"IMPACT OF WATERSHED DEVELOPMENT PROGRAMME ON SOCIO-ECONOMIC STATUS OF POPULATION IN KHATAV TAHSIL OF SATARA DISTRICT (MAHARASHTRA): A GEOGRAPHICAL STUDY"

A THESIS
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TILAK MAHARASHTRA VEEDYAPEETH, PUNE

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CERTIFICATE

This is certify that the thesis entitled **"IMPACT OF WATERSHED DEVELOPMENT PROGRAMME ON SOCIO-ECONOMIC STATUS OF POPULATION IN KHATAV TAHSIL OF SATARA DISTRICT (MAHARASHTRA): A GEOGRAPHICAL STUDY"** which is being submitted herewith for the award of the Degree of Doctor of Philosophy (Ph.D.), in Geography, Tilak Maharashtra Vidyapeeth, Pune is the result of the original research work completed by _____under my supervision and guidance and to the best of my knowledge and belief. The work embodied in this thesis has not formed earlier the basis for the award of Degree or similar title of this or any other university or examining body.

Place:
Date:

_____

RESEARCH GUIDE

DECLARATION

I, hereby declare that the thesis entitled, **"IMPACT OF WATERSHED DEVELOPMENT PROGRAMME ON SOCIO-ECONOMIC STATUS OF POPULATION IN KHATAV TAHSIL OF SATARA DISTRICT (MAHARASHTRA): A GEOGRAPHICAL STUDY"** completed and written by me has not previously formed the basis for the award of any Degree or Diploma or any other similar title of this or any other university or examining body.

Place:

Date:

_____

(Research Student)

ACKNOWLEDGEMENT

Place: _____

(Research Student)

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ABBREVIATIONS

CWP	Comprehensive Wasteland Programme
DAC	Department of Agriculture and Cooperation
DDP	Desert Development Programme
DPAP	Drought Prone Area Programme
IGWSDP	Indo-German Watershed Development Programme
WDM	Watershed Development and Management
DRDA	District Rural Development Agency
EAS	Employment Assurance Scheme
FYP	Five Year Plan
GSDA	Groundwater Survey and Development Agency
GoM	Government of Maharashtra
GoI	Government of India
IRS	Indian Remote Sensing Satellite
IWDP	Integrated Wasteland Development Programme
KVK	Krishi Vidyan Kendra
NGO	Non Governmental Organization
NWDP	National Watershed Development Programme
NWDPRA	National Watershed Development Project for Rainfed Areas
PRI	Panchayat Raj Institution
RVP	River Valley Project
SHG	Self Help Group
TCM	Thousand Cubic Meter
TMC	Thousand Million Cubic Feet
UG	User Group
WA	Watershed Association
WC	Watershed Committee
WDF	Watershed Development Fund
WDP	Watershed Development Programme

WDT	Watershed Development Team
WGDP	Western Ghat Development Programme
ZP	Zilla Parishad
Mbgl	Meter below ground level
PT	Percolation Tanks
CCT	Continuous Counter Trenches
CB	Compartment Bunding
CNB	Cement Nala Bundhara
KTW	Kolhapur Type Weir
MPJBSA	Mahatma Phule Jal va Bhoomi Sandharan Abhiyan
NABARD	National Bank for Agricultural and Rural Development
IWMP	Integrated Watershed Management Programme
SOI	Survey of India
WS	Watershed
KR	Krishna River
ENB	Earthen Nala Bunding
CCB	Continuous Contour Bund
COWDEP	comprehensive Watershed Development Programme
DLT	Drainage Line Treatment
HYV	High Yielding varieties
LBS	loose Boulder Structures
LSCD	Loose Stone Check Dam
NWDB	National Watershed development Board
SC	Scheduled Caste
Ha	Hectare
WDF	Watershed Development Fund
WDP	Watershed development Programme
WSD	Watershed Development

CHAPTER I

INTRODUCTION

1.1 INTRODUCTION

"*Water is the driver of life*"

- Leonardo da Vinci

The air, water, food, clothing and shelter are the basic needs of human. Out of these, water is the key to life, which is crucial resource for humanity and the rest of the living world. Our life will not be possible even for 2-3 days without water. About two-third part of the human body is created from the water.

