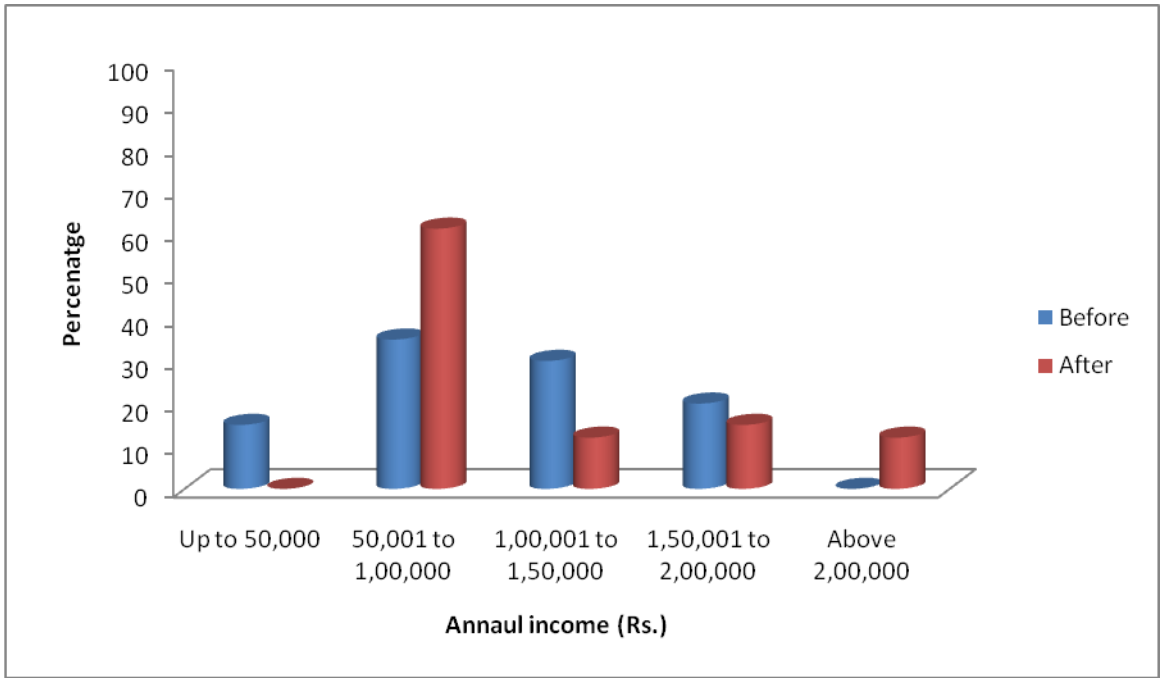



**Fig 42: Distribution of respondents according to their change in annual income in tail region**

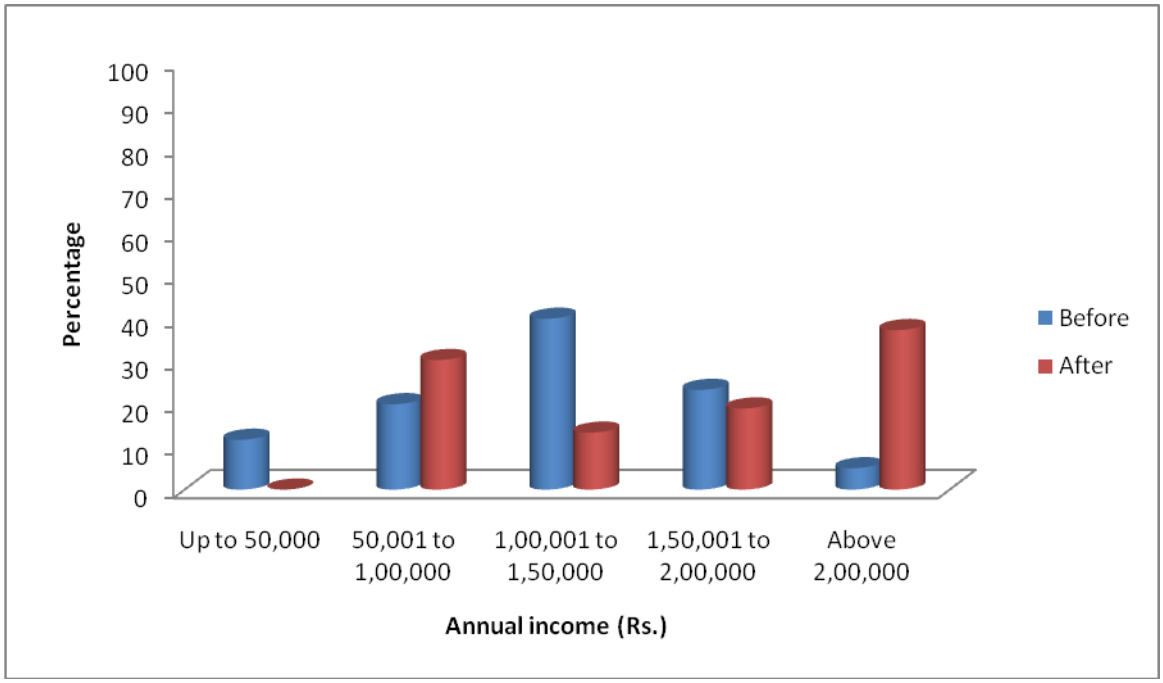



**Fig 43: Distribution of respondents according to change in annual income in study area**

**Table 47. Distribution of respondents according to their change in annual income in tail region**

| Sl. No | Annual Income (Rs.) | Respondents ( n =100) | | | | |
|---|---|---|---|---|---|---|
| | | Before Wan project | | After Wan project | | Percent change |
| | | Freq. | Percent | Freq. | Percent | (%) |
| 1. | Up to 50,000 | 15 | 15.00 | 00 | 00.00 | -100.00 |
| 2. | 50,001 to 1,00,000 | 35 | 35.00 | 61 | 61.00 | 74.28 |
| 3. | 1,00,001 to 1,50,000 | 30 | 30.00 | 12 | 12.00 | -60.00 |
| 4. | 1,51,000 to 2,00,000 | 18 | 20.00 | 15 | 15.00 | -16.66 |
| 5. | Above 2,00,000 | 02 | 00.00 | 12 | 12.00 | 500.00 |
| | **Total** | 100 | 100.00 | 100 | 100.00 | |
| | **Mean** | **1.01** | | **1.36** | | |
| | **S. D.** | **44.5** | | **91.1** | | |
| | **'z' value** | **1.961NS** | | | | |

NS - Non significant

**iv) Change in annual income in study area**

Table 48 revealed the change in annual income of beneficiary farmers before and after Wan irrigation project. From the Table 48, it is concluded that, 646.66 per cent change was observed in the annual income category of above Rs. 2,00,000/-, followed by 51.66 per cent in the annual income category of Rs. 51,000 to 1,00,000/-.There was found reduction (100.00%) in the annual income category up to 50,000 /-., followed by (-400.00%) in the annual income category of Rs.1,00,00 to 1,50,000/-, followed by (18.57%) in the annual income category of Rs. 1,51,000 to 2,00,000/-.

The 'z' value was found significant at 0.05 level of probability. These findings are supported by the findings Suvarna Ingole (2013).

**Table 48. Distribution of respondents according to change in annual income in study area**

| Sl. No | Annual Income (Rs.) | Respondents ( n =300) | | | | |
|---|---|---|---|---|---|---|
| | | Before Wan project | | After Wan project | | Percent change |
| | | Freq. | Percent | Freq. | Percent | (%) |
| 1. | Up to 50,000 | 35 | 11.66 | 00 | 00.00 | -100.00 |
| 2. | 50,001 to 1,00,000 | 60 | 20.00 | 91 | 30.33 | 51.66 |
| 3. | 1,00,001 to 1,50,000 | 120 | 40.00 | 40 | 13.33 | -400.00 |
| 4. | 1,51,000 to 2,00,000 | 70 | 23.34 | 57 | 19.00 | -18.57 |
| 5. | Above 2,00,000 | 15 | 05.00 | 112 | 37.34 | 646.66 |
| | **Total** | 300 | 100.00 | 300 | 100.00 | |
| | **Mean** | **4.30** | | **7.00** | | **62.79** |
| | **S. D.** | **6.00** | | **6.48** | | |
| | **'z' value** | **12.91*** | | | | |

* Significant at 0.05 level of probability

### e) Change in socio political participation

Change in socio political participation of beneficiary farmers in head, middle, tail and total study area were studied saperately in order to know the segmentwise effect of Wan irrigation project on the beneficiary farmers and given as below.

### i) Change in socio political participation in head region

The data pertaining to change in socio-political participation of respondent in head region revealed that, majority (66.67%) of the respondent were found change in participation in social political participation, followed by 33.33 per cent in financial contribution or raised funds for community work. Whereas, there was reduction by 42.85 per cent, regarding participation without any position in socio political organization and official position in one or more organization.

**Table 49. Distribution of respondents according to their change in socio political participation in head region**

| Sl. No | Socio political participation | Respondents ( n = 100 ) | | | | |
|---|---|---|---|---|---|---|
| | | Before Wan project | | After Wan project | | Percent change |
| | | Freq. | Percent | Freq. | Percent | % |
| 1. | Participated in social political institutions | 30 | 30.00 | 50 | 50.00 | 66.67 |
| 2. | Participated without any position in socio political organization | 35 | 35.00 | 20 | 20.34 | -42.85 |
| 3. | Official position in one or more formal organization | 10 | 10.00 | 07 | 07.00 | -42.85 |
| 4. | Official position in socio and political organization | 00 | 00.00 | 00 | 00.00 | 00.00 |
| 5. | Financial contribution or raised funds for community work | 15 | 15.00 | 20 | 20.00 | 33.33 |
| 6. | Active office bearer | 00 | 00.00 | 00 | 00.00 | 00.00 |
| 7. | Involved in community work | 10 | 10.00 | 03 | 03.00 | -70.00 |
| | **Total** | 100 | 100 | 100 | 100 | |
| | **Mean** | **84.07** | | **99.89** | | |
| | **S. D.** | **14.03** | | **16.89** | | |
| | **'z' value** | **8.667NS** | | | | |

NS - Non significant

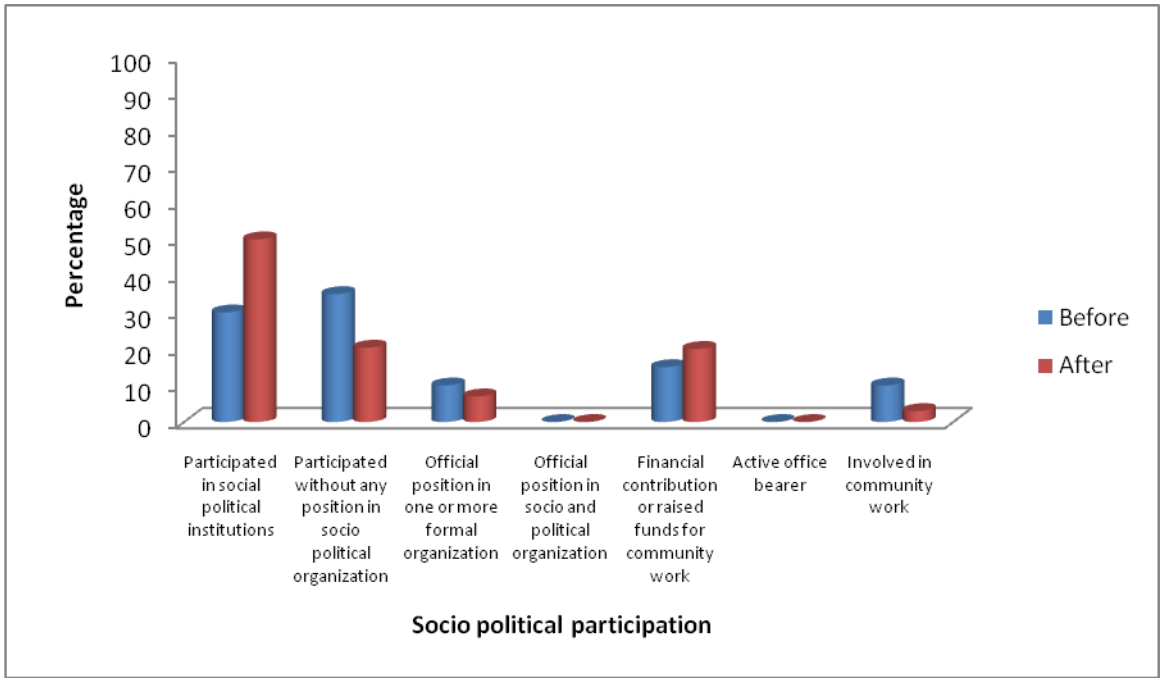



**Fig 44: Distribution of respondents according to their change in socio political participation in head region**

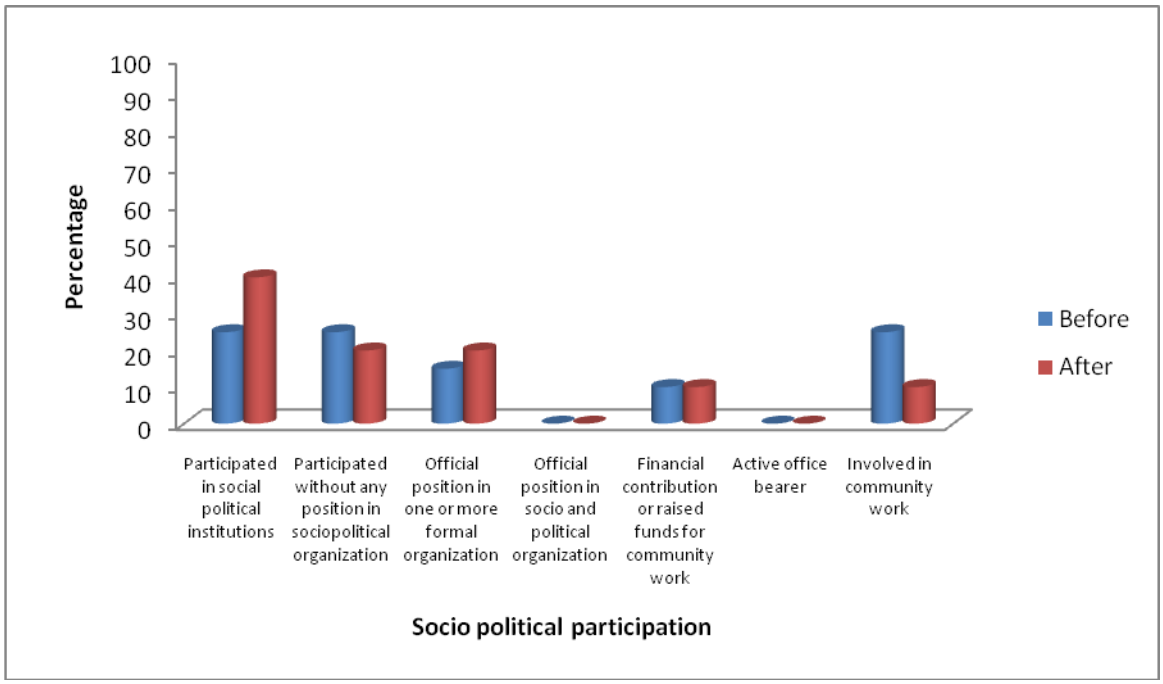



**Fig 45: Distribution of respondents according to their change in socio political participation in middle region**

### ii) Change in socio political participation in middle region

The data pertaining to change in socio-political participation of respondent in middle region revealed that, majority (60.00%) of the respondent were found change in participation in social political participation, followed by 33.33 per cent change in official position in one or more formal organization. Whereas, there was reduction by 60.00 per cent regarding respondents involved in community work.

**Table 50. Distribution of respondents according to their change in socio political participation in middle region**

| Sl. No | Socio political participation | Respondents ( n = 100 ) | | | | |
|---|---|---|---|---|---|---|
| | | Before Wan project | | After Wan project | | Percent change |
| | | Freq. | Percent | Freq. | Percent | % |
| 1. | Participated in social political institutions | 25 | 25.00 | 40 | 40.00 | 60.00 |
| 2. | Participated without any position in sociopolitical organization | 25 | 25.00 | 20 | 20.00 | -20.00 |
| 3. | Official position in one or more formal organization | 15 | 15.00 | 20 | 20.00 | 33.33 |
| 4. | Official position in socio and political organization | 00 | 00.00 | 00 | 00.00 | 00.00 |
| 5. | Financial contribution or raised funds for community work | 10 | 10.00 | 10 | 10.00 | 00.00 |
| 6. | Active office bearer | 00 | 00.00 | 00 | 00.00 | 00.00 |
| 7. | Involved in community work | 25 | 25.00 | 10 | 10.00 | -60.00 |
| | **Total** | 100 | 100 | 100 | 100 | |
| | **Mean** | **75.33** | | **86.03** | | |
| | **S. D.** | **13.6** | | **15.04** | | |
| | **'z' value** | **7.365NS** | | | | |

NS - Non significant

### iii) Change in socio political participation in tail region

The data pertaining to change in socio-political participation of respondent in tail region revealed that, majority (100.00%) of the respondent were found change in participation in social political participation and in

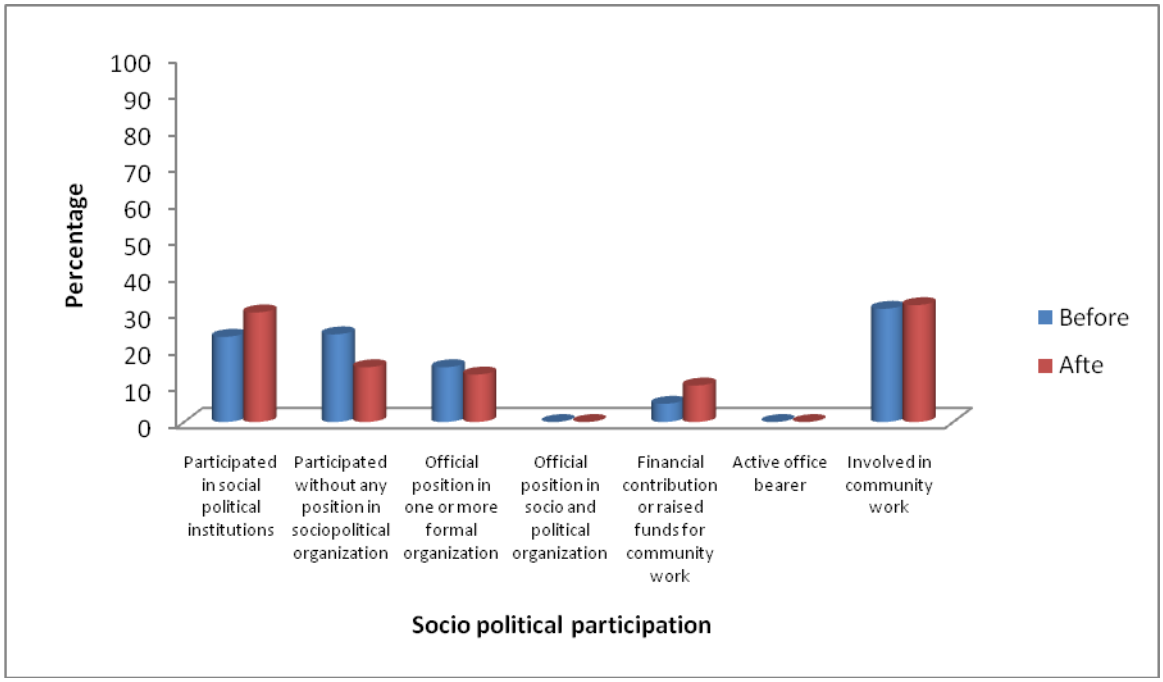



**Fig 46: Distribution of respondents according to their change in socio political participation in tail region**

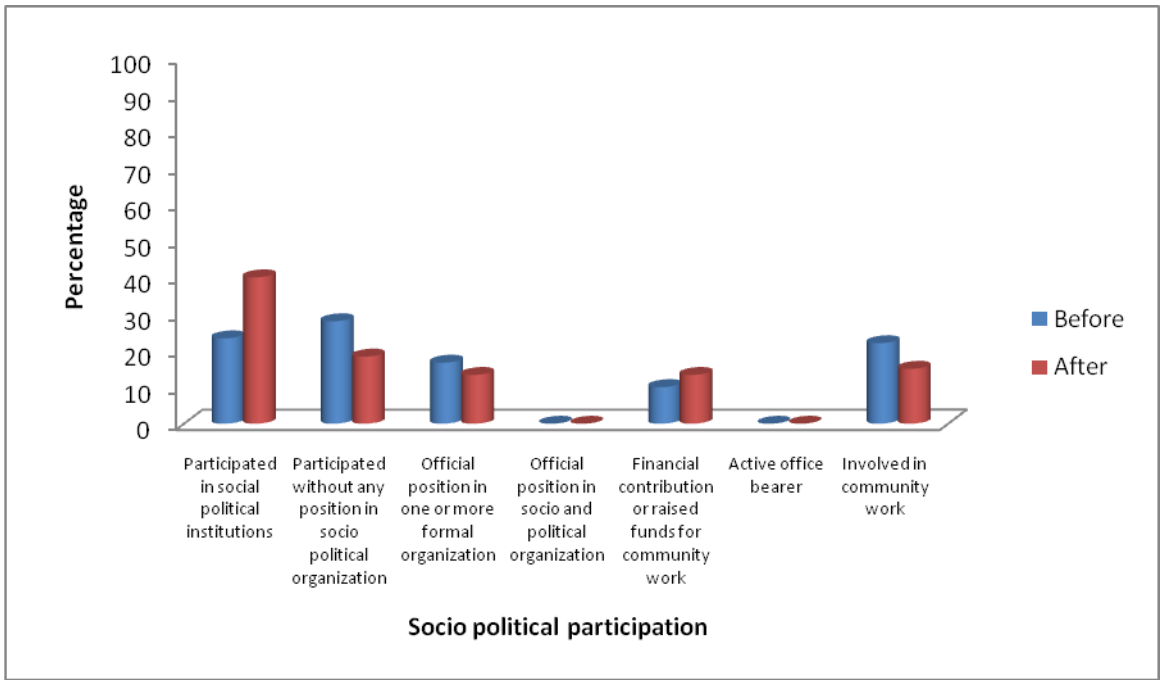



**Fig 47: Distribution of respondents according to their change in socio political participation in study area**

financial contribution or raised funds for community work, followed by 03.22 per cent change in respondent involved in community work.