Just like human, the plants and animal life have basic need of water. Agriculture is purely depends on water. In India, agricultural development is the indication of progress and growth of rural area. With the agricultural development, water also improves the socio-economic status of population. The socio-economic factors like crop production, irrigation facilities, households, education, banking facilities, roads, marketing facilities, etc. observe to the significant progress in the rural area.

Watershed is an ideal unit calling for multidisciplinary approach to the resource management for ensuring continuous benefit on sustainable basis. This approach is the recent approach to area development programmes. Effective use of land and water is fundamental to growth and sustainable development. The concept of watershed management has evolved to ensure effective use of both natural and social capitals. Thus, the Watershed Development Programmes include land, water and human resources as essential components. The Watershed Development Programme is primarily a land based programme, which is increasingly being focused on water, with its main objective being to enhance agricultural productivity through increased in situ moisture conservation and protective irrigation for socio-economic development of rural people (Joshi, et al. 2004, 2006).

Watershed Development aims to balance the conservation, regeneration and use by humans of land and water resources within a watershed. Common benefits from successful Watershed Development projects include improved agricultural yields and increased access to drinking water. The overall attributes of the Watershed Development approach, by and large, are three fold, viz. promoting economic

development of the rural area, employment generation, and restoring ecological balance (DoLR, 2006).

Watershed Development implies the rational utilization of land and water resources for optimum production with minimum hazard to natural resources. The concept of Watershed Development is essentially an adoption of soil and water conservation practices in the particular area. The aims of these practices are proper land use, protecting land against all forms of deterioration, building and maintaining soil fertility, conserving, water for farm use, proper management of local water for drainage, flood protection and sediment reduction and increasing productivity from all land uses.

The Watershed Management is technical concept. In India from last 40 to 50 years watershed management and implementation has been in process. The progress of the rural area is the fundamental factor in the sustainable development of India, for the purpose one should use the available natural resources and concentrate on all over progressive management. The Watershed Management is a dominant factor in economic, technical and social development of society thats why the concept should be briefly understood.

The development of watershed area based on type of soil, depth of soil, vegetative cover, harvestable rain water in that area and watering that area and water budgeting and treatment given to soils from the ridge to the valley. The term Watershed Development encompasses additional dimensions like equity, sustainability, gender and peoples participation. It has become a trusted tool for the overall development of the village and people living within a watershed area. Watershed Development refers to the conservation regeneration and the judicious use of all the resources – natural (like land, water, plants, animals) and human – within the watershed area. Watershed Management tries to bring about the best possible balance in the environment between natural resources on the one side and man and animals on the other. Since it is the man which is primarily responsible for degradation of environment, regeneration and conservation can only be possible by promoting awakening and participation among the people who inhabit the watersheds.

Watershed Development Programmes (WDPs) are among the very important programmes placed under the purview of Department of Land Resources (DoLR), Ministry of Rural Development (MoRD). Three important schemes namely, IWDP, DPAP, and DDP are widely implemented by the State Governments with due priority.

The DoLR has been committed in updating guidelines for these schemes with periodic inputs from Research Organizations, Voluntary Organizations, Technical Committees, Workshops and Seminars amongst others. Especially, the inputs from the C.H. Hanumantha Rao Committee and Parthasarathy Committee are quite popular.

1.2 RESEARCH PROBLEM

Khatav tahsil comes in rain shadow area. In Satara district, rainfall has been decreasing from west to east and Khatav tahsil comes in eastern part of Satara district. This part has every 3-4 years drought-prone condition. This tahsil has yearly normal rainfall between 450 mm to 550 mm. Rainfall has uncertainty and unequal distribution.

Tahsil is a plateau and foothill area. The Yerala is the main river in the tahsil. This river has seasonal pattern. The Yerala river and her tributaries are flowing in the deep and lowland areas. Since the mostly part of tahsil is comprised high elevatation to compare the river, water of river does not use for irrigation. For this area, lift irrigation is economically very costly.

Khatav tahsil has normal socio-economic status population. Agriculture is the main stay of people in tahsil. About 70% of the total workers are engaged in agriculture. This tahsil is famous for growing cereal crops like jowar, bajara, wheat, pulses, onion, potato, peas, and vegetables etc. People are hard worker but rainfall comes there in uncertainty and low percentage. There is really problem of water in every summer season for drinking and agriculture. This area is in need of the Watershed Development.

Watershed Development Programme (WDP) is the main solution in the study area. This scheme work is going on in the study area. Some villages have participated in the watershed and having the positive impacts on agriculture. The villages which have not participated in such projects of the watershed having acute shortage of rainwater supply even for the drinking purpose. For the present study it is necessary to develop:

- Watershed Development to check the surface runoff
- To increase the groundwater table
- To check the erosion
- To recharge the groundwater for scare time period for agriculture and drinking purpose.

This whole programme is base for socio-economic development of the people in area undertaken for the present study. The area under investigation is the home tahsil of researcher. The researcher has seen the positive impacts of the Watershed Development. So in order to face the drought conditions and to offer an eco-friendly way that is both cheap and effective in arresting and indeed reversing the degradation of our natural resources. Therefore it is necessary to look into the Watershed Development seriously.

1.3 SCOPE AND UTILITY OF THE STUDY

The major components of the Watershed Development programme are: protection of tableland, reclamation of shallow ravines, stabilization for cultivation or horticultural plantation wherever irrigation has been made available and stabilization of medium and deep ravines through aforestation for building fuel-fodder reserves.

The main goal of watershed approach is to keep the water where it falls, instead of letting it run unused and to prevent from carrying away fertile soil. It also affects an eco-friendly way that is both cheap and effective in arresting and reversing the degradation of our natural resources.

The attempt is made to look into how Watershed Development is essential in hilly areas of heavy rainfall and how it could transform the drought-prone as well as poverty stricken areas into prosperity.

Rural development can be achieved through sustainable agriculture. Any subsistence based economy functions on the basis of the availability and accessibility of usable water resources in the region.

The present research work is related to the "Impact of the Watershed Development Programme on Socio-economic Status of Population in Khatav tahsil of Satara district" of Maharashtra state. The drought of various intensities has frequently occurred in the recent past in 1957-59; 1970-73; 1984-85; 2000-2003 and 2011 to 2013. To save commercial crops, water for drinking purpose for human beings and animals the ground water from below 500 to 600 feet is exploited but not recharged. When the rainfall decreases below normal the region start facing the water scarcity and due to non development of watershed the heavy rainfall areas also begin to face same sort of condition.

The Watershed Development Programme helps in achieving balanced regional development of any area of the tahsil. Geographers study the existing conditions of an

area in the spatial context and present a synoptic view about the existing conditions of any area/region.

The study of "Impact of the Watershed Development Programme on Socio-economic Status of Population in Khatav Tahsil of Satara District" with the help of regional or spatial approach has not been attempted so far. This might be the first attempt to study at micro-level to appraise the impact of Watershed Development in Khatav tahsil.

Thus, the water is a social treasure that may be protected at all levels by Government and community as well. In this situation Watershed Development becomes a key for sustainable development. Hence, the present study work is significant as it focuses at micro-level study on Watershed Development and its impact on socio-economic development in the rural areas of Khatav tahsil.

The importance of Watershed Development depends on the amount of water already in the soil, the water flowing the time it is conserved, and the plant needs at time. Water conserved before a day period can make the difference between success and failure for a growing crop. Excess water retained during the wet period can damage the crop and reduce yields, especially in low spots fetid water control sometimes helps even in west periods, though, holding the water on drier slowing land rather than letting it run on to level areas below.