Whereas, there was reduction by 37.00 per cent change in respondent having official position in one or more formal organization.

**Table 51. Distribution of respondents according to their change in socio political participation in tail region**

| Sl. No | Socio political participation | Respondents ( n = 100 ) | | | | |
|---|---|---|---|---|---|---|
| | | Before Wan project | | After Wan project | | Percent change |
| | | Freq. | Percent | Freq. | Percent | % |
| 1. | Participated in social political institutions | 15 | 23.33 | 30 | 30.00 | 100.00 |
| 2. | Participated without any position in sociopolitical organization | 24 | 24.00 | 15 | 15.00 | -37.50 |
| 3. | Official position in one or more formal organization | 15 | 15.00 | 13 | 13.00 | -13.33 |
| 4. | Official position in socio and political organization | 00 | 00.00 | 00 | 00.00 | 00.00 |
| 5. | Financial contribution or raised funds for community work | 05 | 05.00 | 10 | 10.00 | 100.00 |
| 6. | Active office bearer | 00 | 00.00 | 00 | 00.00 | 00.00 |
| 7. | Involved in community work | 31 | 31.00 | 32 | 32.00 | 03.22 |
| | **Total** | 100 | 100 | 100 | 100 | |
| | **Mean** | **55.66** | | **77.61** | | |
| | **S. D.** | **11.02** | | **13.06** | | |
| | **'z' value** | **5.698NS** | | | | |

NS - Non significant

### iv) Change in socio political participation in study area

In study area from Table 52 it can be revealed that, after Wan irrigation project majority (71.42%) of the respondents were participated in social political institutions, 33.33 per cent of the respondents raised their funds for community work. Reduction was found in those which were participated without any position in socio political organization (34.52%),

respondents were involved in community work (31.8%1), respondents were having official position in one or more formal organization (20.00%).

**Table 52. Distribution of respondents according to their change in socio political participation in study area**

| Sl. No | Socio political participation | Respondents ( n = 300 ) | | | | |
|---|---|---|---|---|---|---|
| | | Before Wan project | | After Wan project | | Percent change |
| | | Freq. | Percent | Freq. | Percent | (%) |
| 1. | Participated in social political institutions | 70 | 23.33 | 120 | 40.00 | 71.42 |
| 2. | Participated without any position in socio political organization | 84 | 28.00 | 55 | 18.34 | -34.52 |
| 3. | Official position in one or more formal organization | 50 | 16.67 | 40 | 13.33 | -20.00 |
| 4. | Official position in socio and political organization | 00 | 00.00 | 00 | 00.00 | 00.00 |
| 5. | Financial contribution or raised funds for community work | 30 | 10.00 | 40 | 13.33 | 33.33 |
| 6. | Active office bearer | 00 | 00.00 | 00 | 00.00 | 00.00 |
| 7. | Involved in community work | 66 | 22.00 | 45 | 15.00 | -31.81 |
| | **Total** | **300** | **100** | **100** | **100** | |
| | **Mean** | **55.66** | | **77.61** | | **39.43** |
| | **S. D.** | **2.89** | | **2.43** | | |
| | **'z' value** | **8.01NS** | | | | |

NS – Non significat

### f) Change in expenditure pattern

Expenditure pattern is one of the most important component. When the income of a family increases, it has a profound effect on family expenditure. The family expenditure includes expenditure on food, education, housing, clothing, health, electricity, religious function etc.

Change in expenditure pattern of beneficiary farmers in head, middle, tail and total study area were studied saperately in order to know the segmentwise effect of Wan irrigation project on the beneficiary farmers.

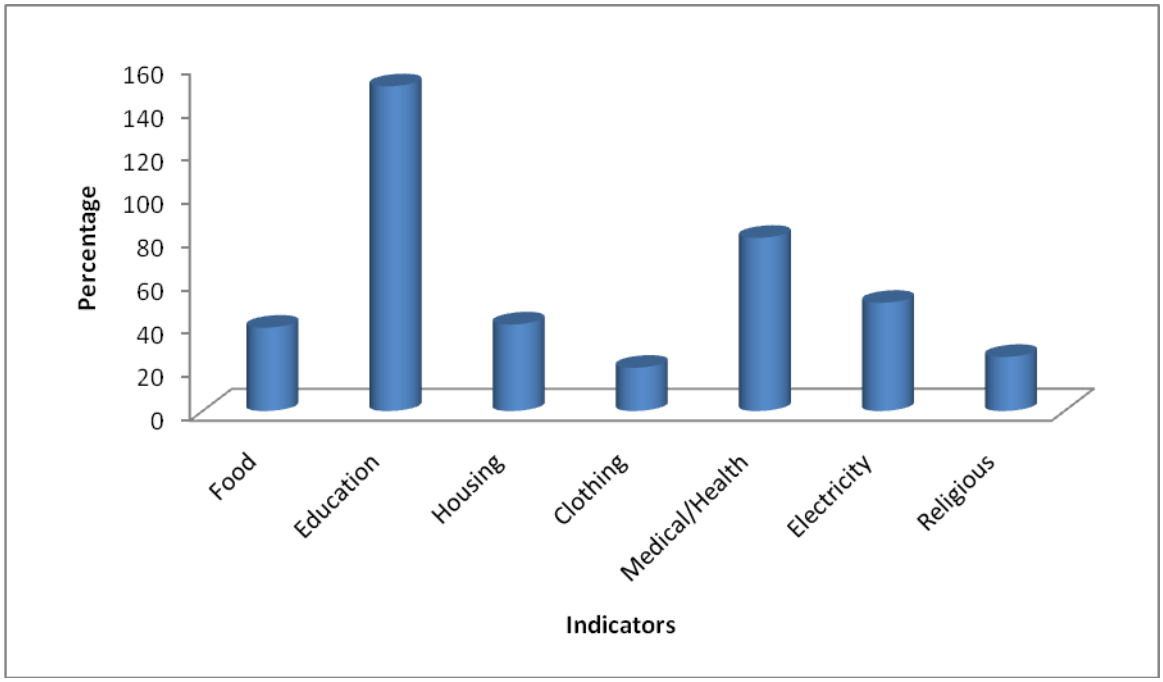



**Fig 48: Distribution of respondents according to their change in expenditure pattern in head region (Mean month expenditure)**

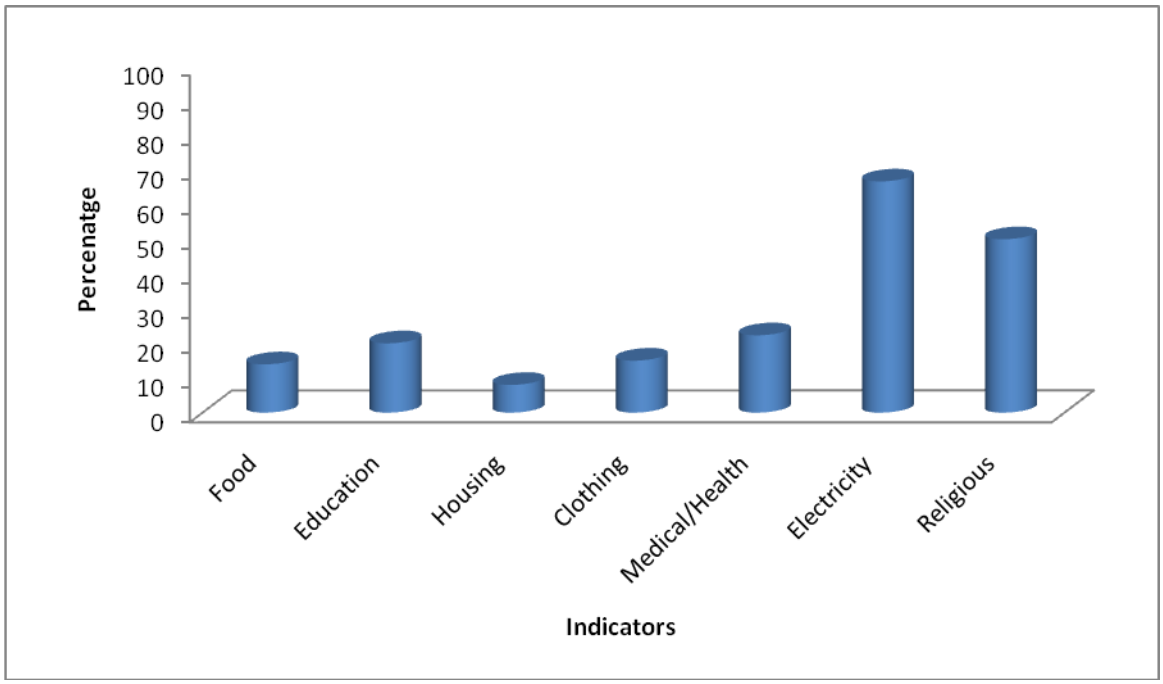



**Fig 49: Distribution of respondents according to their change in expenditure pattern in middle region (Mean month expenditure)**

### i) Change in expenditure pattern in head region

Table 53 revealed that, the expenditure pattern of the beneficiary farmers in head region before and after Wan irrigation project. It was found that there was increase in expenditure pattern, in case of education 150.00 per cent, medical/health 80.00 per cent, electicity 50.00 per cent, housing 40.00 per cent, food 38.50 per cent, religious 25.00 per cent and on cloth 20.00 per cent.

In overall, there was 47.77 per cent change was observed in case of expenditure pattern of beneficiary farmers before and after Wan irrigation project.

**Table 53. Distribution of respondents according to their change in expenditure pattern in head region (Mean month expenditure)**

| Sl. No | Indicators | Respondents ( n = 100 ) | | |
|---|---|---|---|---|
| | | Before Wan project (Rs.) | After Wan project (Rs.) | Percent change (%) |
| 1. | Food | 2166 | 3000 | 38.50 |
| 2. | Education | 1000 | 2500 | 150.00 |
| 3. | Housing | 2500 | 3500 | 40.00 |
| 4. | Clothing | 2500 | 3000 | 20.00 |
| 5. | Medical/Health | 1000 | 1800 | 80.00 |
| 6. | Electricity | 800 | 1200 | 50.00 |
| 7. | Religious | 1200 | 1500 | 25.00 |
| | **Grand Total** | **11166** | **16500** | **47.77** |

### ii) Change in expenditure pattern in middle region

Table 54 revealed the expenditure pattern of the beneficiary farmers in middle region before and after Wan irrigation project. It was found that there was increase in expenditure pattern in case of electricity 66.67 per cent, religious 50.00 per cent, medical/health 22.00 per cent, education 20.00 per cent, clothing 15.00 per cent, food 13.94 per cent and on housing 08.00 per cent.

In overall, there was 20.65 per cent change was observed in case of expenditure pattern of beneficiary farmers before and after Wan irrigation project.

**Table 54. Distribution of respondents according to their change in expenditure pattern in middle region (Mean month expenditure)**

| Sl. No | Indicators | Respondents ( n = 100 ) | | |
|---|---|---|---|---|
| | | Before Wan project (Rs.) | After Wan project (Rs.) | Percent change (%) |
| 1. | Food | 2194 | 2500 | 13.94 |
| 2. | Education | 1500 | 1800 | 20.00 |
| 3. | Housing | 2500 | 2700 | 08.00 |
| 4. | Clothing | 2000 | 2300 | 15.00 |
| 5. | Medical/Health | 1000 | 1223 | 22.30 |
| 6. | Electricity | 600 | 1000 | 66.67 |
| 7. | Religious | 1000 | 1500 | 50.00 |
| | **Grand Total** | **10794** | **13023** | **20.65** |

### iii) Change in expenditure pattern in tail region

Table 55 revealed that, the expenditure pattern of the beneficiary farmers in tail region before and after Wan irrigation project. It was found that there was increase in expenditure pattern in case of clothing 150.00 per cent, medical/health 100.00 per cent, education 85.71 per cent, religious 66.67 per cent, housing 55.55 per cent, food 22.72 per cent and on electricity 20.00 per cent.

In overall, there was 61.53 per cent change was observed in case of expenditure patternof beneficiary respondents before and after Wan irrigation project in tail region.

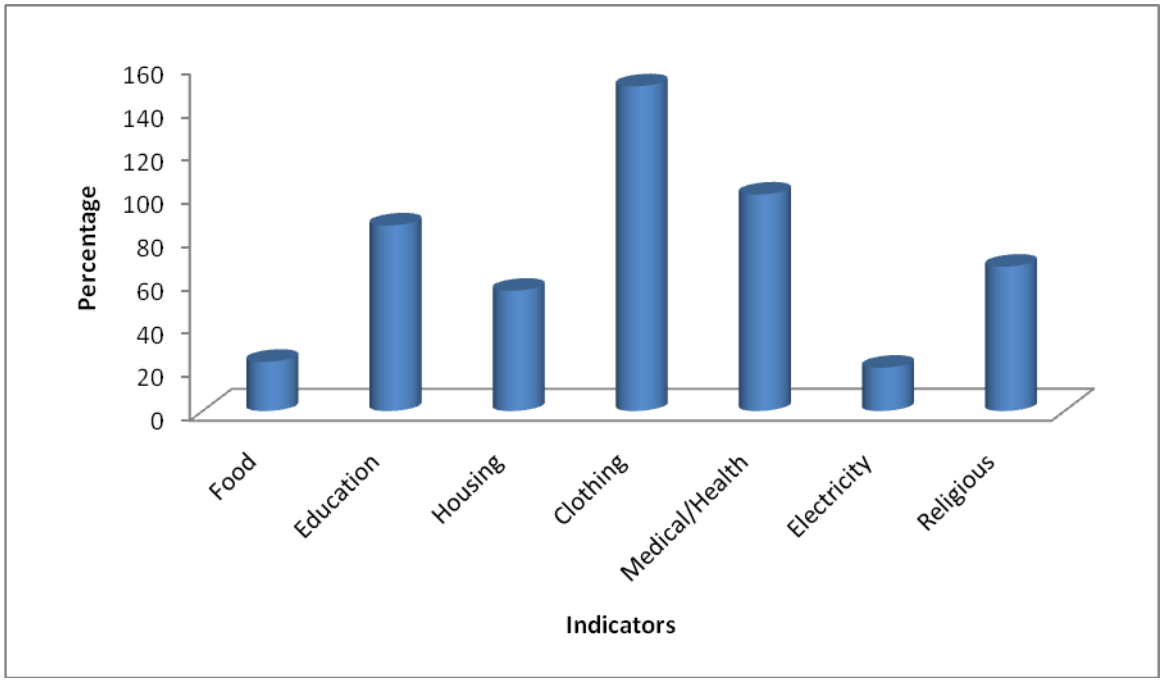



**Fig 50: Distribution of respondents according to their change in expenditure pattern in tail region (Mean monthly expenditure)**

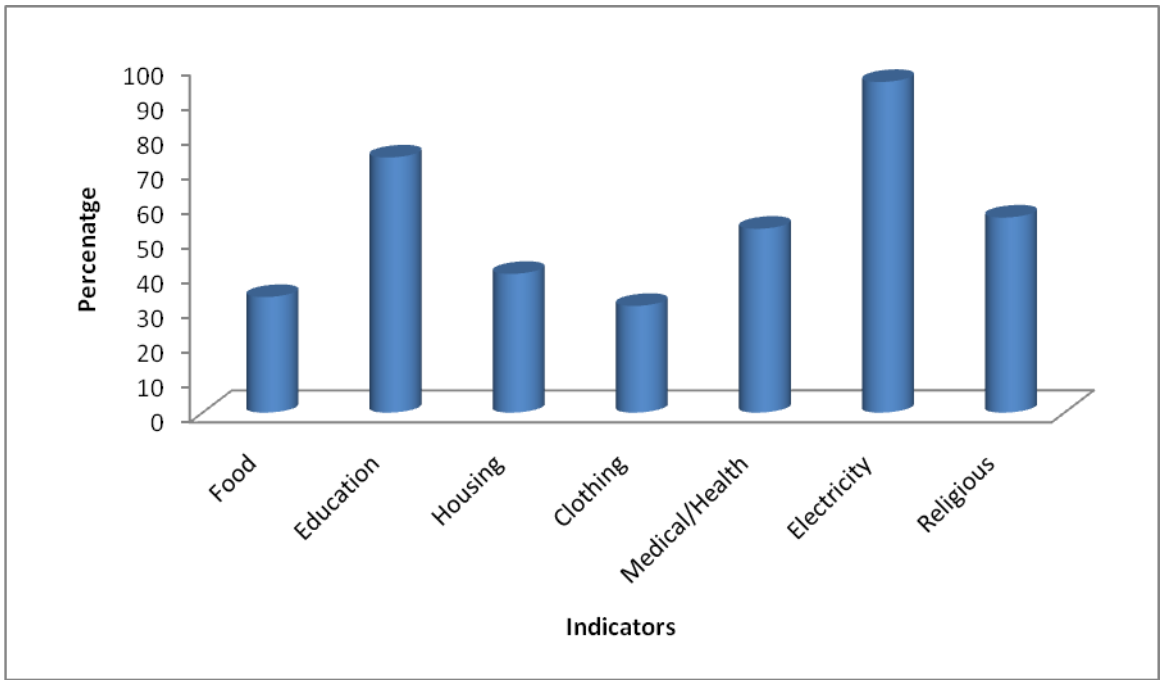



**Fig 51: Distribution of respondents according to their change in expenditure pattern in study area (Mean monthly expenditure)**

**Table 55. Distribution of respondents according to their change in expenditure pattern in tail region (Mean monthly expenditure)**

| Sl. No | Indicators | Respondents ( n = 100 ) | | |
|---|---|---|---|---|
| | | Before Wan project | After Wan project | Percent change (%) |
| 1. | Food | 2200 | 2700 | 22.72 |
| 2. | Education | 700 | 1300 | 85.71 |
| 3. | Housing | 900 | 1400 | 55.55 |
| 4. | Clothing | 1000 | 2500 | 150.00 |
| 5. | Medical/Health | 500 | 1000 | 100.00 |
| 6. | Electricity | 1000 | 1200 | 20.00 |
| 7. | Religious | 1500 | 2500 | 66.67 |
| | **Grand Total** | **7800** | **12600** | **61.53** |

### iv) Change in expenditure pattern in study area

Table 56 revealed that, the expenditure pattern of the beneficiary farmers in study area before and after Wan irrigation project, it was found that there was increase in expenditure pattern in case of electricity 95.33 per cent, education 73.56 per cent, religious 56.25 per cent, medical/health 53.01 per cent, housing 40.00 per cent, food 33.33 per cent and on clothing 30.76 per cent.