Time when water conservation will increase yield are common in semi-arid Climates but are not limited to such areas. The sub-humid and even humid climates have dry periods during which plant growth may suffer periods of water deficit are especially common during the warmest months, as illustrated in figure, because potential water use is highest.

Watershed Development on irrigated land is also profitable but in a different way than in dry land agriculture. Any irrigation water conservation can ultimately be used to irrigate additional land and thereby increase profits. The individuals who do not have additional land available can either purchase less water or spend less for pumping water and thus leave more water available for other persons or for a later time.

1.4 HYPOTHESIS

As the intensity of Watershed Development Programme increases the socio-economic status of the population improves through agricultural development. This hypothesis is formulated to test during the course of investigation.

1.5 OBJECTIVES

The main objectives of the present study are as follows:

1. To study the geographical background as the basis for the Watershed Development.
2. To study the Watershed Development Programmes in the study area.
3. To analyses the impact of Watershed Development Programme on the cropping pattern in the study area.
4. To study the Socio-economic Status of Population in the study area.
5. To study the problems of Watershed Development Programme in the study area.

1.6 STUDY AREA

Khatav tahsil is located between $17^0$39' to 18^0 11' North latitude and $73^0$33' to $74^0$54' East longitude which surrounded by to the east- Man tahsil of Satara district, to the south- Sangli district, to the west-Karad and Koregaon tahsil of Satara district, to the north- Phaltan tahsil of Satara district.

According to 2011 census Khatav tahsil area is 1377.79 sq. km., number of villages 143, number of houses 59699 and rural population 275274 persons. Total population 275274 persons (Male-136802, Female-138472). Population density is 200 persons per sq. km. Khatav tahsil is drought-prone, hilly and rain shadow area, east part of Satara district. In west to east rainfall is decreased Vaduj yearly average rainfall 512.2 mm. In the study area Vaduj, Pusegaon, Aundh, Pusesawali, Mayani, Khatav, Kaledhon, are big villages. These villages are developed in river basin and big streams.

Tahsil village name is Khatav, but administrative village name is Vaduj. Vaduj is middle place in Khatav tahsil. Yerala is main seasonal river in the tahsil (length 120 km.). Vardhangarh, Bhosangarh is old fort and Ner Dam is built on Yerala river (1880-81), Yeralwadi Dam is also (1977) located. Khatav tahsil is rain

shadow area; the major crops such as Bajara, Kharif Jowar, Rabbi Jowar, Potato, fruit farming and pulses are cultivated.

The area under study is one of the drought-prone comprises regions of the state of Maharashtra. Agriculture is the main occupation in the tahsil with more than 75% of the total area being used for agricultural activities.

1.7 DATA BASE

The present study is mainly based on primary data collected through the intensive field work in the study area where the Watershed Development Programmes has already been done.

The work of data collection was divided into two parts- first, the pre-Watershed Development conditions and second, the post-watershed development conditions. For the pre-watershed development the data were collected from the secondary sources, structured household schedule and discussion with the villagers, officers etc.

The information required for the study has been collected through different sources:

(A) Primary Data:

(a) Primary data were collected by a sample survey using a detailed schedule.

(b) View of the farmers and experts.

(c) Field observations / site visits.

(B) Secondary data

The secondary data were collected from various offices, departments, libraries and websites. They are as fallows.

1. Talathi office of concerned villages of Khatav tahsil.
2. Circle office of Khatav tahsil.
3. Office of Block Development Officer (B.D.O.) Panchyat Samiti.
4. Tahsil office of Khatav tahsil.
5. Zilla, Sub Divisional, Tahsil Krishi Office.
6. Office of Soil and Water Conservation, Satara.
7. District Statistical Office, Satara.
8. Irrigation Department, Satara
9. Sakal Agro-one newspaper
10. Daily newspapers about area. (Lokmath, Pudhari, Sakal)

(C) Libraries

1. Tilak Maharashtra Vidyapeeth, Library Pune.
2. Bar. Balasaheb Khardekar Library, Shivaji University, Kolhapur.
3. Balwant College Library, Vita, Dist- Sangli.
4. Arts, Commerce, College Library, Mayani.
5. Neharu Vachnalaya, Mayani.

The Toposheet nos. 47k/1 to 47k/11 with the scale of 1:50,000 were used to analyze physiography, drainage pattern of the study area.

1.8 METHODOLOGY

The present study is based on the primary and secondary data. The primary data was collected through the intensive filed work using household schedule. The secondary data was collected from the government report, census abstract, socio-economic review, agricultural department reports etc. This data was analyzed for crop combination, crop ranking, and crop diversification method. J.C. Weaver's crop combination method was used to analyze the crop combination in the study area.

The digital elevation model is 3D representation of the terrain. The DEM was prepared using ArcGIS software and Shuttle Radar Topography Mission elevation data (SRTM) which was downloaded from the Global Land Cover Facility website (http://www.landcover.org/). The DEM is 3 dimensional representation of the elevation value of the particular area. The DEM of the Khatav tahsil is showing high elevation western side the gentle slope towards the eastern side. Most of the part of Khatav tahsil is having average elevation 300 to 620 m from the sea level. From the analysis of the DEM people generally predict the elevation of the area.

S.O.I. topographical sheets have been used for the study of spatial distribution, site and location of Watershed Development. Cartographic techniques i.e. line graph, bar graph, divided circle etc. have been used for the processing and analyzing of data. Various thematic and cartographic techniques are used to represent the data.

The random sampling method was adopted for selecting the case study. There are 143 villages in the Khatav tahsil. To study the performance of Watershed Development programme, which are implemented in the selected 25 villages only, out of which 8 villages (32 percent sampling) have been selected purposefully for study the impact of Watershed Development programme on socio-economic status of population. The selection of the villages is based on maximum work done in these villages. There were found 6456 land holders in these 8 villages. Out of these, we

have taken about beneficiary selected 326 farmers (about 5 percent) for the sample study. For best analysis and evaluation, we have used the "before and after method" in the sample study. This method too, proved the best in strengthening and confirming the collected information. Lastly conclusions were drawn and results were shown with the help of maps, graphs, tables and diagrams etc.

1.9 OUTLINE OF RESEARCH WORK

The entire study is divided into following seven chapters:

1. Introduction:

   Research Problem, Significance of Research, Hypothesis, Objectives, Study Area, Data Base, Methodology, Outline of Research Work, Limitations of the Study, Review of the Literature and References etc.
2. Geographical Background which covers physiography, geology, drainage, climate and demographic characteristics of the study area.
3. Watershed Development Programmes
4. Cropping Pattern
5. Case Study-Farmers of Selected Villages
6. Impact of Watershed Development on Socio-economic Status of Population
7. Conclusion and Suggestions

   Last, Seventh chapter presents conclusions and suggestions of the study.

1.10 REVIEW OF LITERATURE

There are research works investigated by referring different kind of literature. There is little published material particularly regarding to the impact of Watershed Development. These studies while addressing several issues have also focused the positive impact of Watershed Development on cropping, agricultural productivity, employment generation and increase in income amongst others.

Sing (1985), studied several efforts made by the central and state government and this efforts are grouped under six approaches such as 1) Multipurpose approach 2) The minimum package approach 3) Target group approach 4) Area development approach 5) Spatial planning approach 6) Rural development approach.

Singh and Yadav (1987), made an attempt to study the conservation and planning of water resources in Varanasi district. Area of under, over and balanced

utilization have been delineated and different conservation practices have been suggested taking into account the water requirement of area by 2001 A.D.