**Table 56. Distribution of respondents according to their change in expenditure pattern in study area (Mean monthly expenditure)**

| Sl. No | Indicators | Respondents ( n = 300 ) | | |
|---|---|---|---|---|
| | | Before Wan project (Rs.) | After Wan project (Rs.) | Percent change (Percent) |
| 1. | Food | 18000 | 24000 | 33.33 |
| 2. | Education | 2300 | 3992 | 73.56 |
| 3. | Housing | 2500 | 3500 | 40.00 |
| 4. | Clothing | 2600 | 3400 | 30.76 |
| 5. | Medical/Health | 1560 | 2387 | 53.01 |
| 6. | Electricity | 1200 | 2344 | 95.33 |
| 7. | Religious | 1600 | 2500 | 56.25 |
| | **Grand Total** | **29760** | **42123** | **41.54** |
| | **'z' value** | **10.02**** | | |

** Significant at 0.01 level of probability

In overall, there was 41.54 per cent change was observed in case of expenditure patternof beneficiary respondents before and after Wan irrigation project in study area.

**'**z' value was found significant at 0.01 level of probability in case of expenditure pattern of beneficiary farmers before and after Wan irrigation project.

**g) Change in economic empowerment**

The empowerment of deprived begins with, their economic development. Economic empowerment improves their standard of living and builds positive attitude towards life. If respondents are economically strong, they can able to take decision in any situation. In this way economic empowerment supports their livelihood and to fulfill the basic requirements of their families. Change in economic empowerment of beneficiary farmers in head, middle, tail and total study area were studied saperately in order to know the segmentwise effect of Wan irrigation project on the beneficiary farmers and it is presented in the following heads.

**i) Change in economic empowerment in head region**

Table 57 revealed the distribution of respondents of head region according to their economic empowerment after Wan irrigation project, it is found that there was increase in freedom to start business of (100.00 %), followed by opportunity for economic development (42.85%), authority to employ labour and participating in decision about adopting modern technology in home (33.33%), freedom for offering present to relatives (25.00%), personal saving in the form of fixed deposite and participation in decision about marketing of produce (11.11%). Whereas, there was reduction in operating seasonal accounts by 75.00 per cent and participating in decision about purchaising building /house by 30.00 per cent.

The 'z' value was found significant at 0.05 level of probability.It means that there was positive impact in respect of economic empowerment of beneficiary respondents of head region after Wan irrigation project.

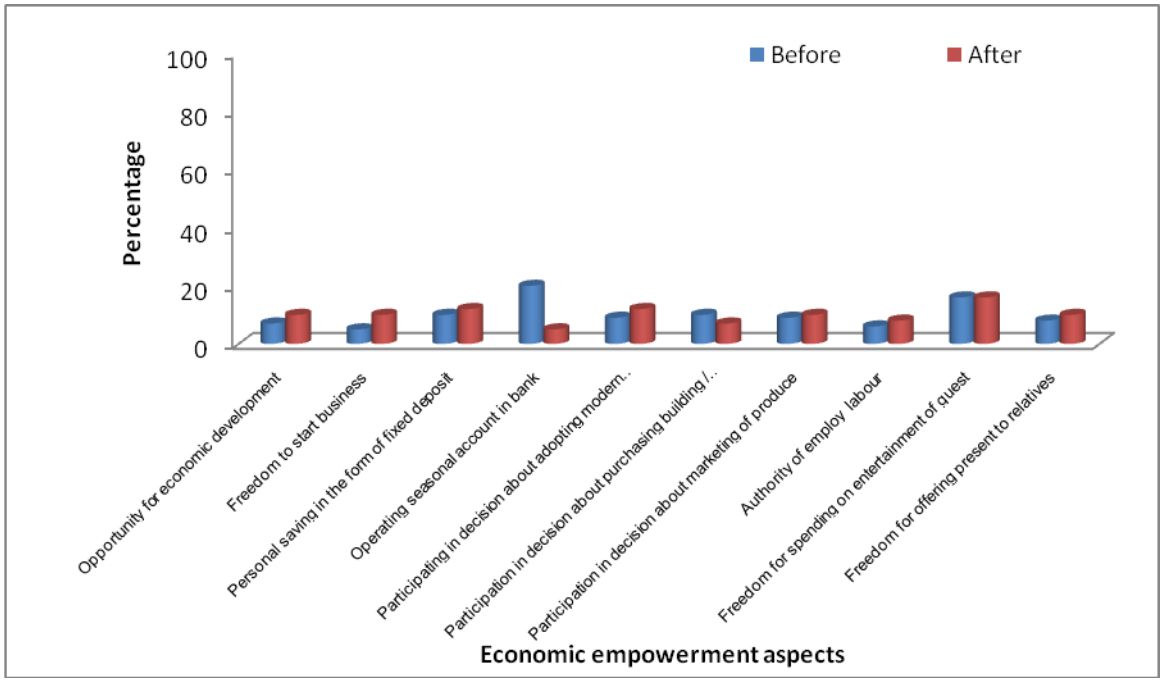



**Fig 52: Distribution of respondents of head region according to their change in economic empowerment**

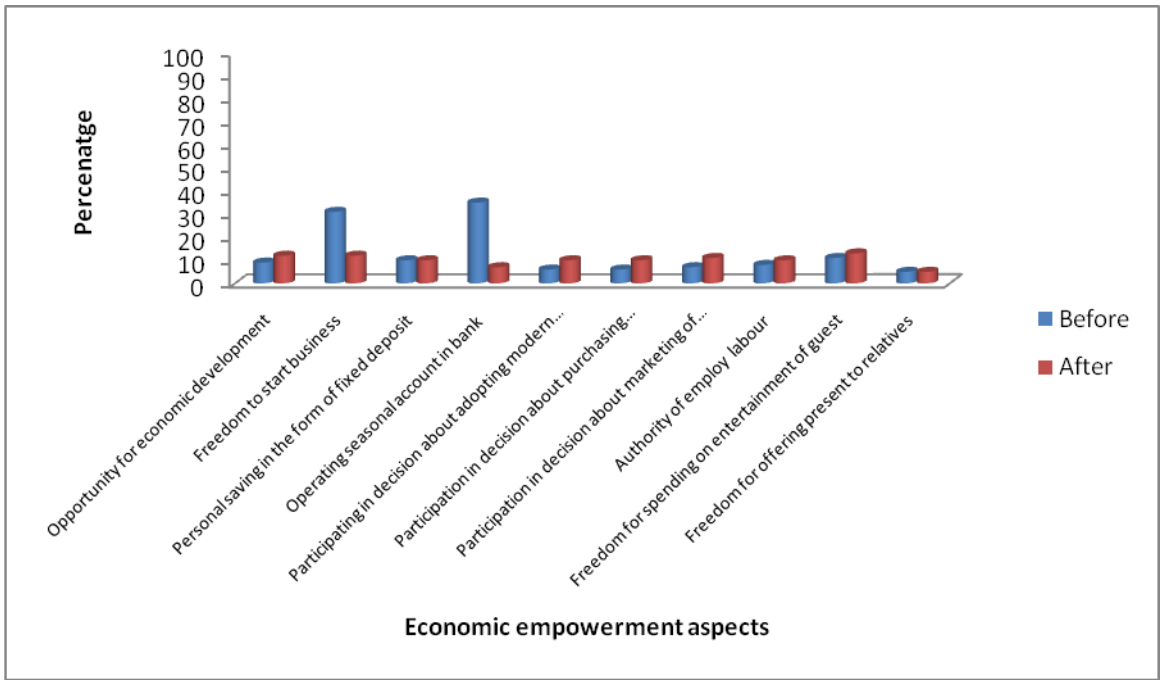



**Fig 53: Distribution of respondents of middle region according to their change in economic empowerment**

**Table 57. Distribution of respondents of head region according to their change in economic empowerment**

| Sl. No | Economic empowerment aspects | Head region ( n = 100 ) | | | | |
|---|---|---|---|---|---|---|
| | | Before Wan project | | After Wan project | | Percent change |
| | | Frequency | Percent | Frequency | Percent | (%) |
| 1. | Opportunity for economic development | 07 | 07.00 | 10 | 10.00 | 42.85 |
| 2. | Freedom to start business | 05 | 05.00 | 10 | 10.00 | 100.00 |
| 3. | Personal saving in the form of fixed deposit | 10 | 10.00 | 12 | 12.00 | 20.00 |
| 4. | Operating seasonal account in bank | 20 | 20 | 05 | 05 | -75.00 |
| 5. | Participating in decision about adopting modern technology in home | 09 | 09.00 | 12 | 12.00 | 33.33 |
| 6. | Participation in decision about purchasing building/ house | 10 | 10.00 | 07 | 07.00 | -30.00 |
| 7. | Participation in decision about marketing of produce | 09 | 09.00 | 10 | 10.00 | 11.11 |
| 8. | Authority of employ labour | 06 | 06.00 | 08 | 08.00 | 33.33 |
| 9. | Freedom for spending on entertainment of guest | 16 | 16.00 | 16 | 16.00 | 00.00 |
| 10. | Freedom for offering present to relatives | 08 | 08.00 | 10 | 10.00 | 25.00 |
| | **Total** | **100** | **100.00** | **100** | **100.00** | |
| | **Mean** | **82.22** | | **99.79** | | |
| | **S. D.** | **11.3** | | **15.3** | | |
| | **'z' value** | **5.395*** | | | | |

* Significant at 0.05 level of probability

### ii) Change in economic empowerment in middle region

Table 58 revealed the distribution of respondents of middle region according to their economic empowerment after Wan irrigation project, it is found that there was increase in freedom to start business at 300.00 per cent, followed by participating in decision about purchaising building /house and participating in decision about adopting modern technology in home (66.67%), participation in decision about marketing produce by (57.14%), opportunity for economic development (33.33%), authority to employ labour (25.00%) and freedom for spending on entertainment of guest (18.18%). Whereas, there was reduction in operating seasonal accounts by 80.00 per cent. The 'z' value was found significant at 0.01 level of probability.It means that, there was positive impact in respect of economic empowerment of beneficiary respondents of middle region after Wan irrigation project.

**Table 58. Distribution of respondents of middle region according to their change in economic empowerment**

| Sl. No | Economic empowerment aspects | Middle region( n = 100 ) | | | | |
|---|---|---|---|---|---|---|
| | | Before Wan project | | After Wan project | | Percent change |
| | | Frequency | Percent | Frequency | Percent | (%) |
| 1. | Opportunity for economic development | 09 | 09.00 | 12 | 12.00 | 33.33 |
| 2. | Freedom to start business | 03 | 31.00 | 12 | 12.00 | 300.00 |
| 3. | Personal saving in the form of fixed deposit | 10 | 10.00 | 10 | 10.00 | 00.00 |
| 4. | Operating seasonal account in bank | 35 | 35.00 | 07 | 07.00 | -80.00 |
| 5. | Participating in decision about adopting modern technology in home | 06 | 06.00 | 10 | 10.00 | 66.67 |
| 6. | Participation in decision about purchasing building/ house | 06 | 06.00 | 10 | 10.00 | 66.67 |
| 7. | Participation in decision about marketing of produce | 07 | 07.00 | 11 | 11.00 | 57.14 |
| 8. | Authority of employ labour | 08 | 08.00 | 10 | 10.00 | 25.00 |
| 9. | Freedom for spending on entertainment of guest | 11 | 11.00 | 13 | 13.00 | 18.18 |
| 10. | Freedom for offering present to relatives | 05 | 05.00 | 05 | 05.00 | 00.00 |
| . | **Total** | **100** | **100.00** | **100** | **100.00** | |
| | **Mean** | **79.2** | **88.20** | | | |
| | **S. D.** | **7.8** | **13.2** | | | |
| | **'z' value** | **3.201**** | | | | |

** Significant at 0.01 level of probability

### iii) Change in economic empowerment in tail region

Table 59 revealed distribution of respondents of tail region according to their economic empowerment after Wan irrigation project, it is found that there was increase in freedom to start business by 300.00 per cent, freedom for spending on entertainment of guest (266.66%), operating seasonal accounts in bank (200.00%), freedom for offering present to relatives (150.00%), participation in decision about marketing produce (125.00%), opportunity for economic development and participating in decision about purchaising building /house (100.00%), personal saving in the form of fixed deposite (80.00%), participating in decision about adopting modern technology in home (60.00%) and authority to employ labour 16.66 per cent.

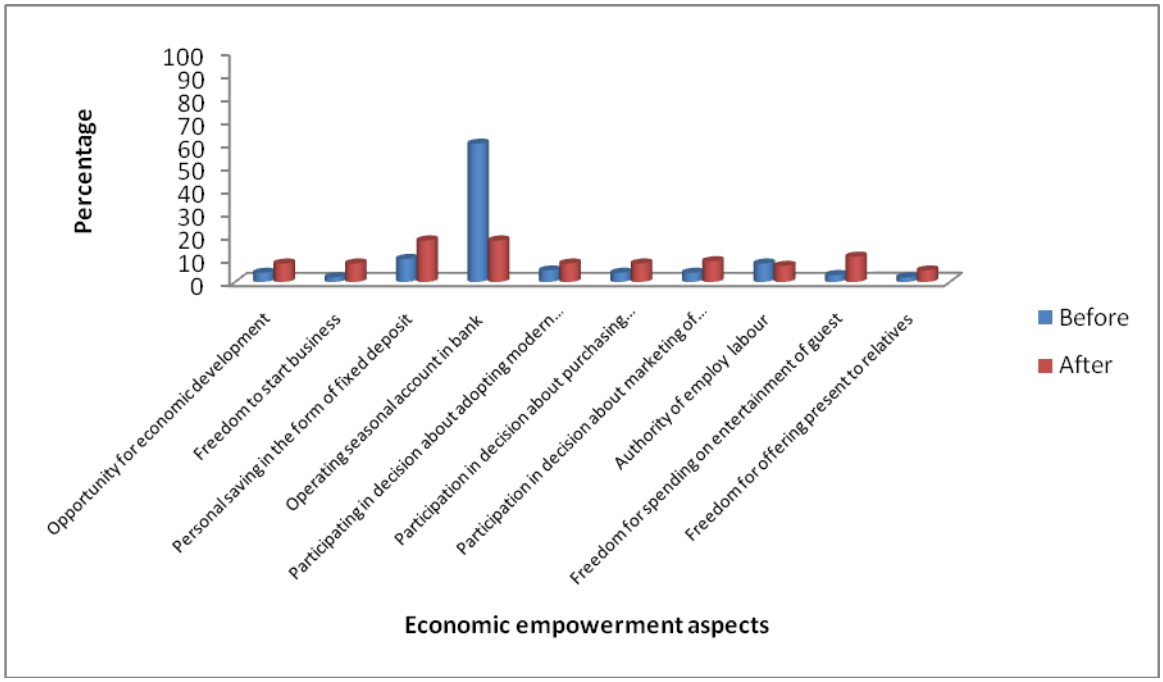



**Fig 54: Distribution of respondents of tail region according to their change in economic empowerment**

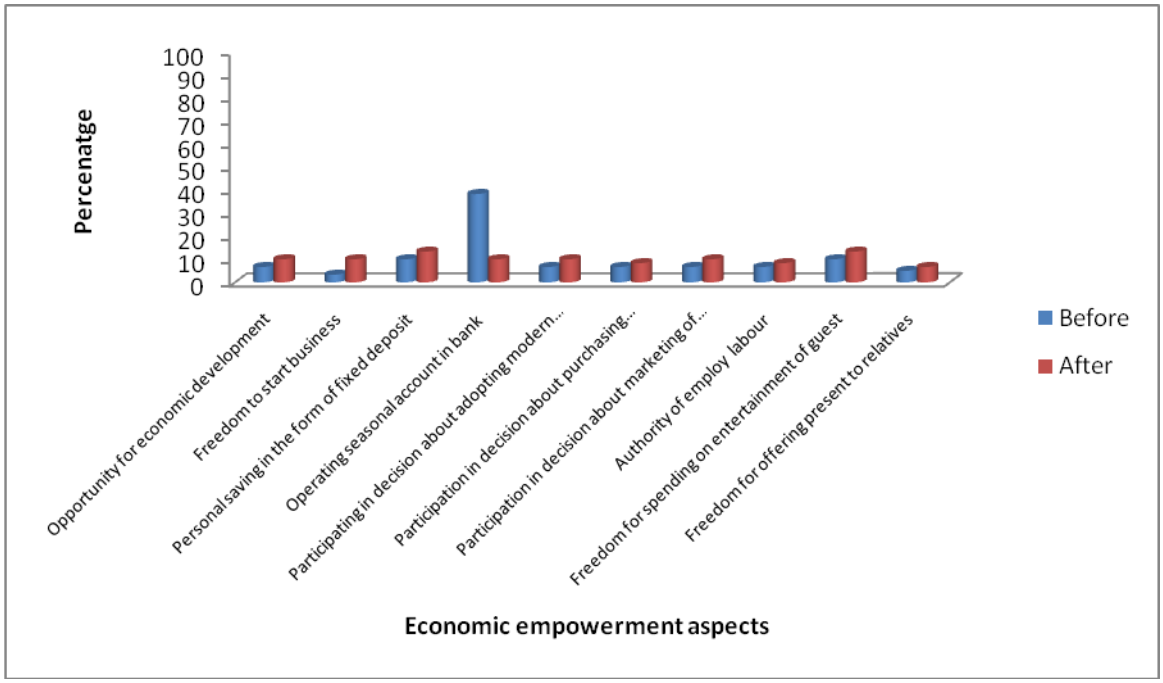



**Fig 55: Distribution of respondents of study area according to their change in economic empowerment**

**Table 59. Distribution of respondents of tail region according to their change in economic empowerment**

| Sl. No | Economic empowerment aspects | Tail region( n = 100 ) | | | | |
|---|---|---|---|---|---|---|
| | | Before Wan project | | After Wan project | | Percent change |
| | | Frequency | Percent | Percent | Percent | % |
| 1. | Opportunity for economic development | 04 | 04.00 | 08 | 08.00 | 100.00 |
| 2. | Freedom to start business | 02 | 02.00 | 08 | 08.00 | 300.00 |
| 3. | Personal saving in the form of fixed deposit | 10 | 10.00 | 18 | 18.00 | 80.00 |
| 4. | Operating seasonal account in bank | 60 | 60.00 | 18 | 18.00 | 200.00 |
| 5. | Participating in decision about adopting modern technology in home | 05 | 05.00 | 08 | 08.00 | 60.00 |
| 6. | Participation in decision about purchasing building/ house | 04 | 04.00 | 08 | 08.00 | 100.00 |
| 7. | Participation in decision about marketing of produce | 04 | 04.00 | 09 | 09.00 | 125.00 |
| 8. | Authority of employ labour | 06 | 08.00 | 07 | 07.00 | 16.66 |
| 9. | Freedom for spending on entertainment of guest | 03 | 03.00 | 11 | 11.00 | 266.66 |
| 10. | Freedom for offering present to relatives | 02 | 02.00 | 05 | 05.00 | 150.00 |
| | **Total** | 100 | 100.00 | 100 | 100.00 | |
| | **Mean** | **71.06** | **82.03** | | | |
| | **S. D.** | **5.21** | **11.0** | | | |
| | **'z' value** | **3.201**** | | | | |

** Significant at 0.01 level of probability

The 'z' value was found significant at 0.01 level of probability.It means that there was positive impact in respect of economic empowerment of beneficiary fermers of tail region after Wan irrigation project.