Vats (1987), applied remote sensing techniques in geomorphological investigation of Pali district western Rajasthan. He stated that these geomorphic unites have different physical potentials and provide a sound base for rational land use, soil and water conservation, planning and development maps he has produced the thematic maps, grid themes, digital elevation model (DEM), etc.

Chaugule (1987), in "Eco-Morphology Analysis of Warna Basin- A study in regional development", investigated the various aspects like geology, landforms and land use pattern of Warna basin and developed a spatial model of regional development for Warna basin.

Bilas, Ram (1988) has made a single contribution by researching into both quantitative and qualitative aspects of ground water for Waranasi District in east U.P.

Pawar, C.T. (1989), studied the relationship between the irrigation and agriculture. The relationship between agriculture and changes in crop productivity, intensity, crop combination, crop diversification and overall agricultural development with land degradation problem is also studied.

Gujar, Ram Kumar (1990), Attempts to cover geographical perspectives on irrigation system in arid and semi arid regions of India.

Seshgiri Rao (1993), used the remote sensing technique in mapping of basic parameters in field of watershed characterization and land degradation studies. He further stated that the landsat data had been very useful in watershed characterization and land degradation.

Rasid (1993), has given the well known scholars in the field of remote sensing. The articles focused on the application of remote sensing in spatial planning, management of ground water, resource mapping, watershed characterization and land degradation studies etc.

More-Patil (1995) has investigated the general land use and agriculture land use pattern by conventional methods and identified agriculture land use regions for Kolhapur district and also suggested land capability classification and land use planning for same region.

Bhatti, Vinita (1996) has made an attempt to study the groundwater development in India.

Jagadale (1996) attempted to study the geology, geomorphology and land use of the Dudhganga-Vedganga river basin by applying remote sensing techniques and suggested a spatial model for river basin management.

Pendase (1997), discussed about the development in Ralegansiddhi.

Omkar, Ramakrishna Rao (1997), made an attempt to study the impact of irrigation on land use patterns. According to them the impact of irrigation was manifold and is felt invariably in the land utilization pattern.

Tripathi and Viswakarma (1998), studied Land use, cropping pattern and levels of development in Banda district of U.P. According to them the pattern of land utilization is a function of four factors - land, water, air and man. Therefore, the study of land use pattern is of prime concern of geographers to know the relationship between man and natural environment. Nine-fold classification of land use regrouped into five categories for the convenience of the study.

Pawar, C.T. (1998) has attempted to study the impact of percolation tanks on the cropping pattern, land use pattern and socio-economic aspects with a case study of on percolation Tank in Kolhapur District.

The Kothapally study by **Wani et al** (2001) has shown significant impact of watershed management on crop production, increase in ground water level, reduction in run off water, increase in income, etc.

Ranade, Vidhyanand (2001) in his book "Panlot Kshetra Vikas Tantra Ani Mantra" presented the concept of Watershed Development and how it is useful for the prosperity of India. It further makes aware about the successful programmes of Watershed Development. e.g. Ralegansiddi, Babhulwadi etc.

Athvale (2003), analyses traditional practices of rain and surface water harvesting as well as more recent ones like check dams. The method of analysis of hydrological data and scientific basis for the water harvesting is also analysed.

Chitale, Madhav in his book (2005) 'Bhartiya Jalkrantiche Padechinhe' informs about the post-independence development and changes in watershed. It also discusses about social development, role of water irrigation and the importance of agricultural development. The central idea is "The Principal of rural regional development is depending on the development of proper irrigation system."

Dhamdhere, Suresh in his book (2005) "Maharashtratil Sinchan, Panlot Ani Jalsandharan" discussed the various problems like droughts in Maharashtra. He finds

"An increase in availability of irrigation system through Watershed Development and water conservation."

Dharashivkar, Mukund in his book (2005) "Dushkal Bhedsavtoy" discussed about the problems of availability of water, water storage system, successful programme of water management, importance of groundwater resources etc. He also suggested that "every drop of rain water should be percolated in the soil for sustainable development".

Mandal, Biswaijeet et. al (2006) have studied "Impact Evaluation of Watershed Development Project on Socio-economic Indicators - A case study." According to them there was an increase in net cultivated area by 4.7 percent, cropping intensity by 16 percent, productivity in all the crops, favorable changes in animal husbandry components, employment states, household income and consumption level of household unites are pre-project period and outside the watershed area."

Bhosale, S.M. (2007) has studied various schemes of water conservation and its impact on beneficiaries of water conservation schemes, cropping and land use pattern in Khanapur taluka of Sangli District.

Hanumantha Rao, **C.H.** has pointed out "Watershed Development has been conceived basically as a strategy for protecting the livelihoods of the people inhabiting the fragile ecosystems experiencing soil erosion and moisture stress"

Sai Hin Lai et al. (2007) studied application of remote sensing and GIS in the hydrological study of the upper Bernam river basin of Malaysia with the help of toposheet and soil.

All these studies are based on different types of Watershed Development (water conservation) with a macro and micro focus. Most of the studies have been conducted on the wells, tube wells, minor irrigation projects, ponds, tanks and different types of Watershed Development Programmes. It has been popularized in most of the dry zones of Maharashtra State. Its impact on exclusive farmers under command is an interesting topic to study the macro and micro implication of Watershed Development Programme.

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CHAPTER II

GEOGRAPHICAL BACKGROUND

2.1 INTRODUCTION

Khatav tahsil has uneven geographical settings and background. It has different natural perspective. Generally, the geographical setting and background includes location, physiography, geology, climate, drainage, soil etc. natural factors. Also, it contains demographic structure, settlement pattern, land use pattern and transport network.

2.2 LOCATION

The study area encompasses the south-western part of Maharashtra. Khatav tahsil is located between $17^0$39' to $18^0$11' north latitude and $73^0$33' to $74^0$54' east longitude which surrounded by the east- Man tahsil of Satara district, to the south- Sangli district, to the west-Karad and Koregaon tahsil of Satara district, to the north- Phaltan tahsil in Satara district. According to (Census 2011) Khatav tahsil area is 1377.79 sq. km., No. of villages 143, number of houses 59699, rural population 2,75,274 persons. Total population 2,75,274 persons. (male-1,36,802; female-1,38,472) population density 200 persons per sq. km. (fig. 2.1)