**iv) Change in economic empowerment in study area**

Table 60 revealed distribution of respondents of study area according to their economic empowerment after Wan irrigation project, it is found that there was increase in freedom to start business by 200.00 per cent, opportunity for economic development, participating in decision about adopting modern technology in home and participation in decision about marketing of produce (50.00%), personal saving in the form of fixed deposite, freedom for spending on entertainment of guest and freedom for offering present to relatives (33.33%), participating in decision about for purchaising building /house and feedom to employ labour (25.00%).

**Table 60. Distribution of respondents of study area according to their change in economic empowerment**

| Sl. No | Economic empowerment aspects | Studt area ( n = 300 ) | | | | |
|---|---|---|---|---|---|---|
| | | Before Wan project | | After Wan project | | Percent change |
| | | Frequency | Percent | Percent | Percent | % |
| 1. | Opportunity for economic development | 20 | 06.67 | 30 | 10.00 | 50.00 |
| 2. | Freedom to start business | 10 | 03.33 | 30 | 10.00 | 200.00 |
| 3. | Personal saving in the form of fixed deposit | 30 | 10.00 | 40 | 13.33 | 33.33 |
| 4. | Operating seasonal account in bank | 115 | 38.32 | 30 | 10.00 | -73.91 |
| 5. | Participating in decision about adopting modern technology in home | 20 | 06.67 | 30 | 10.00 | 50.00 |
| 6. | Participation in decision about purchasing building/ house | 20 | 06.67 | 25 | 08.34 | 25.00 |
| 7. | Participation in decision about marketing of produce | 20 | 06.67 | 30 | 10.00 | 50.00 |
| 8. | Authority of employ labour | 20 | 06.67 | 25 | 08.34 | 25.00 |
| 9. | Freedom for spending on entertainment of guest | 30 | 10.00 | 40 | 13.33 | 33.33 |
| 10. | Freedom for offering present to relatives | 15 | 05.00 | 20 | 06.66 | 33.33 |
| | **Total** | **300** | **100.00** | **300** | **100.00** | |
| | **Mean** | **83.11** | | **99.28** | | **19.45** |
| | **S. D.** | **2.86** | | **2.21** | | |
| | **'z' value** | **11.44**** | | | | |

** Significant at 0.01 level of probability

'z' value was found significant at 0.01 level of probability. In overall, there was 19.45 per cent change was observed in case of economic empowerment of beneficiary farmers before and after Wan irrigation project in study area.

## 5.3 Total Impact of Wan irrigation project on agriculture and socio-economic development

In connection with the overall impact of Wan irrigation project on the agriculture and socio-economic development of beneficiary farmers, it revealed that, there was a change in cropping intensity in the study from 121.81 per cent to 150.96 per cent after the Wan irrigation project.In order to test the variability of mean value, the data were subjected to **'**z**'** test and the **'**z**'** value was found significant at 0.01 level of probability. In case of productivity of major kharif and rabi crops in the study area of Wan irrigation

project,it was found that, the productivity of soybean, cotton, wheat and gram were change up to 27.27, 20.50, 50.00 and 38.46 per cent respectively.

The **'z'** value for rabi crop in particularly wheat and gram were found significant at 0.05 and 0.01 level of probability, respectively.

Hence, we can conclude that there was positive significant impact of Wan irrigation project on the beneficiary farmers in terms of their agriculture development.

**Table 61. Total Impact of Wan irrigation project on agriculture and socio-economic development of study area**

| Sl. No. | Dimensions of agriculture and socio-economic development | Respondents (n = 300) | | | |
|---|---|---|---|---|---|
| | | Before (mean) | After (mean) | % Change | 'z' Value |
| **A)** | **Agriculture development** | | | | |
| **1.** | Cropping intensity | 121.81 | 150.96 | 23.93 | 9.856 ** |
| **2.** | Productivity of major crops | | | | |
| **i)** | Soybean | 11 | 14 | 27.27 | 4.260NS |
| **ii)** | Cotton | 10 | 12.50 | 20.50 | 2.085NS |
| **iii)** | Wheat | 24 | 36 | 50.00 | 13.61* |
| **iv)** | Gram | 13 | 18 | 38.46 | 9.913** |
| | **Total (A)** | | | **80.08** | |
| **B)** | **Socio-economic development** | | | | |
| **1.** | Occupation | 1.29 | 2.33 | 80.62 | 9.81** |
| **2.** | Land holding | 2.00 | 2.85 | 42.50 | 1.08NS |
| **3.** | Family education | 2.29 | 4.20 | 83.40 | 10.24** |
| **4.** | Annual income | 4.30 | 7.00 | 62.79 | 12.91* |
| **5.** | Socio political participation | 55.66 | 77.61 | 39.43 | 8.01NS |
| **6.** | Expenditure pattern | 29760 | 42123 | 41.54 | 10.02** |
| **7.** | Economic empowerment | 83.11 | 99.28 | 19.45 | 11.44** |
| | **Total (B)** | | | **52.81** | |
| **Total impact (A+B)** | | **132.89%** | | | |

** Significant at 0.01 level of probability
* Significant at 0.05 level of probability
NS - Non significant

While studying the impact of Wan irrigation project on the beneficiary farmers in terms of socio-economic develpoment, it was found that the mean value of occupation (2.33), land holding, (2.85), family education (4.20), annual income (7.00), socio political participation (77.61), expenditure pattern (42123) and economic empowerment (99.28) were found to be higher after Wan irrigation project.

There was change in occupation, land holding, family education, annual income, socio political participation, expenditure pattern and economic empowerment to the tune of 80.62, 42.50, 83.40, 62.79, 39.43, 41.54 and 19.45 per cent, respectively.

In order to test the variability of mean value, the data subjected to the **'z'** test. The **'z'** value of occupation, family education, expenditure pattern and economic empowerment were found significant at 0.01 level of probability.Whereas, the **'z'** value of annual income was found significant at 0.05 level of probability.

Hence, from this result, we can conclude that there was positive and significant impact of Wan irrigation project on the beneficiary farmrers in terms of their socio-economic development.

When an impact as a whole was considered i, e, agriculture and socio-economic development, 132.89 per cent impact of Wan irrigation project on the beneficiary farmers was noticed.

Hence, from this we can conclude that irrigation project had created a significant impact on the beneficiary farmers.

The above findings are in confirmative with the findings of Rajeshwari Desai (2005) and Suvarna Ingole (2013).

## 5.4 Relational Analysis

The data were subjected to the statistical tools like coefficient of correlation, path analysis and 'z' test.The cofficient correlation analysis help in determining the relationship between selected personal, socio-economic, situational and psychological characteristics of beneficiaries with the dependent variable impact of Wan irrigation project on the beneficiary farmers. The 'z' test analysis helps for testing mean difference between beneficiaries before and after Wan irrigation project.The path analysis isolates the direct and indirect effects of the individual independent variables on the dependent variable impact of Wan irrigation project on the beneficiary farmers. The results are presented in the subsequent sub – parts as follows.

### 5.4.1 Coefficient of correlation between selected independent variables of beneficiaries of head region with the dependent variable i.e. impact of Wan irrigation project

The relationship between selected personal, socio-economic and psychological characteristics of beneficiaries of the head region with the agriculture development parameters i, e, cropping intensity and productivity and socio-economic development parameters were statistically tested by using coefficient of correlation. Similarly, the 'r' values for the relationship between selected independent and dependent variables in head, middle and tail region presented as follows.

#### 5.4.1.1 Coefficient of correlation between selected independent variables of beneficiaries of head region with agriculture development parameters

In case of cropping intensity, it is observed from the findings presented in Table 62 that, land holding, occupation, farming experience, sources of irrigation, method of irrigation, land under irrigation and frequency of irrigation in a year, method of irrigation, land under irrigation and frequency of irrigation in a year were found to be positively significant at 0.01 level of probability .

Whereas, the variables like annual income, type of land, economic motivation, scientific orientation, innovativeness and irrigation potential were found to be significant at 0.05 level of probability.The other variable such as distance of dam was found to be negatively significant at 0.05 level of probability.

The relational analysis with productivity revealed that, the variables annual income, sources of irrigation, method of irrigation, economic motivation and frequency of irrigation in a year were found to be significant at 0.01 level of probability.

Whereas, the variables land holding, occupation, farming experience, type of land, scientific orientation, innovativeness and irrigation potential were found to be significant at 0.05 level of probability.

The rest of the variable didn't show any relationship with the dependent variables.

**Table 62. Coefficient of correlation between selected independent variables of beneficiaries of head region with agriculture development parameters**

| Sl. No. | Independent Variables | Cropping intensity 'r' value | Productivity 'r' value |
|---|---|---|---|
| 1 | Age | 0.040 | 0.054 |
| 2 | Land holding | 0.262** | 0.205* |
| 3 | Annual income | 0.206* | 0.298** |
| 4 | Occupation | 0.261** | 0.198* |
| 5 | Farming experience | 0.291** | 0.196* |
| 6 | Sources of information | 0.106 | 0.110 |
| 7 | Sources of irrigation | 0.360** | 0.265** |
| 8 | Method of irrigation | 0.305** | 0.306** |
| 9 | Type of land | 0.204* | 0.199* |
| 10 | Land under irrigation | 0.263** | 0.201* |
| 11 | Economic motivation | 0.195* | 0.256** |
| 12 | Scientific orientation | 0.197* | 0.200* |
| 13 | Innovativeness | 0.223* | 0.223* |
| 14 | Frequency of irrigation in a year | 0.281** | 0.203** |
| 15 | Irrigation potential | 0.222* | 0.214* |
| 16 | Distance of dam | -0.202* | -199* |

** Significant at 0.01 level of probability
* Significant at 0.05 level of probability

### 5.4.1.2 Coefficient of correlation between selected independent variables of beneficiaries of head region with socio-economic development parameters

Coefficient of correlation between selected independent variables of beneficiaries of head region with socio-economic development parameters viz. occupation, land holding, family education, annual income, socio-political participation, expenditure pattern and economic empowerment presented in Table 63.

**Table 63. Coefficient of correlation between selected independent variables of beneficiaries of head region with socio-economic development parameters**

| Sl. No. | Independent Variables | Occu. | Land Holding | Family edu. | Annual Income | SPP | Expt. Pattern | Econ. Empow. |
|---|---|---|---|---|---|---|---|---|
| 1 | Age | 0.053 | 0.116 | 0.023 | 0.025 | 0.253* | 0.237* | 0.230* |
| 2 | Land holding | 0.255* | 0.231* | 0.205* | 0.225** | 0.239* | 0.223* | 0.260** |
| 3 | Annual income | 0.219* | 0.415** | 0.346** | 0.228* | 0.317** | 0.341** | 0.360** |
| 4 | Occupation | 0.293** | 0.203* | 0.274** | 0.204* | 0.202* | 0.332** | 0.273** |
| 5 | Farming experience | 0.194* | 0.195* | 0.203* | 0.194* | 0.195* | 0.338* | 0.244* |
| 6 | Sources of information | 0.172 | 0.119 | 0.060 | 0.128 | 0.080 | 0.115 | 0.247* |
| 7 | Sources of irrigation | 0.344** | 0.344** | 0.210* | 0.233* | 0.259** | 0.323** | 0.282** |
| 8 | Method of irrigation | 0.271** | 0.523** | 0.306** | 0.258** | 0.234* | 0.230* | 0.243* |
| 9 | Type of land | 0.262** | 0.210* | 0.217* | 0.241* | 0.281** | 0.263* | 0.221* |
| 10 | Land under irrigation | 0.199** | 0.303** | 0.260** | 0.258** | 0.222* | 0.412** | 0.368** |
| 11 | Economic motivation | 0.204* | 0.218* | 0.235* | 0.213* | 0.270** | 0.416** | 0.436** |
| 12 | Scientific orientation | 0.241 | 0.201* | 0.201* | 0.225* | 0.240* | 0.225* | 0.229* |
| 13 | Innovativeness | 0.197* | 0.216* | 0.237* | 0.232* | 0.224* | 0.212* | 0.226* |
| 14 | Frequency of irrigation in a year | 0.254** | 0.219* | 0.239* | 0.301** | 0.251* | 0.323** | 0.436** |
| 15 | Irrigation potential | 0.205* | 0.266** | 0.195* | 0.405** | 0.099 | 0.351** | 0.322** |
| 16 | Distance of dam | 0.201* | -0.196* | -0.218* | -0.201* | 0.114 | -0.226* | -0.218* |

** Significant at 0.01 level of probability
* Significant at 0.05 level of probability

It is revealed from Table 63 that, in case of occupation,out of 16 variables, the variables namely occupation, sources of irrigation, method of irrigation, type of land, frequency of irrigation in a year were found to be positively significant at 0.01 level of probability.

Whereas, variables namely land holding, annual income, farming experience, economic motivation, innovativeness, irrigation potential were found to be positively significant at 0.05 level of probability. The rest of the variables didn't show any relationship with the dependent variable occupation.

In case of land holding, it is revealed from Table 62, out of total independent variables, the variables namely annual income, sources of irrigation, method of irrigation land under irrigation and irrigation potential were found to be positively significant at 0.01 level of probability Whereas,the

variables such as land holding, farming experience, type of land, economic motivation, scientific orientation, innovativeness, frequency of irrigation in a year were found to be significant at 0.05 level of probability.

Distance of dam showed negatively significant relationship with dependent variable at 0.05 level of probability.

In case of family education, out of total independent variables, the variables viz. annual income, occupation, method of irrigation and land under irrigation were found to be positively significant at 0.01 level of probability. Whereas, the variables such as land holding, farming experience,sources of irrigation, type of land, economic motivation, scientific orientation, innovativeness, frequency of irrigation in a year and irrigation potential were found to be significant at 0.05 level of probability.

Distance of dam showed negatively significant relationship with dependent variable at 0.05 level of probability.

In case of annual income, out of total independent variables, the variables namely land holding, method of irrigation, land under irrigation, occupation, method of irrigation, land under irrigation, frequency of irrigation in a year and irrigation potential were found to be positively significant at 0.01 level of probability. Whereas, the variables such as land holding, annual income, occupation, farming experience, sources of irrigation, type of land, economic motivation, scientific orientation and innovativeness were found to be significant at 0.05 level of probability.

Distance of dam showed negatively significant relationship with dependent variable at 0.05 level of probability.

In case of socio political participation, out of total independent variables, the variables namely annual income, sources of irrigation, type of land and economic motivation were found to be positively significant at 0.01 level of probability. Whereas, the variables namely age, land holding, occupation, farming experience, method of irrigation, land under irrigation, scientific orientation, innovativeness and frequency of irrigation in a year were found to be significant at 0.05 level of probability.The rest of the variables didn’t show any relationship with the socio political participation.

In case of expenditure pattern, out of total variables, the variables viz. annual income, occupation, sources of irrigation, land under irrigation, economic motivation, frequency of irrigation in a year and irrigation potential were found to be positively significant at 0.01 level of probability. Whereas, the variables such as age, land holding, farming experience, method of irrigation, type of land, scientific orientation and innovativeness were found to be significant at 0.05 level of probability.

Distance of dam showed negatively significant relationship with expenditure pattern at 0.05 level of probability.

In case of economic empowerment, variables viz. land holding, annual income, occupation, sources of irrigation,land under irrigation, economic motivation, frequency of irrigation in a year and irrigation potential were found to be positively significant at 0.01 level of probability. Whereas, the variables such as age, farming experience, sources of information, method of irrigation, type of land, scientific orientation and innovativeness were found to be significant at 0.05 level of probability.

Distance of dam showed negative significant relationship with economic empowerment at 0.05 level of probability.

### 5.4.2 Coefficient of correlation between selected independent variables of beneficiaries of middle region with the dependent variable impact of Wan irrigation project

The relationship between selected independent variables of beneficiaries of middle region with agriculture development parameters and socio-economic development parameters are presented in this part.

#### 5.4.2.1 Coefficient of correlation between selected independent variables of beneficiaries of middle region with agriculture development parameters

In case of cropping intensity, Table 64 revealed that, the variables namely land holding, annual income, occupation, farming experience, sources of irrigation, method of irrigation, type of land , land under irrigation and frequency of irrigation and irrigation potential were found to be positively significant at 0.01 level of probability .

**Table 64. Coefficient of correlation between selected independent variables of beneficiaries of middle region with agriculture development parameters**

| Sl. No. | Independent Variables | Cropping intensity 'r' value | Productivity 'r' value |
|---|---|---|---|
| 1 | Age | 0.022 | 0.022 |
| 2 | Land holding | 0.203** | 0.280** |
| 3 | Annual income | 0.325** | 0.230* |
| 4 | Occupation | 0.370** | 0.368** |
| 5 | Farming experience | 0.264** | 0.396** |
| 6 | Sources of information | 0.066 | 0.111 |
| 7 | Sources of irrigation | 0.274** | 0.396** |
| 8 | Method of irrigation | 0.369** | 0.366** |
| 9 | Type of land | 0.350** | 0.208* |
| 10 | Land under irrigation | 0.290** | 0.263** |
| 11 | Economic motivation | 0.221* | 0.278** |
| 12 | Scientific orientation | 0.214* | 0.227* |
| 13 | Innovativeness | 0.228* | 0.226* |
| 14 | Frequency of irrigation in a year | 0.282** | 0.303** |
| 15 | Irrigation potential | 0.277** | 0.235* |
| 16 | Distance of dam | -0.200* | -0.213* |

** Significant at 0.01 level of probability
* Significant at 0.05 level of probability

Whereas, the variables like economic motivation, scientific orientation and innovativeness were found to be significant at 0.05 level of probability.

The other variable distance of dam was found to be negatively significant at 0.05 level of probability.

The relational analysis with productivity revealed that, the variables land holding, occupation, farming experience, sources of irrigation, method of irrigation, land under irrigation and frequency of irrigation in a year were found to be significant at 0.01 level of probability.

Whereas, the variables namely annual income, type of land, scientific orientation, innovativeness and irrigation potential were found significant at 0.05 level of probability.

Variable distance of dam was found to be negatively significant at 0.05 level of probability.

### 5.4.2.2 Coefficient of correlation between selected independent variables of beneficiaries of middle region with socio-economic development parameters

Coefficient of correlation between selected independent variables of beneficiary of middle region with socio-economic development parameters viz. occupation, land holding, family education, annual income, socio-political participation, expenditure pattern and economic empowerment presented in Table 65. It is revealed from Table 65 that, in case of occupation, the variables such as occupation, sources of irrigation, method of irrigation, type of land, land under irrigation and frequency of irrigation in a year were found to be positively significant at 0.01 level of probability.

**Table 65. Coefficient of correlation between selected independent variables of beneficiaries of middle region with socio-economic development parameters**

| Sl. No. | Independent Variables | Occu. | Land Holding | Family edu. | Annual Income | SPP | Expt. Pattern | Econ. Empow. |
|---|---|---|---|---|---|---|---|---|
| 1 | Age | 0.061 | 0.044 | 0.099 | 0.032 | 0.194* | 0.200* | 0.218* |
| 2 | Land holding | 0.231* | 0.221* | 0.232* | 0.261** | 0.234* | 0.233* | 0.258** |
| 3 | Annual income | 0.236* | 0.306** | 0.391** | 0.208* | 0.267** | 0.322** | 0.512** |
| 4 | Occupation | 0.404** | 0.281* | 0.352** | 0.263** | 0.201* | 0.296** | 0.263** |
| 5 | Farming experience | 0.290* | 0.195* | 0.205* | 0.316** | 0.212* | 0.205* | 0.201* |
| 6 | Sources of information | 0.102 | 0.133 | 0.060 | 0.122 | 0.050 | 0.114 | 0.126 |
| 7 | Sources of irrigation | 0.255** | 0.311** | 0.210** | 0.312** | 0.351** | 0.308** | 0.302** |
| 8 | Method of irrigation | 0.300** | 0.279** | 0.306** | 0.257** | 0.315* | 0.213* | 0.199* |
| 9 | Type of land | 0.261** | 0.254* | 0.230* | 0.231* | 0.204** | 0.197* | 0.197* |
| 10 | Land under irrigation | 0.296** | 0.289** | 0.280** | 0.402** | 0.198* | 0.336** | 0.278** |
| 11 | Economic motivation | 0.205* | 0.261** | 0.263** | 0.314** | 0.319** | 0.416** | 0.523** |
| 12 | Scientific orientation | 0.194* | 0.197* | 0.215* | 0.200* | 0.219* | 0.195* | 0.229* |
| 13 | Innovativeness | 0.220* | 0.203* | 0.211* | 0.196* | 0.200* | 0.222* | 0.206* |
| 14 | Frequency of irrigation in a year | 0.255** | 0.301** | 0.337** | 0.266** | 0.206* | 0.523** | 0.502** |
| 15 | Irrigation potential | 0.266* | 0.306** | 0.201* | 0.257** | 0.265* | 0.307** | 0.306** |
| 16 | Distance of dam | -0.201* | 0.088 | 0.071 | -0.198* | 0.091 | 0.103 | 0.110 |

** Significant at 0.01 level of probability
* Significant at 0.05 level of probability

Whereas, the variables namely land holding, annual income, farming experience, economic motivation, scientific orientation, innovativeness and irrigation potential were found to be positively significant at 0.05 level of probability. Variable distance of dam was found negatively significant at 0.05 level of probability. The rest of the variables didn't show any relationship with the occupation.

In case of land holding, it is revealed from Table 65, out of total independent variables, the variables namely annual income, sources of irrigation, method of irrigation land under irrigation, economic motivation frequency of irrigation in a year and irrigation potential were found to be positively significant at 0.01 level of probability. Whereas, the variables such as land holding, occupation, farming experience, type of land, scientific orientation and innovativeness were found to be significant at 0.05 level of probability. Rest of the variables didn't show any relationship with land holding.

In case of family education, out of total independent variables, the variables viz. annual income, occupation, sources of irrigation, method of irrigation, land under irrigation, economic motivation and frequency of irrigation in a year were found to be positively significant at 0.01 level of probability. Whereas, the variables such as land holding, farming experience, type of land, scientific orientation, innovativeness and irrigation potential were found to be significant at 0.05 level of probability. Rest of the variables didn't show any relationship with land holding.

In case of annual income, out of total independent variables, the variables namely land holding, occupation, sources of irrigation, method of irrigation, land under irrigation, economic motivation frequency of irrigation in a year and irrigation potential were found to be positively significant at 0.01 level of probability. Whereas, the variables such as annual income, type of land, scientific orientation and innovativeness were found to be significant at 0.05 level of probability. Distance of dam showed negative significant relationship at 0.05 level of probability.

In case of socio political participation, out of total independent variables, the variables namely annual income, sources of irrigation, type of

land and economic motivation were found to be positively significant at 0.01 level of probability. Whereas, the variables namely age, land holding, occupation, farming experience, method of irrigation, land under irrigation, scientific orientation, innovativeness, frequency of irrigation in a year and irrigation potential were found to be significant at 0.05 level of probability. The rest of the variables didn't show any relationship with the socio political participation.

In case of expenditure pattern, out of total variables, the variables viz. annual income, occupation, sources of irrigation, land under irrigation, economic motivation, frequency of irrigation in a year and irrigation potential were found to be positively significant at 0.01 level of probability. Whereas, the variables such as age, land holding, farming experience, method of irrigation, type of land, scientific orientation and innovativeness were found to be significant at 0.05 level of probability. The rest of the variables didn't show any relationship with the expenditure pattern.

In case of economic empowerment, variables viz. land holding, annual income, occupation, sources of irrigation, land under irrigation, economic motivation, frequency of irrigation in a year and irrigation potential were found to be positively significant at 0.01 level of probability. Whereas, the variables such as age, farming experience, method of irrigation, type of land, scientific orientation and innovativeness were found to be significant at 0.05 level of probability.The rest of the variables didn't show any relationship with economic empowerment.

### 5.4.3 Coefficient of correlation between selected independent variables of beneficiaries of tail region with the dependent variable impact of Wan irrigation project

The relationship between selected independent variables of beneficiaries of tail region with agriculture development parameters and socio-economic development parameters are presented in this part.

#### 5.4.3.1 Coefficient of correlation between selected independent variables of beneficiaries of tail region with agriculture development parameters

In case of cropping intensity, Table 66 revealed that, the variables namely land holding, occupation, farming experience, sources of irrigation, method of irrigation, type of land, frequency of irrigation and

irrigation potential were found to be positively significant at 0.01 level of probability .

**Table 66. Coefficient of correlation between selected independent variables of beneficiaries of tail region with agriculture development parameters**

| Sl.No. | Independent Variables | Cropping intensity 'r' value | Productivity 'r' value |
|---|---|---|---|
| 1 | Age | 0.008 | 0.025 |
| 2 | Land holding | 0.256** | 0.214* |
| 3 | Annual income | 0.195* | 0.233* |
| 4 | Occupation | 0.222** | 0.206* |
| 5 | Farming experience | 0.259** | 0.262** |
| 6 | Sources of information | 0.101 | 0.132 |
| 7 | Sources of irrigation | 0.273** | 0.364** |
| 8 | Method of irrigation | 0.254** | 0.301** |
| 9 | Type of land | 0.262** | 0.195* |
| 10 | Land under irrigation | 0.291** | 0.259** |
| 11 | Economic motivation | 0.199* | 0.233* |
| 12 | Scientific orientation | 0.195* | 0.225* |
| 13 | Innovativeness | 0.205* | 0.204* |
| 14 | Frequency of irrigation in a year | 0.341** | 0.280** |
| 15 | Irrigation potential | 0.388** | 0.216* |
| 16 | Distance of dam | -0.198* | -0.194* |

** Significant at 0.01 level of probability
* Significant at 0.05 level of probability

Whereas, the variables like annual income, economic motivation, scientific orientation and innovativeness were found to be significant at 0.05 level of probability.

The variable distance of dam was found negatively significant at 0.05 level of probability.

The relational analysis with productivity revealed that, the variables farming experience, sources of irrigation, method of irrigation, land under irrigation and frequency of irrigation in a year were found to be significant at 0.01 level of probability.

Whereas, the variables land holding, annual income, occupation, type of land, economic motivation, scientific orientation innovativeness and irrigation potential were found to be significant at 0.05 level of probability.

The variable distance of dam was found negatively significant at 0.05 level of probability.

#### 5.4.3.2 Coefficient of correlation of selected independent variables of beneficiaries of tail region with socio-economic development parameters

Coefficient of correlation between selected independent variables of beneficiary of middle region with socio-economic development parameters viz. occupation, land holding, family education, annual income, socio-political participation, expenditure pattern and economic empowerment presented in Table 67.

**Table 67. coefficient of correlation between selected independent variables of beneficiaries of tail region with socio-economic development parameters**

| Sl. No. | Independent Variables | Occu. | Land Holding | Family edu. | Annual Income | SPP | Expt. Pattern | Econ. Empow. |
|---|---|---|---|---|---|---|---|---|
| 1 | Age | 0.022 | 0.122 | 0.021 | 0.030 | 0.194* | 0.195* | 0.230* |
| 2 | Land holding | 0.249* | 0.204* | 0.250* | 0.261** | 0.196* | 0.201* | 0.200* |
| 3 | Annual income | 0.213* | 0.322** | 0.431** | 0.201* | 0.322** | 0.341** | 0.304** |
| 4 | Occupation | 0.299** | 0.203* | 0.254** | 0.195** | 0.233* | 0.212* | 0.223** |
| 5 | Farming experience | 0.239** | 0.294** | 0.196* | 0.197* | 0.207* | 0.231* | 0.240* |
| 6 | Sources of information | 0.127 | 0.130 | 0.024 | 0.061 | 0.045 | 0.113 | 0.131 |
| 7 | Sources of irrigation | 0.422** | 0.260** | 0.201* | 0.266** | 0.321** | 0.291** | 0.282** |
| 8 | Method of irrigation | 0.315** | 0.284** | 0.303* | 0.258** | 0.234* | 0.194* | 0.213* |
| 9 | Type of land | 0.257** | 0.268* | 0.198* | 0.204* | 0.204** | 0.205* | 0.221* |
| 10 | Land under irrigation | 0.259** | 0.256** | 0.205** | 0.296** | 0.202* | 0.301** | 0.268** |
| 11 | Economic motivation | 0.203* | 0.211* | 0.235* | 0.291** | 0.255** | 0.316** | 0.336** |
| 12 | Scientific orientation | 0.101 | 0.120 | 0.105 | 0.194* | 0.114 | 0.195* | 0.196* |
| 13 | Innovativeness | 0.196* | 0.124 | 0.199* | 0.203* | 0.214* | 0.221* | 0.226* |
| 14 | Frequency of irrigation in a year | 0.311** | 0.218* | 0.249* | 0.362** | 0.195* | 0.326** | 0.336** |
| 15 | Irrigation potential | 0.236* | 0.257** | 0.194* | 0.321** | 0.194* | 0.261** | 0.267** |
| 16 | Distance of dam | -0.201* | 0.195* | 0.025 | -0.197* | 0.035 | 0.198* | -0.204* |

** Significant at 0.01 level of probability
* Significant at 0.05 level of probability

It is revealed from Table 67 that, in case of occupation, the variables such as occupation, farming experience, sources of irrigation, method of irrigation, type of land, land under irrigation and frequency of irrigation in a year were found positively significant at 0.01 level of probability.

Whereas, variables namely land holding, annual income, economic motivation, innovativeness and irrigation potential were found to be positively significant at 0.05 level of probability. Variable distance of dam was found negatively significant at 0.05 level of probability.The rest of the variables didn't show any relationship with the occupation.

In case of land holding, out of total independent variables, the variables namely annual income, farming experience, sources of irrigation, method of irrigation, land under irrigation and irrigation potential were found positively significant at 0.01 level of probability. Whereas, the variables such as land holding, occupation, type of land, economic motivation, frequency of irrigation in a year and distance of dam were found significant at 0.05 level of probability. Rest of the variables didn't show any relationship with land holding.

In case of family education, out of total independent variables, the variables viz. annual income, occupation and land under irrigation were found to be positively significant at 0.01level of probability. Whereas, the variables such as land holding, farming experience, sources of irrigation, method of irrigation, type of land, economic motivation, innovativeness, frequency of irrigation in a year and irrigation potential were found significant at 0.05 level of probability. Rest of the variables didn't show any relationship with land holding.

In case of annual income, out of total independent variables, the variables namely land holding, occupation, sources of irrigation, method of irrigation, land under irrigation, economic motivation , frequency of irrigation in a year and irrigation potential were found positively significant at 0.01 level of probability. Whereas, the variables such as annual income, farming experience, type of land, scientific orientation and innovativeness were found to be significant at 0.05 level of probability.

Distance of dam showed negatively significant relationship at 0.01 level of probability.Rest of the variables didn't show any relationship with land holding.

In case of socio political participation, out of total independent variables, the variables namely annual income, sources of irrigation, type of land and economic motivation were found to be positively significant at 0.01 level of probability. Whereas, the variables namely age, land holding, occupation, farming experience, method of irrigation, land under irrigation, innovativeness, frequency of irrigation in a year and irrigation potential were found to be significant at 0.05 level of probability.The rest of the variables didn't show any relationship with socio political participation.

In case of expenditure pattern out of total variables, the variables viz. annual income, occupation, sources of irrigation, land under irrigation, economic motivation, frequency of irrigation in a year and irrigation potential were found to be positively significant at 0.01 level of probability.

Whereas, the variables such as age, land holding, farming experience, method of irrigation, type of land, scientific orientation innovativeness and distance of dam were found to be significant at 0.05 level of probability. The rest of the variables didn't show any relationship with the dependent variable expenditure pattern.

In case of economic empowerment, variables viz. annual income, occupation, sources of irrigation, land under irrigation, economic motivation, frequency of irrigation in a year and irrigation potential were found to be positively significant at 0.01 level of probability. Whereas, the variables such as age, land holding, farming experience, method of irrigation, type of land, scientific orientation and innovativeness were found to be significant at 0.05 level of probability.

Distance of dam showed negatively significant relationship at 0.01 level of probability.

### 5.4.4 Coefficient of correlation between selected independent variables of beneficiaries of study area with the dependent variable impact of Wan irrigation project

The relationship between selected independent variables of beneficiaries of study area with agriculture development parameters and socio-economic development parameters are presented in this part.

#### 5.4.4.1 Coefficient of correlation between selected independent variables of beneficiaries of study area with agriculture development parameters

In case of cropping intensity,Table 68 revealed that, the variables namely land holding, occupation, farming experience, sources of irrigation, method of irrigation, type of land, land under irrigation, frequency of irrigation, irrigation potential and distance of dam were found to be positively significant at 0.01 level of probability.

**Table 68. Coefficient of correlation between selected independent variables of beneficiaries of study area with agriculture development parameters**

| Sl. No. | Independent Variables | Cropping intensity 'r' value | Productivity 'r' value |
|---|---|---|---|
| 1 | Age | 0.080 | 0.074 |
| 2 | Land holding | 0.162** | 0.180* |
| 3 | Annual income | 0.123* | 0.130* |
| 4 | Occupation | 0.172** | 0.168* |
| 5 | Farming experience | 0.156** | 0.196** |
| 6 | Sources of information | 0.106 | 0.110 |
| 7 | Sources of irrigation | 0.173** | 0.196** |
| 8 | Method of irrigation | 0.169** | 0.184** |
| 9 | Type of land | 0.150** | 0.158* |
| 10 | Land under irrigation | 0.190** | 0.198** |
| 11 | Economic motivation | 0.121* | 0.171** |
| 12 | Scientific orientation | 0.117* | 0.128* |
| 13 | Innovativeness | 0.114* | 0.118* |
| 14 | Frequency of irrigation in a year | 0.161** | 0.203** |
| 15 | Irrigation potential | 0.177** | 0.126* |
| 16 | Distance of dam | 0.153** | 0.165** |

** Significant at 0.01 level of probability
* Significant at 0.05 level of probability

Whereas, the variables like annual income, economic motivation, scientific orientation and innovativeness were found to be significant at 0.05 level of probability.Rest of the variables didn't show any relationship with cropping intensity.

The relational analysis with productivity revealed that, the variables farming experience, sources of irrigation, method of irrigation, land under irrigation, economic motivation, frequency of irrigation in a year and distance of dam were found to be significant at 0.01 level of probability.

Whereas, the variables land holding, annual income, occupation, type of land, scientific orientation, innovativeness and irrigation potential were found to be significant at 0.05 level of probability.The other variables such as age and sources of information does not show any relationship with the productivity.

**5.4.4.2 Coefficient of correlation between selected independent variables of beneficiaries of study area with socio-economic development parameters**

Coefficient of correlation between selected independent variables of beneficiary of study area with socio-economic development parameters viz. occupation, land holding, family education, annual income, socio-political participation, expenditure pattern and economic empowerment presented in Table 69.

It is revealed from Table 69 that, in case of occupation the variables such as occupation, farming experience, sources of information, sources of irrigation, method of irrigation, type of land, land under irrigation and frequency of irrigation in a year and distance of dam were found were found to be positively significant at 0.01 level of probability.

Whereas, the variables namely land holding, annual income and irrigation potential were found to be positively significant at 0.05 level of probability. Variable innovativeness was found to be negatively significant at 0.05 level of probability.The rest of the variables didn't show any relationship with the occupation.

In case of land holding, out of total independent variables, the variables namely annual income, occupation, farming experience, sources of

irrigation, method of irrigation, type of land, land under irrigation, economic motivation, frequency of irrigation in a year and irrigation potential were found to be positively significant at 0.01 level of probability. Whereas, the variables such as age, land holding, sources of information, scientic orientation, innovativeness and distance of dam were found to be significant at 0.05 level of probability.

**Table 69. Coefficient of correlation between selected independent variables of beneficiaries of study area with socio-economic development parameters**

| Sl. No. | Independent Variables | Occu. | Land Holding | Family edu. | Annual Income | SPP | Expt. Pattern | Econ. Empow. |
|---|---|---|---|---|---|---|---|---|
| 1 | Age | 0.053 | 0.116* | 0.023 | 0.025 | 0.154* | 0.137* | 0.230** |
| 2 | Land holding | 0.149* | 0.123* | 0.155** | 0.165** | 0.139* | 0.123* | 0.160** |
| 3 | Annual income | 0.123* | 0.917** | 0.346** | 0.128* | 0.917** | 0.341** | 0.560** |
| 4 | Occupation | 0.204** | 0.204** | 0.200** | 0.204** | 0.204* | 0.212** | 0.173** |
| 5 | Farming experience | 0.194** | 0.194** | 0.130* | 0.194** | 0.194* | 0.138* | 0.144* |
| 6 | Sources of information | 0.172** | 0.119* | 0.060 | 0.128* | 0.080 | 0.115* | 0.147* |
| 7 | Sources of irrigation | 0.344** | 0.344** | 0.210** | 0.233** | 0.159** | 0.223** | 0.182** |
| 8 | Method of irrigation | 0.523** | 0.523** | 0.306* | 0.158** | 0.134* | 0.130* | 0.143* |
| 9 | Type of land | 0.185** | 0.185** | 0.132* | 0.141* | 0.181** | 0.163* | 0.121* |
| 10 | Land under irrigation | 0.199** | 0.303** | 0.151** | 0.258** | 0.122* | 0.412** | 0.168** |
| 11 | Economic motivation | 0.103 | 0.218** | 0.235** | 0.205** | 0.170** | 0.816** | 0.436** |
| 12 | Scientific orientation | 0.108 | 0.137* | -0.115* | 0.125* | 0.140* | -0.126* | -0.129* |
| 13 | Innovativeness | -0.120* | 0.124* | 0.142* | 0.132* | 0.124* | -0.122* | -0.126* |
| 14 | Frequency of irrigation in a year | 0.215** | 0.218** | 0.149** | 0.301** | 0.151** | 0.523** | 0.436** |
| 15 | Irrigation potential | 0.136* | 0.266** | 0.101 | 0.405** | 0.099 | 0.251** | 0.322** |
| 16 | Distance of dam | 0.201** | 0.113* | -0.118* | -0.115* | -0.114* | -0.126* | -0.118* |

** Significant at 0.01 level of probability
* Significant at 0.05 level of probability

In case of family education, out of total independent variables, the variables viz. land holding, annual income, occupation, sources of irrigation, land under irrigation, economic motivation and frequency of irrigation in a year were found positively significant at 0.01 level of probability. Whereas, the variables such as land holding, farming experience, sources of irrigation, method of irrigation, type of land, economic motivation, innovativeness , frequency of irrigation in a year and irrigation potential were

found significant at 0.05 level of probability. Variable distance of dam was found to be negatively significant at 0.01level of probability. Rest of the variables didn't show any relationship with family education.

In case of annual income out of total independent variables, the variables namely land holding, occupation, farming experience, sources of irrigation, method of irrigation, land under irrigation, economic motivation, frequency of irrigation in a year and irrigation potential were found positively significant at 0.01 level of probability. Whereas, the variables such as annual income, sources of information, type of land, scientific orientation and innovativeness were found significant at 0.05 level of probability.

Variable distance of dam showed negatively significant relationship at 0.01 of level of probability. Rest of the variables didn't show any relationship with land holding.

In case of socio political participation, out of total independent variables, the variables namely annual income, sources of irrigation, type of land and economic motivation and frequency of irrigation in a year were found positively significant at 0.01level of probability. Whereas, the variables namely age, land holding, occupation, farming experience, method of irrigation, land under irrigation, scientif orientation and innovativeness were found significant at 0.05 level of probability.

Variable distance of dam showed negatively significant relationship at 0.01 of level of probability. The rest of the variables didn't show any relationship with the socio political participation.

In case of expenditure pattern, out of total variables, the variables viz. annual income, occupation, sources of irrigation, land under irrigation, economic motivation, frequency of irrigation in a year and irrigation potential were found positively significant at 0.01 level of probability. Whereas, the variables such as age, land holding, farming experience sources of information, method of irrigation and type of land were found significant at 0.05 level of probability.

Variables namely scientific orientation, innovativeness and distance of dam were found negatively significant at 0.01 level of probability.

In case of economic empowerment, variables viz. age, land holding, annual income, occupation, sources of irrigation, land under irrigation, economic motivation, frequency of irrigation in a year and irrigation potential were found to be positively significant at 0.01 level of probability. Whereas, the variables such as farming experience, sources of information, method of irrigation and type of land were found to be significant at 0.05 level of probability.

Variables namely scientific orientation, innovativeness and distance of dam were found negatively significant at 0.05 level of probability.

**5.5 Path analysis**

The method of path analysis with multivariable path model, as suggested by Land (1969) was used to explain the total direct and indirect effect of all the sixten independent (exogenous) variables on impact of Wan irrigation project on agriculture and socio-economic development as dependent (endogenous) variable. A path diagram of postulated model is given in figure. The numerical values for the path coefficient for all the independent variables are furnished in the figure alongwith the arrows. In search of the influence exerted by the independent variables on the dependent variable, both direct and indirect, through other variables present in the situation, the correlation coefficient values were subjected to path analysis. Based on the values of path coefficients for all the independent variables, the total indirect effect for each variable was work out. The results presented in the form of path coefficients for direct, total indirect and the variables having largest indirect effects in order of importance on impact of Wan irrigation on agriculture and socio-economic development through other variables is presented in Table 70.

**1) Direct effect**

The direct effect of various independent variables on impact indicated that, sources of irrigation showed positive and maximum direct effect (0.3612) , followed by the variables, frequency of irrigation (0.2825),land under irrigation (0.2651), land holding (0.2530), irrigation potential (0.2156),annual income (0.2130), occupation (0.2021) and economic motivation (0.2010) exerted positive and direct effect on impact.

The variables innovativeness (-0.3325), sources of information (-0.1502), age (-0.1052), farming experience (-0.0671) and type of land (-0.0298) exerted substantial maximum negative direct effect on impact, the effect of other variables was relatively negligible.

Thus, it could be inferred that the beneficiary farmers those who have higher innovativeness, high sources of information, older in age and with more farming experience had lower level of impact of Wan irrigation project on them.

It could also be inferred that, farmers with increasing sources of irrigation, more frequency of irrigation, increasing land under irrigation, higher land holding, more irrigation potential, higher annual income, more subsidary occupation and higher economic empowerment had higher impact on agriculture and socio-economic development, directly.

**2) Total indirect effect**

It is observed from Table 70 that, sources of irrigation exerted positive and maximum total indirect effect (0.7623) on the dependent variable impact, followed by occupation (0.7214), land under irrigation (0.6245), frequency of irrigation (0.5623), land holding (0.5155), irrigation potential (0.4212), sources of information (0.3524), farming experience (0.3521), distance of dam (0.3310), annual income (0.3145), method of irrigation (0.2513), inovativeness (0.2142), economic motivation (0.1960), scientific orientation (0.1840) and type of land (0.1123) had exerted the substantial positive total indirect effect. Age exerted highest negative indirect effect (-0.3112).

It clearly implied that increasing sources of irrigation has exerted maximum total indirect effect on impact of Wan irrigation project on agriculture and socio-economic development.

**3) Maximum indirect effect**

Further it was observed from Table 70 that, land holding (0.2552), occupation (0.2543), method of irrigation (0.2484), economic motivation (0.2013), annual income (0.1976), distance of dam (0.1921), frequency of irrigation in a year (0.1865), age (0.1765) irrigation potential (0.1495), land under irrigation (0.1296), sources of irrigation (0.1182) and

innovativeness (0.0824) had exerted maximum indirect effect on the dependent variable impact in descending order of magnitude.

Similarly, it was revealed that out of the 16 variables, maximum variables namely sources of irrigation, method of iirigation, type of land, and irrigation potential had largest indirect effect on the impact through land under irrigation only.

Thus sources of irrigation along with frequency of irrigation in a year,land under irrigation, land holding and irrigation potential did not only exerted the maximum direct effect but also served as a vehicle for the production of indirect effect through other variables on increasing impact of Wan irrigation project on beneficiary farmers.

**Table 70. Direct and indirect effects of the independent variables on the dependent variable impact of Wan irrigation project**

| Sl. No. | Independent Variables | Correlation coefficient 'r' | Direct effect | Total indirect effect | Variables having maximum indirect effect |
|---|---|---|---|---|---|
| 1 | Age (a) | 0.4164 | -0.1052 | -0.3112 | 0.1765(e) |
| 2 | Land holding (b ) | 0.7685 | 0.2530 | 0.5155 | 0.2552 (d) |
| 3 | Annual income (c) | 0.5275 | 0.2130 | 0.3145 | 0.1976 (k) |
| 4 | Occupation (d) | 0.9235 | 0.2021 | 0.7214 | 0.2543 (c) |
| 5 | Farming experience( e) | 0.4192 | -0.0671 | 0.3521 | 0.0380 (m) |
| 6 | Sources of information (f) | 0.5026 | -0.1502 | 0.3524 | 0.0161 (g) |
| 7 | Sources of irrigation (g) | 1.1235 | 0.3612 | 0.7623 | 0.1182 (j) |
| 8 | Method of irrigation (h) | 0.2978 | 0.0465 | 0.2513 | 0.2484 (j) |
| 9 | Type of land (i) | 0.1421 | -0.0298 | 0.1123 | 0.0821 (j) |
| 10 | Land under irrigation (j) | 0.8896 | 0.2651 | 0.6245 | 0.1296 (c) |
| 11 | Economic motivation (k) | 0.3970 | 0.2010 | 0.1960 | 0.2013 (i) |
| 12 | Scientific orientation (l) | 0.2472 | 0.0632 | 0.1840 | 0.0560 (g) |
| 13 | Innovativeness (m) | 0.5467 | -0.3325 | 0.2142 | 0.0824 (o) |
| 14 | Frequency of irrigation in a year (n) | 0.8448 | 0.2825 | 0.5623 | 0.1865 (c) |
| 15 | Irrigation potential (o) | 0.6368 | 0.2156 | 0.4212 | 0.1495 (j) |
| 16 | Distance of dam (p) | 0.3545 | 0.0235 | 0.3310 | 0.1921 (h) |

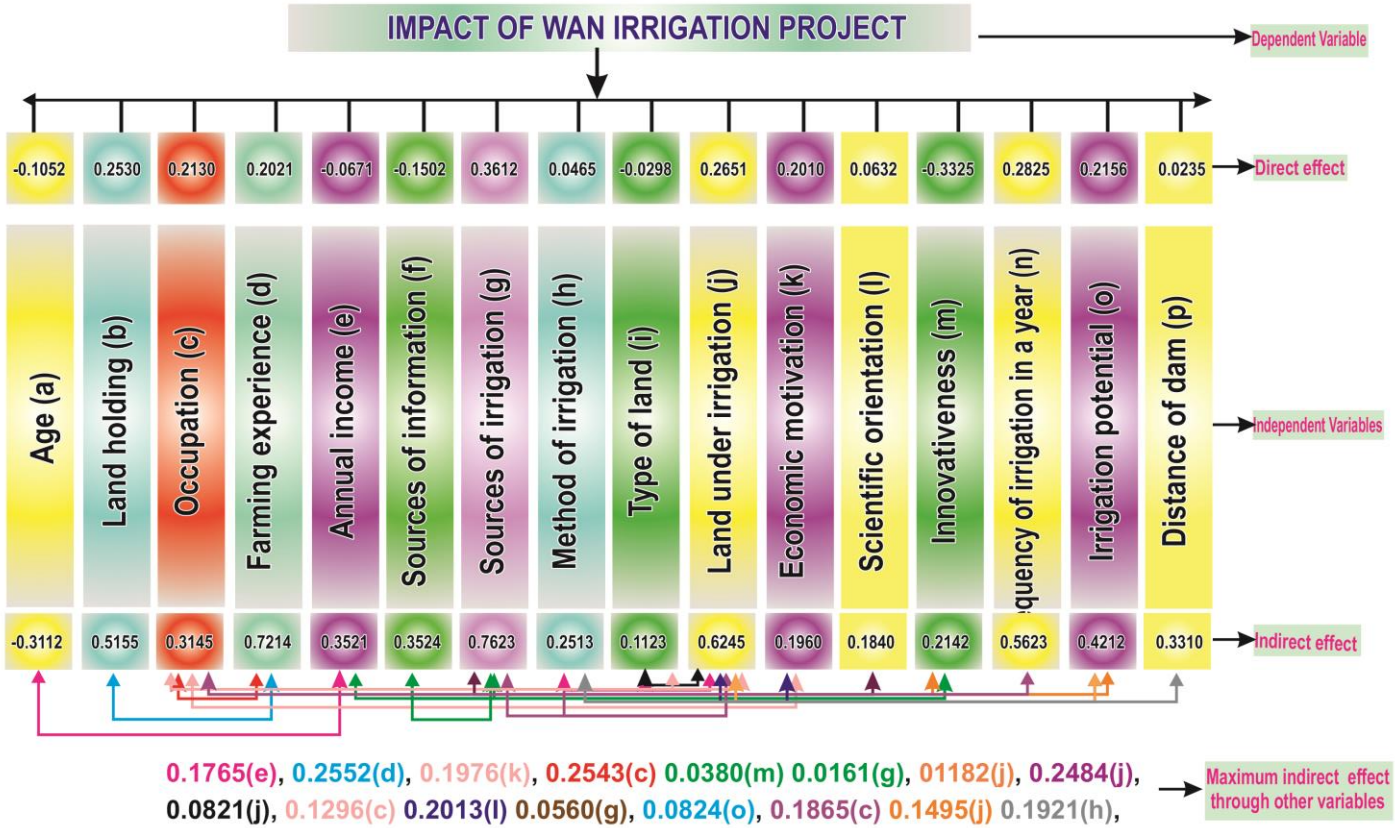



**Fig. 56 Path diagram showing direct and indirect effects of the independent variables on the impact of WAN IRRIGATION PROJECT**

## 5.6 Constraints experienced by the beneficiaries of Wan irrigation project

Command area of Wan irrigation project was divided into three segments for the purpose of the study as head reach, middle reach and tail reach. The various types of difficulties faced by beneficiaries from these segments of Wan irrigation project were collected and represented in Table 71.

**Table 71. Constraints experienced by the beneficiaries of Wan irrigation project**

| Sl. No. | Constraints | Beneficiaries | |
|---|---|---|---|
| | | Frequency | Percentage |
| **A.** | **Head reach** | **(n=100)** | |
| 1 | Crop damage due to excess flow of water | 65.00 | 65.00 |
| 2 | Increase in salinity of soil due to continuous leakage of water in field through major and minor distributaries | 50.00 | 50.00 |
| 3 | No timely cleaning of canal | 45.00 | 45.00 |
| 4 | Improper gate to canal | 35.00 | 35.00 |
| 5 | Conflict among the beneficiary farmers | 30.00 | 30.00 |
| **B.** | **Middle reach** | **(n=100)** | |
| 1 | Irrigation water was not supplied in summer season | 60.00 | 60.00 |
| 2 | No proper maintainance of major and minor distributaries | 65.00 | 65.00 |
| **C.** | **Tail reach** | **(n=100)** | |
| 1. | Procedural delay in releasing water | 52.00 | 52.00 |
| 2. | Canal water not reached at the tail portion | 75.00 | 75.00 |
| 3. | More flow of water in head and middle reach | 55.00 | 55.00 |
| 4. | Illeagal use of water from distributaries | 45.00 | 45.00 |
| 5 | Lack of co-operation from water distribution society to solve problems regarding irrigation | 50.00 | 50.00 |
| 6 | Poor accessibility of information and market | 35.00 | 35.00 |
| 7. | Canal sedimentation | 40.00 | 40.00 |

A critical look at Table 71 reveals that, varieties of difficulties were experienced by the beneficiaries. The data presented in above Table observed that in head reach majority (65.00%) of the beneficiary farmers expressed the constraints of crops damage due to excess flow of water in head region, it was followed by increase in salinity of soil due to continuous leakage of water in the field through major and minor distributaries (50.00%).

No timely cleaning of canal (45.00%), improper gate to canal (35.00%) and conflicts among the beneficiary farmers during distribution of water (30.00%)

In the case of middle reach, major constraints were no proper maintainance of major and minor distributaries (65.00%) and irrigation water was not supplied in summer season (60.00%).

More difficulties were faced by beneficiaries of tail reach region. In tail reach major constraint expressed by beneficiaries were canal water not reached at the tail portion (75.00%), followed by more flow of water in head and middle reach (55.00%), procedural delay in releasing water in tail reach (52.00%), lack of co-operation from water distribution society to solve problems regarding irrigation (50.00%), illeagal use of water from distributaries (45.00%),followed by canal sedimentation (40.00%) and poor accessibility of information and market expressed by 35.00 per cent respondents.

In summing up the constraints analysis revealed that, more constrains were faced by beneficiaries of tail reach region as compared to head reach and middle reach.

**5.7 Suggestions of beneficiaries of Wan irrigation project**

Over the constraints, beneficiary farmers from head, middle and tail reach has given the suggestions to overcome them and presented in Table 72. It is found that 80.00 per cent of the beneficiary farmer suggested equal distribution of water in all three region, 65.00 per cent suggested proper maintainance of major and minor distributaries, 51.66 per cent suggested appoint one person from respective village for regular cleaning of major and minor distributaries, 45.00 per cent beneficiary suggested regularly attend the water distribution society meetings by beneficiary farmers, 40.00 per cent suggested regular cleaning of canal and 38.33 per cent beneficiary farmers suggested timely supply of irrigation water.

**Table 72. Suggestions of beneficiaries of Wan irrigation project**

| Sl. No. | Suggestions | Beneficiaries (n=300) | |
|---|---|---|---|
| | | Frequency | Percentage |
| 1. | Timely supply of irrigation water | 115 | 38.33 |
| 2. | Maintainance of major and minor distributaries | 195 | 65.00 |
| 3. | Regular cleaning of canal | 120 | 40.00 |
| 4. | Regularly attend the water distribution society meetings by beneficiary farmers | 135 | 45.00 |
| 5. | Appoint one person from respective village for regular cleaning of major and minor distributaries | 155 | 51.66 |
| 6. | Equal distribution of water in all three regions | 240 | 80.00 |

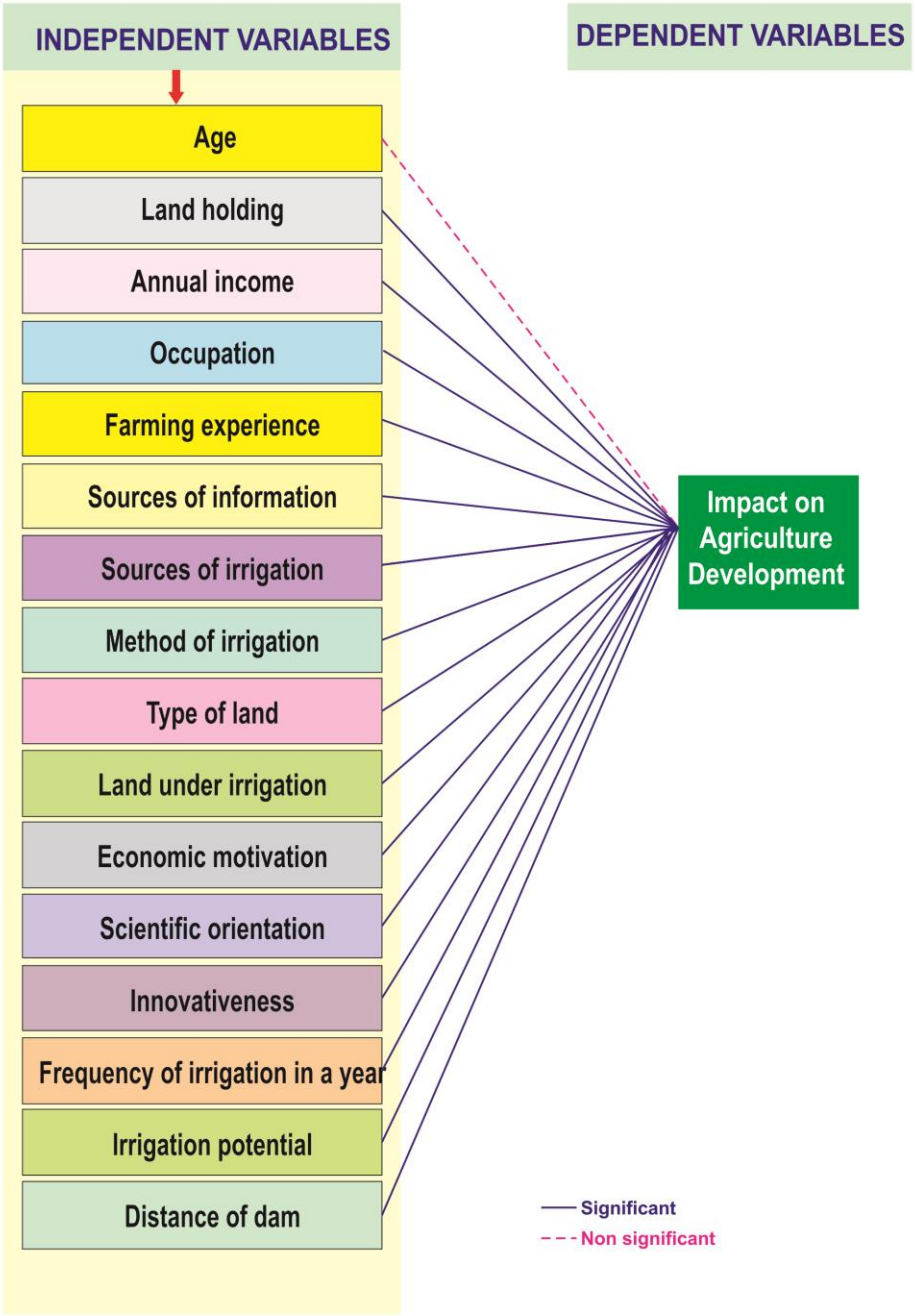



Fig. 57a. Empirical Model of study showing relationship between independent and dependent variables

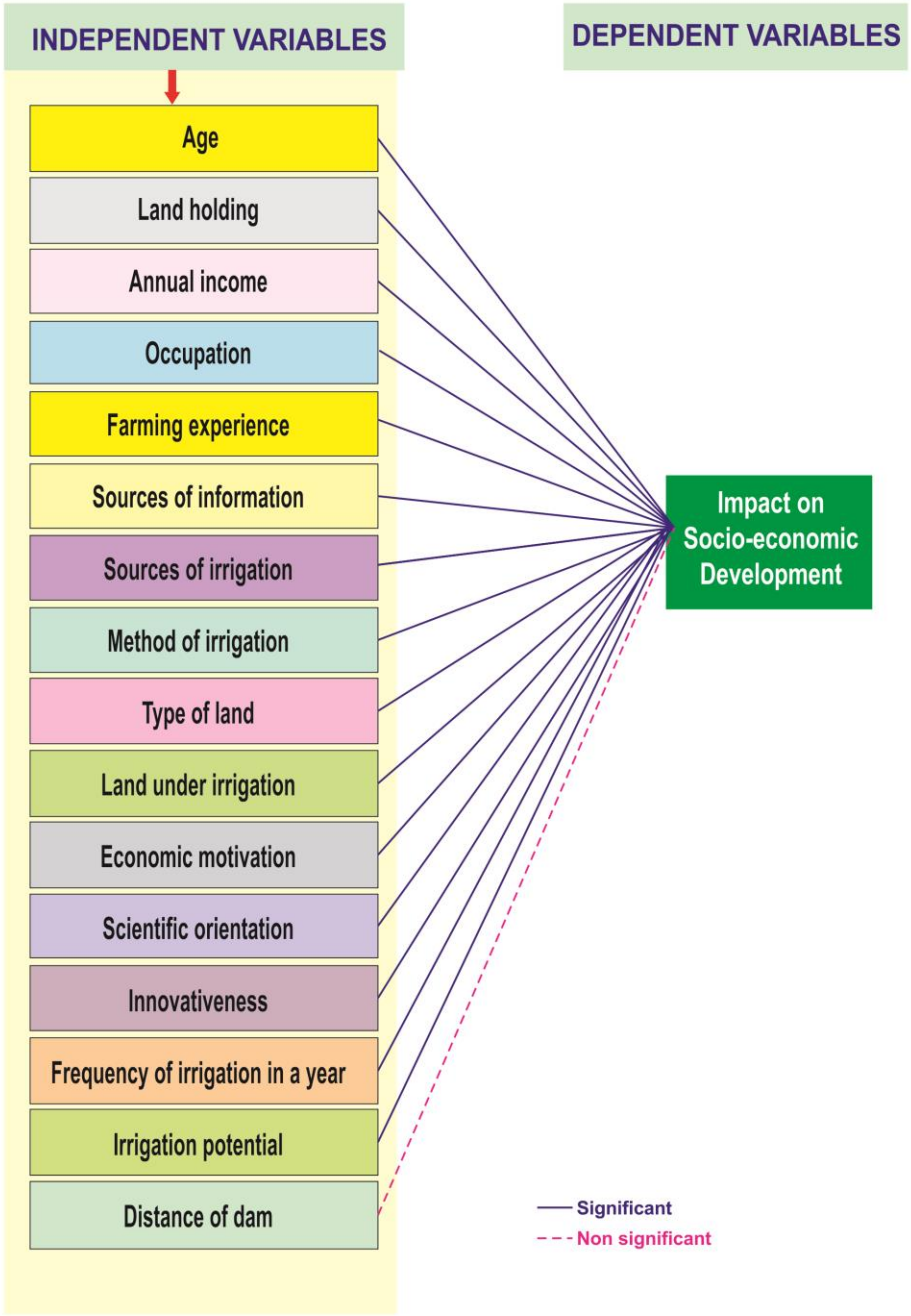



**Fig. 57b. Empirical Model of study showing relationship between independent and dependent variables**

## CHAPTER VI

# SUMMARY AND CONCLUSIONS

Wan irrigation project is major irrigation project constructed on Wan river in Telhara Taluka in Akola District. This project was sanctioned by Government of Maharashtra in 1979 with the estimated cost of Rs. 1337 lakh and up to completion of the project Rs. 22839.00 lakh was spent on the project. It was started functioning from 2005. The catchment area of this project is 279 Sq.km and gross command area of this project is 25028 ha. This project is a major source of irrigation in Akola and Buldhana district of Maharashtra State.

It is therefore felt needed to examine the impact of this project on its beneficiaries in terms of extent of agriculture and socio-economic development in this area.The study entitled “Impact of Wan irrigation project on agriculture and socio-economic development of beneficiary farmers” was frame and conducted in two districts of western Vidarbha viz. Akola and Buldhana The independent variables selected for the study are age, land holding, annual income, occupation, farming experience, sources of information, sources of irrigation, method of irrigation, type of land, land under irrigation, economic motivation, scientific orientation, innovativeness, frequency of irrigation in a year, irrigation potential and distance of dam, while impact of Wan irrigation project on agriculture and socio-economic development were studied as dependent variables. The primary data were collected through personal interview for fulfilling the following specific objectives.

### 6.1 Specific objectives of the study

1) To study the personal, socio-economic, psychological and situational characteristics of the beneficiary farmers.
2) To study the impact of Wan irrigation project on agriculture and socio-economic development of the beneficiary farmers.
3) To study the relationship between the selected characteristics of the beneficiary farmers with the impact of Wan irrigation project.

4) To study the constraints experienced by the beneficiary farmers of Wan irrigation project.

5) To invite the suggestions from the beneficiary farmers.

## 6.2 Methodology

The study was undertaken in two districts of Western Vidarbha of Maharashtra viz. Akola and Buldhana by conducting field survey with ex-post facto design of social research. In this study, the respondents were the beneficiaries of Wan irrigation project. In the present study, the command area of Wan irrigation project was divided into three segments as head reach, middle reach and tail reach. From each segment five villages were selected on the basis of beneficiary farmers. From each village 20 beneficiary farmers were selected as respondents.

In all, 300 beneficiaries of Wan irrigation project constituted the sample respondent of study. Beneficiaries were selected with the help of proportionate method of random sampling, which covered 15 villages of two districts of Western Vidarbha.

## 6.3 Findings

The salient findings of the present research study are summarized below.

### 6.3.1 Distributional analysis

#### 6.3.1.1 Distribution of personal, socio–economic, psychological and situational characteristics of the beneficiaries of Wan irrigation project

##### 6.3.1.1.1 Age

The agewise distribution of beneficiaries reveals that, majority (45.00%) of the beneficiaries were in the age group of 36-50 years, followed by 30.00 per cent of them in old age category and 25.00 per cent of the respondents belonged to old age category. Thus, it was concluded that, majority of respondents belonged to middle age category. It might be due to the reason, that mostly middle and young age group people are the key generators of income, which constitute the main work force in the society.

#### 6.3.1.1.2 Land holding

The study pointed out that, 37.66 per cent respondents possessed small, 30.00 per cent marginal, 24.00 per cent semi medium, 05.33 per cent medium category of land holding, followed by large (03.00%) category of land holding.

#### 6.3.1.1.3 Occupation

In the study area, majority of respondents i.e, 66.67 per cent were engaged found in agriculture as their main occupation for earning, followed by 13.33 per cent were engaged in agriculture plus labour for wage earning as a support, followed by 10.00 percent were engaged in agriculture plus allied occupation earning as a supportive endeavor to farming, followed by 10.00 per cent were engaged in agriculture plus business and no one was under agri plus service category. The above findings revealed that, majority of the beneficiaries were engaged in agriculture as their main occupation.

#### 6.3.1.1.4 Farming experience

In study area, 37.00 per cent respondents were having farming experience ranging from 21 to 30 years, followed by 28.00 per cent were having above 30 years, followed by 23.33 per cent respondents were having farming experience ranging from 11 to 20 years and 11.67 per cent of respondents were having farming experience up to 10 years.

#### 6.3.1.1.5 Annual income

In study area, 37.34 per cent of respondents were having annual income above Rs. 2,00,000/-, followed by 30.33 per cent of respondents were having annual income in between Rs. 51001 to 100000/-, 19.00 pe rcent of respondents were having annual income in between Rs. 1,50,001 to 2,00,000/- and 13.33 per cent of respondents were having annual income in between Rs.1,00,001 to 1,50,000/- respectively.

It is evident that, the beneficiaries belonging to higher income categories had definite benefit and economic support for their livelihood from this irrigation project.

#### 6.3.1.1.6 Sources of information

In study area, more than half of the respondents i.e. (53.67%) had medium level of sources of information followed by high level of information (46.36%) and no one found in low sources of information category.

The findings indicated that the Gramsevak, Agriculture Assistants, Agriculture Input Dealers, friends and relatives of the beneficiaries were mostly contacted for seeking information.

#### 6.3.1.1.7 Sources of irrigation

In study area, it was revealed that, in all the three regions i.e. head, middle and tail, all the respondents were using canal water for irrigation (100%), it was followed by 42.00 per cent of the respondents were using well and tubewell as source of irrigation to irrigate their field.

#### 6.3.1.1.8 Method of irrigation

In study region, out of total respondent more than half of respondents i, e. (51.33%) were using sprinkler irrigation method followed by drip (37.67%) and flood irrigation method (11.00%).

#### 6.3.1.1.9 Type of land

In study area, 47.33 per cent of respondents were possessed very deep type of land, followed by deep type of land (36.00%) and moderately deep (16.67%).

It is concluded that, soil type of the study area was very deep and deep type.

#### 6.3.1.1.10 Land under irrigation

In study area, 37.00 per cent of respondents were having 1.01 to 2.00 ha area under canal irrigation, followed by 30.00 per cent up to 1.00 ha area under canal irrigation, 24.00 per cent were having 2.01 to 4.00 ha area under canal irrigation, 05.33 per cent were having 4.01 to 10.00 ha area under canal irrigation and only 03.00 per cent above 10.00 ha area under canal irrigation.

#### 6.3.1.1.11 Economic motivation

In study area, 92.00 percent of respondents were found in high category of economic motivation, followed by 08.00 per cent in medium category of economic motivation. No one was observed in low category of economic motivation and it clearly indicates the positive impact of Wan irrigation project on beneficiaries.

#### 6.3.1.1.12 Scientific orientation

In study area, 75.00 per cent of the respondents were found in the medium category of scientific orientation, followed by high (14.34%) and low (10.66%) level of scientific orientation.

#### 6.3.1.1.13 Innovativeness

In study area, 68.67 per cent of the respondents were found in the medium category of innovativeness, followed by high (31.33%) category of innovativeness. No one was observed in low category of innovativeness.

#### 6.3.1.1.14 Frequency of irrigation in a year

In study area, 41.00 per cent of respondents were using 4 to 6 irrigation for irrigating their crop, it was followed by 39.00 per cent up to 3 irrigation and remaining 20.00 per cent of respondents were using above 6 number of irrigation to their crops.

#### 6.3.1.1.15 Irrigation potential

In study area, 37.00 per cent of respondents were having irrigation potential up to 1.01 to 2.00 ha area of their land. It was followed by 30.00 per cent (up to 1.00 ha), 24.00 per cent (2.01 to 4.00 ha), 05.33 per cent (4.00 to 10.00 ha) and 03.00 per cent (above 10.00 ha), respectively.

#### 6.3.1.1.16 Distance of dam

In study area, nearly fifty per cent of the respondents (47.67%), whose land was found in between 21 to 30 km distance from the dam, followed by 38.00 per cent of the respondents whose land was found in between 11 to 20 km and 14.33 per cent of the respondents land observe up to 10 km distance from the dam.

### 6.3.1.2 Impact of Wan irrigation project

It is operationally defined as the effect of Wan irrigation project on beneficiary farmers of the command area.

The effect was ascertained in terms of agriculture and socio-economic development of beneficiary farmers before the year 2005 and after Wan irrigation i.e. in the year 2016.

**A] Agriculture development**

Agricultural development was studied in terms of change in cropping pattern, change in cropping intensity and change in productivity of major kharif, rabi and other crops.

**1) Change in cropping pattern and cropping intensity**

In the study area, there was change in area under cotton, tur and it was increaseed by 11.65 per cent and 13.69 per cent respectively.The area under soybean and Hy. Jowar reduced by 02.52 per cent and 48.78 per cent.

In case of rabi crop, the area under wheat, gram, ground nut and in total were found to be increase by 63.63 per cent, 75.00 per cent, 28.82 percent and in total 92.59 per cent respectively. The gross cropped area was increased which may help farmers to bring more area under rabi crops. As with the availability of water for irrigation resulted in increased in area under crop in rabi season.

In case of cropping intensity before and after Wan irrigation project, it was found that there was increase in cropping intensity in the study area from 121.81 to 150.96. It means that, it was increased by 29.15 per cent.

From the above findings it can be inferred that there was definite impact of Wan irrigation project towards changing cropping intensity, change in area under various crops which may help beneficiaries for the socio-economic upliftment.

**2) Change in productivity**

In study area, the productivity of all the major crops of kharif and rabi was found increased. After the Wan irrigation project the productivity of soybean increased by 27.27 per cent, cotton 25.00 per cent, tur 22.22 per cent, Hy. jowar 42.85 per cent.

In case of rabi crop, the productivity of wheat increased by 05.00 per cent, gram 38.46 per cent, ground nut 03.00 per cent after the Wan irrigation project.

**B] Socio-economic development**

Socio-economic development was studied in terms of change in occupation, change in land holding, change in family education, change in annual income, change in socio political participation, change in expenditure pattern and change in economic empowerment of beneficiary farmers.

**1) Change in occupation**

In the study area, before the Wan irrigation project most of the respondents having agriculture and labour as their occupation (59.00%), followed by agriculture (34.00%), agriculture plus allied occupation (06.00%) and agriculture plus business 01.00 per cent. However, after Wan irrigation project, it was found that majority (66.67%) of the respondents were having agriculture as their main occupation followed by agriculture plus labour (13.33%), agriculture plus allied occupation and agriculture plus business 10.00 per cent. The ‘z’ value is significant at 0.01 level of probability.

**2) Change in land holding**

In study area, before Wan irrigation project 43.33 per cent of respondents possessed marginal land holding, it was followed by small land holding (28.00%), semi medium (23.34%) and only 03.00 per cent and 02.00 per cent possessed medium and large type of land holding, respectively. Whereas, after Wan irrigation project 36.66 per cent of respondents possessed small type of land holding, it was followed by marginal land holding (30.00%), semi medium land holding (25.00%) and only 05.00 per cent and

03.00 per cent possessed medium and large type of land holding, respectively.

**3) Change in family education**

In the study area, it was found that, after Wan irrigation project the percent change of education level was relatively higher in above 12 std. (200.00%), 150.00 per cent was noticed in 8 to 10 std. education, 100.00 per cent in 11 to 12 std. education, 50.00 per cent in up to 4 std. and 33.33 per cent in 5 to 7 std. education of the respondents family.

The ‘z’ value is significant at 0.05 level of probability.

**4) Change in annual income**

In study area, 766.66 per cent change was observed in the annual income category of above Rs. 2,00,000/-, followed by 33.33 per cent in the annual income category of Rs. 51,000 to 1,00,000/-. At the same time 100.00 per cent reduction in the annual income category up to 50,000/-, followed by 66.66 per cent in the annual income category of Rs.1,00,00 to 1,50,000/-, 28.57 per cent in the annual income category of Rs. 1,51,000 to 2,00,000/-.

The ‘z’ value was significant at 0.05 level of probability.

**5) Change in socio political participation**

In study area, after Wan irrigation project majority (71.42%) of the respondents were participated in social political institutions, 33.33 per cent respondents raised funds for community work. Reduction was found in those which were participated without any position in socio political organization by 34.52 per cent.

**6) Change in expenditure pattern**

In study area, after Wan irrigation project there was increase in expenditure pattern, in case of electricity 95.33 per cent, education 73.56 per cent, religious 56.25 per cent, medical/health 53.01 per cent, housing 40.00 per cent, food 33.33 per cent and on clothing 30.76 per cent. The ‘z’ value was found significant at 0.01 level of probability.

**7) Change in economic empowerment**

In study area, after Wan irrigation project, there was increase in freedom to start business by 200.00 per cent, followed by opportunity for economic development, participating in decision about adopting modern technology in home and participation in decision about marketing of produce by 50.00 per cent, personal saving in the form of fixed deposite, freedom for spending on entertainment of guest and freedom for offering present to relatives by 33.33 per cent.

The ‘z’ value was found significant at 0.01 level of probability.

### 6.3.1.3 Total Impact of Wan irrigation project on agriculture and socio-economic development

In connection with the overall impact of Wan irrigation project on the beneficiary farmers, it was found that 80.08 per cent of agriculture development and 52.81 per cent of socio-economic development. In total full impact of both 132.89 per cent impact was noticed on the beneficiary farmers.

Hence, from this we can conclude that irrigation project had created a significant impact on the beneficiary farmers.

### 6.3.1.4 Relational analysis

The data were subjected to the statistical tools like coefficient of correlation and path analysis.The correlation analysis help in determining the relationship between selected personal, socio-economic, situational and psychological characteristics of beneficiaries with the dependent variable impact of Wan irrigation project on the beneficiary farmers. The path analysis isolates the direct and indirect effects of the individual independent variables on the dependent variable impact of Wan irrigation project on the beneficiary farmers. The results are presented in the subsequent sub – parts as follows.

#### 6.3.1.4.1 Coefficient of correlation between selected independent variables of beneficiaries of study area with the dependent variable impact of Wan irrigation project

The relationship between selected personal, socio-economic and psychological characteristics of beneficiaries of the study area with the agriculture development parameters i, e, cropping intensity and productivity

and socio-economic development parameters viz. change in occupation, change in land holding, change in family education, change in annual income, change in socio-political participation, change in expenditure pattern and change in economic empowerment were statistically tested by using coefficient of correlation.

#### 6.3.1.4.1.1 Coefficient of correlation between selected independent variables of beneficiaries of study area with agriculture development parameters

In case of cropping intensity, the variables namely land holding, occupation, farming experience, sources of irrigation, method of irrigation, type of land, land under irrigation, frequency of irrigation, irrigation potential and distance of dam were found to be positively significant at 0.01 level of probability .

Whereas, the variables like annual income, economic motivation, scientific orientation and innovativeness were found to be significant at 0.05 level of probability. While, rest of the variables didn't show any relationship with cropping intensity.

The relational analysis with productivity revealed that, the variables farming experience, sources of irrigation, method of irrigation, land under irrigation, economic motivation, frequency of irrigation in a year and distance of dam were found significant at 0.01 level of probability.

Whereas, the variables land holding, annual income, occupation, type of land, scientific orientation, innovativeness and irrigation potential were found significant at 0.05 level of probability.The other variables such as age and sources of information does not show any relationship with the productivity.

#### 6.3.1.4.1.2 Coefficient of correlation between selected independent variables of beneficiaries of study area with socio-economic development parameters

In case of occupation the variables such as occupation, farming experience, sources of information, sources of irrigation, method of irrigation, type of land, land under irrigation and frequency of irrigation in a year and distance of dam were found were found positively significant at 0.01 level of probability.

Whereas, the variables namely land holding, annual income and irrigation potential were found positively significant at 0.05 level of probability. Variable innovativeness was found to be negatively significant at 0.05 level of probability.The rest of the variables didn't show any relationship with the occupation.

In case of land holding, out of total independent variables, the variables namely annual income, occupation, farming experience, sources of irrigation, method of irrigation, type of land, land under irrigation, economic motivation, frequency of irrigation in a year and irrigation potential were found to be positively significant at 0.01 level of probability. Whereas, the variables such as age, land holding, sources of information, scientic orientation, innovativeness and distance of dam were found significant at 0.05 level of probability.

In case of family education, out of total independent variables, the variables viz. land holding, annual income, occupation, sources of irrigation, land under irrigation, economic motivation and frequency of irrigation in a year were found positively significant at 0.01 level of probability. Whereas, the variables such as land holding, farming experience, sources of irrigation, method of irrigation, type of land, economic motivation, innovativeness, frequency of irrigation in a year and irrigation potential were found significant at 0.05 level of probability. Variable distance of dam was found negatively significant at 0.0 1 level of probability. Rest of the variables didn't show any relationship with family education.

In case of annual income out of total independent variables, the variables namely land holding, occupation, farming experience, sources of irrigation, method of irrigation, land under irrigation, economic motivation, frequency of irrigation in a year and irrigation potential were found positively significant at 0.01 level of probability. Whereas, the variables such as annual income, sources of information, type of land, scientific orientation and innovativeness were found significant at 0.05 level of probability.

The variable distance of dam showed negatively significant relationship at 0.01 of level of probability. Rest of the variables didn't show any relationship with land holding.

In case of socio political participation, out of total independent variables, the variables namely annual income, sources of irrigation, type of land and economic motivation and frequency of irrigation in a year were found positively significant at 0.01level of probability. Whereas, the variables namely age, land holding, occupation, farming experience, method of irrigation, land under irrigation, scientific orientation and innovativeness were found significant at 0.05 level of probability.

The variable distance of dam showed negatively significant relationship at 0.01 of level of probability. The rest of the variables didn't show any relationship with the socio political participation.

In case of expenditure pattern, out of total variables, the variables viz. annual income, occupation, sources of irrigation, land under irrigation, economic motivation, frequency of irrigation in a year and irrigation potential were found positively significant at 0.01 level of probability. Whereas, the variables such as age, land holding, farming experience sources of information, method of irrigation and type of land were found significant at 0.05 level of probability.

The variables namely scientific orientation, innovativeness and distance of dam were found negatively significant at 0.01 level of probability.

In case of economic empowerment, variables viz. age, land holding, annual income, occupation, sources of irrigation, land under irrigation, economic motivation, frequency of irrigation in a year and irrigation potential were found positively significant at 0.01 level of probability. Whereas, the variables such as farming experience, sources of information, method of irrigation and type of land were found to be significant at 0.05 level of probability.

The variables namely scientific orientation, innovativeness and distance of dam were found negatively significant at 0.05 level of probability.

### 6.3.1.5 Path analysis

It was observed that, land holding (0.2552), occupation (0.2543), method of irrigation (0.2484), economic motivation (0.2013), annual income (0.1976), distance of dam (0.1921), frequency of irrigation in a year (0.1865), age (0.1765) irrigation potential (0.1495), land under irrigation (0.1296), sources of irrigation (0.1182) and innovativeness (0.0824) had exerted maximum indirect effect on the dependent variable impact in descending order of magnitude.

Similarly, it was revealed that out of the 16 variables, maximum variables namely sources of irrigation, method of iirigation, type of land, and irrigation potential had largest indirect effect on the impact through land under irrigation only.

Thus, sources of irrigation along with frequency of irrigation in a year,land under irrigation, land holding and irrigation potential did not only exerted the maximum direct effect but also served as a vehicle for the production of indirect effect through other variables on increasing impact of Wan irrigation project on beneficiary farmers.

### 6.3.1.6 Constraints experienced by the beneficiaries of Wan irrigation project

In head reach, majority (65.00%) of the beneficiary farmers expressed the constraints of crops damage due to excess flow of water, 50.00 per cent expressed the constraints of increase in salinity of soil due to continuous leakage of water in the field through major and minor distributaries and 45.00 per cent expressed no timely cleaning of canal.

In middle reach, major constraints are, no proper maintainance of major and minor distributaries (65.00%) and irrigation water was not supplied in summer season (60.00%).

In tail reach, major constraint expressed by beneficiaries were canal water not reached at the tail portion (75.00%), followed by more flow of water in head and middle reach (55.00%), procedural delay in releasing water in tail reach (52.00%).

### 6.3.1.7 Suggestions of beneficiaries of Wan irrigation project

Over the constraints, beneficiary farmers from head, middle and tail reach portion has given the suggestions to overcome the constraints. The major suggestions are 80.00 per cent of the beneficiary farmer suggested equal distribution of water in all three region, 65.00 per cent suggested proper maintainance of major and minor distributaries, 51.66 per cent suggested appoint one person from respective village for regular cleaning of major and minor distributaries, 45.00 per cent beneficiary suggested regularly attend the water distribution society meetings by beneficiary farmers, 40.00 per cent suggested regular cleaning of canal and 38.33 per cent suggested timely supply of irrigation water.

## CHAPTER VII

# IMPLICATIONS

The present study has brought out important findings having valuable action implication from the point of view of increasing the impact on the beneficiaries of Wan irrigation project. The implications based on the observations and findings of the study are presented as follows.

### 7.1 Implications for action

1) The present study findings indicate that most of the farmers' were from small and semi medium holding group and cropping pattern mainly includes agronomic crops. It is therefore suggested that, instead of agronomic crops they could try vegetable cultivation for additional income and can also go for fruit cultivation.

2) It is observed that majority of beneficiaries from head and middle region were engaged in agriculture as a main occupation, where as in tale region only 25.00 per cent were engaged in agriculture as their main occupation due to uneven supply of water. It is therefore suggested that, irrigation department to pay attention towards timely and equal distribution of water.

3) As there is excess availability of water in head region,it is therefore implied that State Department of Agriculture should encourage the beneficiary of this reason for selecting dairy as susidary occupation as there is scope to take fodder cultivation and can organize additional tours for farmers to aware about cropping pattern in various regions of Maharashtra. In this way, excess water can be utilized and beneficiary farmers could go for subsidiary occupation like gottary, dairy, poultry etc.

4) It is observed that majority of the beneficiary were having very deep type of land (47.33%). In this regards extension functionaries should organized vocational training programmes on various new crop cultivation practices which are suitable in this type of soil.

5) It is noticed that, canal, well and tubewell are the major sources of irrigation and there is increase in water level in tube well and well.

Therefore it is implicated that, irrigation department should motivate the farmers in the command area of the Wan irrigation project for fish rearing which may help the farmers to yield additional income.

6) The findings revealed that the major constraints faced by beneficiary farmers were canal cleaning, uneven distribution of water and leakage of water. Therefore, it is implicated that, these types of problems can solve by water distribution societies at village level by organizing regular meetings regarding regular and equal distribution of water. They can also appoint one or two labours from respective village for cleaning of canals and regular and timely distribution of water. In addition, they can organize campaigns to avoid these types of problems at village level.

7) It is observed that economic motivation is high in all the three regions. It is therefore suggested that, they could go for small scale agro based industries or small processing unit by making groups of farmers as business purpose.

8) It is evident from the study that after Wan irrigation project there were changes observed in the dimensions of agriculture and socio-economic development such as cropping pattern, cropping intensity, crop productivity, annual income, expenditure pattern, economic empowerment, family education. It means that there is definite impact of Wan irrigation project on agriculture and socio-economic development. It is therefore implicated that, the implementation of this type of project should be extended to other areas. So farmers can take advantage of the irrigation project for their better life.

9) There is positive impact on agriculture and socio-economic development. Therefore it is implicated that, region specific basic infrastructure needs to be improved in all the sectors for making agriculture sustainable. Better road connectivity for greater market access as well as increasing the storage capacity. As the productivity of all kharif and rabi crops were found increased with the availability of water, there is need to improve food security through construction of larger grain storage facilities, processing unit and cold storage facility, shed-net house with high

technology farming with the help of University, KVK scientists by taking the advantage of the State Department of Agriculture and other.

### 7.2 Implications for further research

1. Similar studies may be undertaken on another major irrigation project in other part of Vidarbha region of Maharashtra.
2. Similar studies with same objectives with same sample size in only one district can be valid conclusion.
3. Studies based on administration, training and implementation aspects of Wan irrigation project may be conducted.
4. Studies on the role of water distribution society in implementing Wan irrigation project must be carried out.
5. A comparative study between beneficiary and non beneficiary is also possible.

## CHAPTER VIII

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## APPENDIXES

## INTERVIEW SCHEDULE

**Title of Thesis** : **Impact of Wan Irrigation Project on Agriculture and Socio-economic Development of Beneficiary Farmers**

**Name of Researcher** : **Ku. Neeta Himmatrao Deokate**
**Ph.D. (Agri) Extension Education**

(**GENERAL INFORMATION**)

**Name of farmer**-

……

**Village-** …… **Taluka-** ……..

**District-**…… **Mobile No-……**

**PART-I**

**A) Independent Variables**

**1. Age……..**Yrs**. Education…….**

**2. Land holding**

a)Irrigated land : ……ha

b) Rainfed land: ……ha

c) Total land : ha

**3. Occupation and Annual income**

| Sl. No. | Occupation | | Annual income (Rs.) in a year |
|---|---|---|---|
| 1 | Agriculture+ Labour | | |
| 2 | Agriculture | | |
| 3 | Agriculture+ allied occupation | | |
| 4 | Agriculture+ Business | | |
| 5 | Agriculture + Service | | |
| | **Total income (Rs.)** | | |

**4. Farming experience**

| Sl. No. | Farming experience | Years |
|---|---|---|
| 1 | Up to 5 yr. | |
| 2 | 6yr. to 10 yr. | |
| 3 | Above 10 yr. | |

**5. Sources of information**

| Sl. No. | Institution | Always (3) | Sometime(2) | Never (1) |
|---|---|---|---|---|
| **A** | **Formal Agencies** | | | |
| 1 | Gram Sevak | | | |
| 2 | Agriculture Assistant of State Agril. Dept. | | | |
| 3 | Agriculture Supervisor of State Agril. Dept. | | | |
| 4 | Agri. Officer of State Agril. Dept. | | | |
| 5 | Extension Officer of Panchayat Samiti | | | |
| 6 | University Scientist | | | |
| 7 | KVK Scientist | | | |
| 8 | Others | | | |
| **B** | **Informal Agencies** | | | |
| 1 | Friends | | | |
| 2 | Neighbours | | | |
| 3 | Progressive Farmers | | | |
| 4 | Opinion Leader | | | |
| 5 | Relatives | | | |
| 6 | Agril. Input dealers | | | |
| 7 | Award Winning Farmers | | | |
| 8 | Others | | | |

**6. Sources of irrigation**

| Sl. No. | Irrigation source | (√) |
|---|---|---|
| 1 | No source | |
| 2 | River | |
| 3 | Well/ Tube well | |
| 4 | Canal | |
| 5 | Farm pond | |
| 6 | Others | |

**7. Method of irrigation**

| Sl. No. | Method of irrigation | (√) |
|---|---|---|
| 1 | Sprinkler | |
| 2 | Drip | |
| 3 | Flood | |
| 4 | Other | |

**8. Type of land**

| Sl. No. | Status of soil | |
|---|---|---|
| 1 | Very deep | |
| 2 | Deep | |
| 3 | Moderately deep | |
| 4 | Shallow | |
| 5 | Very shallow | |

**9. Land under irrigation**

| Sl. No. | Category | |
|---|---|---|
| 1 | Marginal (Up to 1.00 ha.) | |
| 2 | Small (1.01 to 2.00 ha.) | |
| 3 | Semi medium (2.01 to 4.00 ha.) | |
| 4 | Medium (4.01 to 10.00ha.) | |
| 5 | Large ( Above 10.01ha.) | |

**10. Economic motivation**

| Sl. No. | Statement | SA | A | UD | DA | SDA |
|---|---|---|---|---|---|---|
| 1 | A farmer should work towards large yield and economic profit | | | | | |
| 2 | The most successful farmer is one who makes the more profit from the irrigation | | | | | |
| 3 | A farmer should try new farming idea which may earn him more money by using irrigation through the project | | | | | |
| 4 | It is important for the farmers to have a large harvest by using irrigation in order to buy many things besides food | | | | | |
| 5 | It is difficult for the farmers children's to make good start unless he can provide them economic assistance | | | | | |
| 6 | Farmer using irrigation from canal should increase standard of living but not only economically | | | | | |

(Positive statements – 1,2,3,4, and 5) (Negative statements – 6)

**11. Scientific orientation**

| Sl. No. | Statements | SA 5 | A 4 | UD 3 | DA 2 | SDA 1 |
|---|---|---|---|---|---|---|
| 1 | New method of farming gives better results to farmer after irrigation project/facility | | | | | |
| 2 | The way of farmer forefathers farmed is still the best way to farm today | | | | | |
| 3 | Even a farmer with lots of experience should use new methods of irrigation | | | | | |
| 4 | Though it takes time for farmer to learn new irrigation methods in farming, it is worth the efforts | | | | | |
| 5 | A good farmer experiments with new ideas in irrigation through project | | | | | |
| 6 | Traditional methods of irrigation having to be changed in order to raise the level of farmer | | | | | |

(Positive statements- 1,3,4,5,6 ) (Negative statements - 2)

## 12. Innovativeness

| Sl. No. | Statements | A 3 | UD 2 | D 1 |
|---|---|---|---|---|
| 1 | I feel restless to a new innovation I have heard about | | | |
| 2 | They talk of many new irrigation projects and facilities these days but who knows if they are better | | | |
| 3 | After our entire fore father were wise in their irrigation methods I don't see any reason for changing these old methods | | | |
| 4 | Often new technology are not successful however if they are promising I would surely like to adopt it | | | |
| 5 | For time to time I have heard of several new technologies and I have tried most these technologies in last few years | | | |
| 6 | Somehow I believed that traditional methods are best | | | |

(Positive statements – 1,4,5) (Negative statements – 2 ,3,6)

## 13. Frequency of irrigation( through canal) in a year

| Sl. No. | Frequency of irrigation in a year (By canal irrigation) | Months | | | | | | | | Season Kharif Rabi Summer | Year |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | D | J | F | M | A | M | S | O | | |
| 1 | **Up to 3 irrigation** | | | | | | | | | | |
| 2 | **3 – 6 irrigation** | | | | | | | | | | |
| 3 | **Above 6 irrigation** | | | | | | | | | | |

## 14. Irrigation potential

| Sl. No. | Total land possessed by the farmer (ha) | Potential of farmer to irrigate the land (ha) (By canal irrigation) | Actual land under canal irrigation (ha) | Percent land irrigated through canal irrigation (ha) |
|---|---|---|---|---|
| 1 | | | | |
| 2 | | | | |
| 3 | | | | |

**15. Distance of dam**

| Sl. No. | Distance of dam | Km |
|---|---|---|
| 1 | Up to 10 | |
| 2 | 11 to 20 | |
| 3 | 21 to 30 | |

**PART II**

**B) Dependent variables**

**A) Agriculture Development**

**i) Cropping pattern**

| Sl. No. | Season | Before (Year 2005) | | Season | After (Present Year) | |
|---|---|---|---|---|---|---|
| | | Crop | Area (ha) | | Crop | Area (ha) |
| 1 | Kharif | | | Kharif | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| 2 | Rabi | | | Rabi | | |
| | | | | | | |
| | | | | | | |
| 3 | Summer | | | Summer | | |
| | | | | | | |
| | | | | | | |
| 4 | Other | | | Other | | |
| | | | | | | |
| | | | | | | |

**ii) Cropping intensity**

| Sl. No. | Season | Before irrigation project | | Cropping Intensity | After irrigation project | | Cropping Intensity |
|---|---|---|---|---|---|---|---|
| | | Total land available for cultivation (ha) | Actual land under cultivation (ha) | | Total land available for cultivation (ha) | Actual land under cultivation (ha) | |
| 1 | Kharif | | | | | | |
| 2 | Rabi | | | | | | |
| 3 | Summer | | | | | | |
| | | | | | | | |
| | **Total CI** | | | | | | |

**iii) Productivity**

| Sl.No. | Season | Before irrigation project | | After irrigation project | |
|---|---|---|---|---|---|
| | | Name of crops | Average productivity in q/ha | Name of crops | Average productivity in q/ha |
| 1 | Kharif | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| 2 | Rabi | | | | |
| | | | | | |
| | | | | | |
| **3** | Summer | | | | |
| | | | | | |
| | | | | | |

**b) Socio-economic development**

**i) Occupation and Annual income**

| Sl. No. | Occupation | Occupation | | Annual Income (Rs.) | |
|---|---|---|---|---|---|
| | | Before | After | Before | After |
| 1 | Agriculture+ Labour | | | | |
| 2 | Agriculture | | | | |
| 3 | Agriculture+Allied occupation | | | | |
| 4 | Agriculture+ Business | | | | |
| 5 | Agriculture + Service | | | | |

**ii) Land holding**

| Sl. No. | Land holding | Before | After |
|---|---|---|---|
| 1 | Up to1.00ha | | |
| 2 | 1.01to 2.00 ha | | |
| 3 | 2.01 to 4.00 ha | | |
| 4 | 4.01 to 10.00 ha | | |
| 5 | Above 10.00 ha | | |

**iii) Family education**

| Sl. No. | Level of Education | Before (No. of family members) | After (No. of family members) |
|---|---|---|---|
| 1 | Illiterate | | |
| 2 | Up to 4 std. | | |
| 3 | 5 to 7 std. | | |
| 4 | 8 to 10 std. | | |
| 5 | 11 to 12 std. | | |
| 6 | Above 12 | | |

**iv) Socio political participation**

| Sl.No. | Socio political participation | Before | After |
|---|---|---|---|
| 1 | Participated in social political institutions | | |
| 2 | Participated without any position in sociopolitical organization | | |
| 3 | Official position in one or more formal organization | | |
| 4 | Official position in socio and political organization | | |
| 5 | Financial contribution or raised funds for community work | | |
| 6 | Active office bearer | | |
| 7 | Involved in community work | | |

**v) Expenditure pattern (Monthly)**

| Sl. No. | Indicators | Before (Rs) | After (Rs) |
|---|---|---|---|
| 1 | Food | | |
| 2 | Education | | |
| 3 | Housing | | |
| 4 | Clothing | | |
| 5 | Medical/ Health | | |
| 6 | Electricity | | |
| 7 | Religious | | |
| 8 | Other repayment | | |

**vi) Economic empowerment**
**(Scale developed by Vidya Tayde (2006))**

| Sl. No. | Economic empowerment aspects | Response (Yes/No) | | | |
|---|---|---|---|---|---|
| | | Before | | After | |
| 1 | Opportunity for economic development | | | | |
| 2 | Freedom to start business | | | | |
| 3 | Personal saving in the form of fixed deposit | | | | |
| 4 | Operating seasonal account in bank | | | | |
| 5 | Participating in decision about adopting modern technology in home | | | | |
| 6 | Participation in decision about purchasing building/ house | | | | |
| 7 | Participation in decision about marketing of produce | | | | |
| 8 | Authority of employ labour | | | | |
| 9 | Freedom for spending on entertainment of guest | | | | |
| 10 | Freedom for offering present to relatives | | | | |

**PART - III**

**Constraints : Did you come across with some difficulties while using water for irrigation through WAN irrigation project, if Yes, please tell/ specify**

| Sl. No. | Constraints | Yes | No |
|---|---|---|---|
| 1<br>2<br>3<br>4<br>5<br>6 | | | |

**PART - IV**

**Suggestions :**

| Sl. No. | Suggestions |
|---|---|
| 1<br>2<br>3<br>4<br>5<br>6 | |

# VITA

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