KHATAV TAHSIL: LOCATION

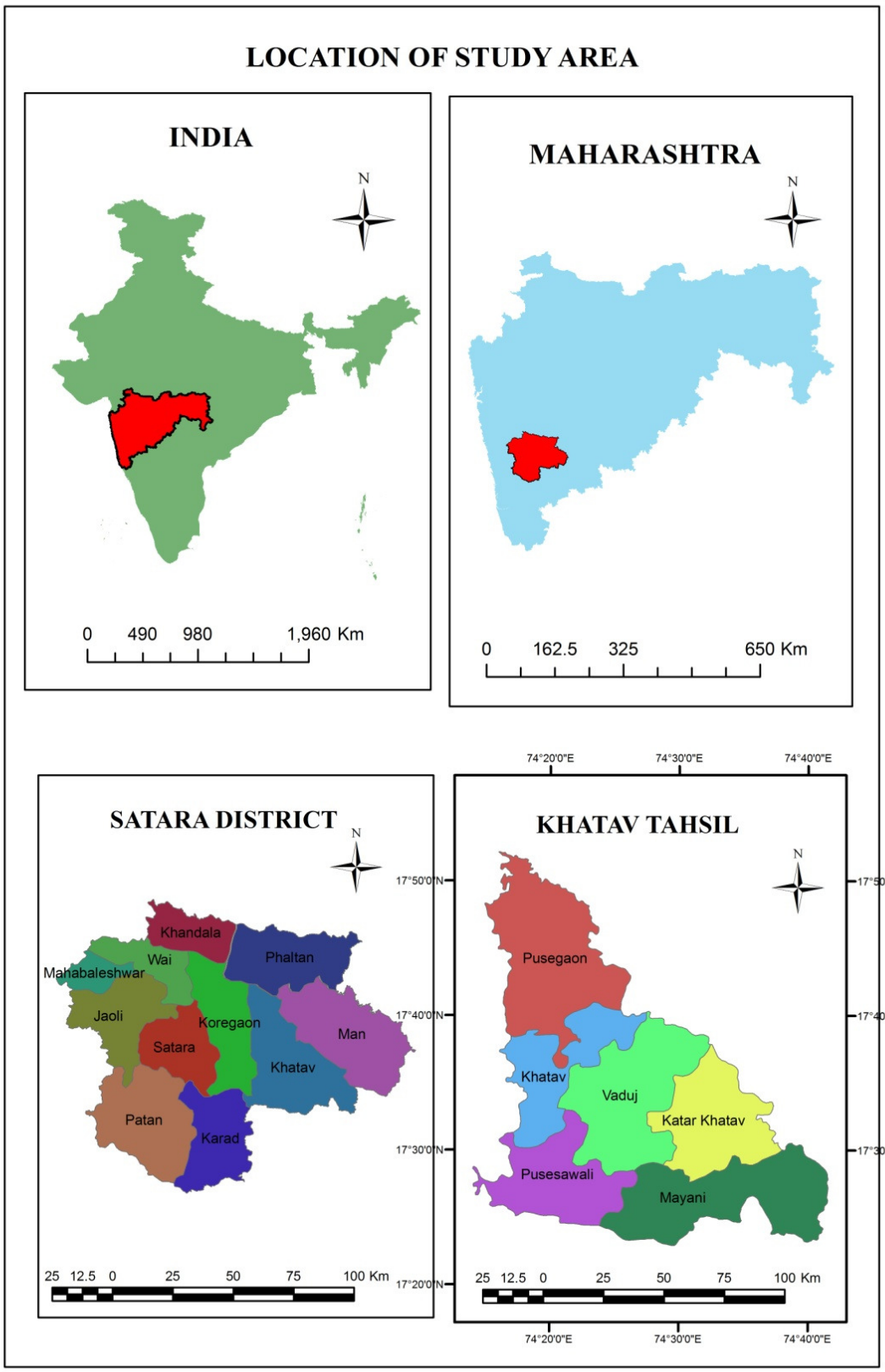

Fig. 2.1

Khatav tahsil is drought-prone, hilly and rain shadow area, east part of Satara district. In west to east rainfall decreases Vaduj has yearly average rainfall 512.2 mm. solaknath, bhapshah, vardhangarh, bhushangarh four hills. Tahsil village name is Khatav, but administrative village name is Vaduj. Yerala is main seasonal river in the tahsil (length 120 km.). In this area Vaduj, Pusegaon, Aundh, Pusesawali, Mayani, Khatav, Kaledhon, are big villages.

2.3 PHYSIOGRAPHY:

The physiography comprises the physical environment which determines the Watershed Development programmes. The physical base particularly the relief, drainage, slope, geology, climate and soil play a vital role in Watershed Development programme.

2.3.1 RELIEF

As Watershed Development programme is concerned, relief plays dominant role. Relief is an important element which is directly influences on the Watershed Development programme. The Khatav tahsil is a part of Maharashtra Deccan basaltic plateau with an average height of 600 meter above mean sea level. Some parts of Mahadev hill ranges has come in the tahsil. This tahsil has four hills- solaknath, bhapshah, vardhangarh and bhusangarh. The solaknath hill range has Northern part, bhapshah hill range central part, vardhangarh hill range north-western boundary and bhusangarh hill range southern part of Khatav tahsil. There are two hill forts in the tahsil. The bhosangarh fort is located in the south part and vardhangarh fort is located in north–west part of Khatav tahsil. (fig.2.2)

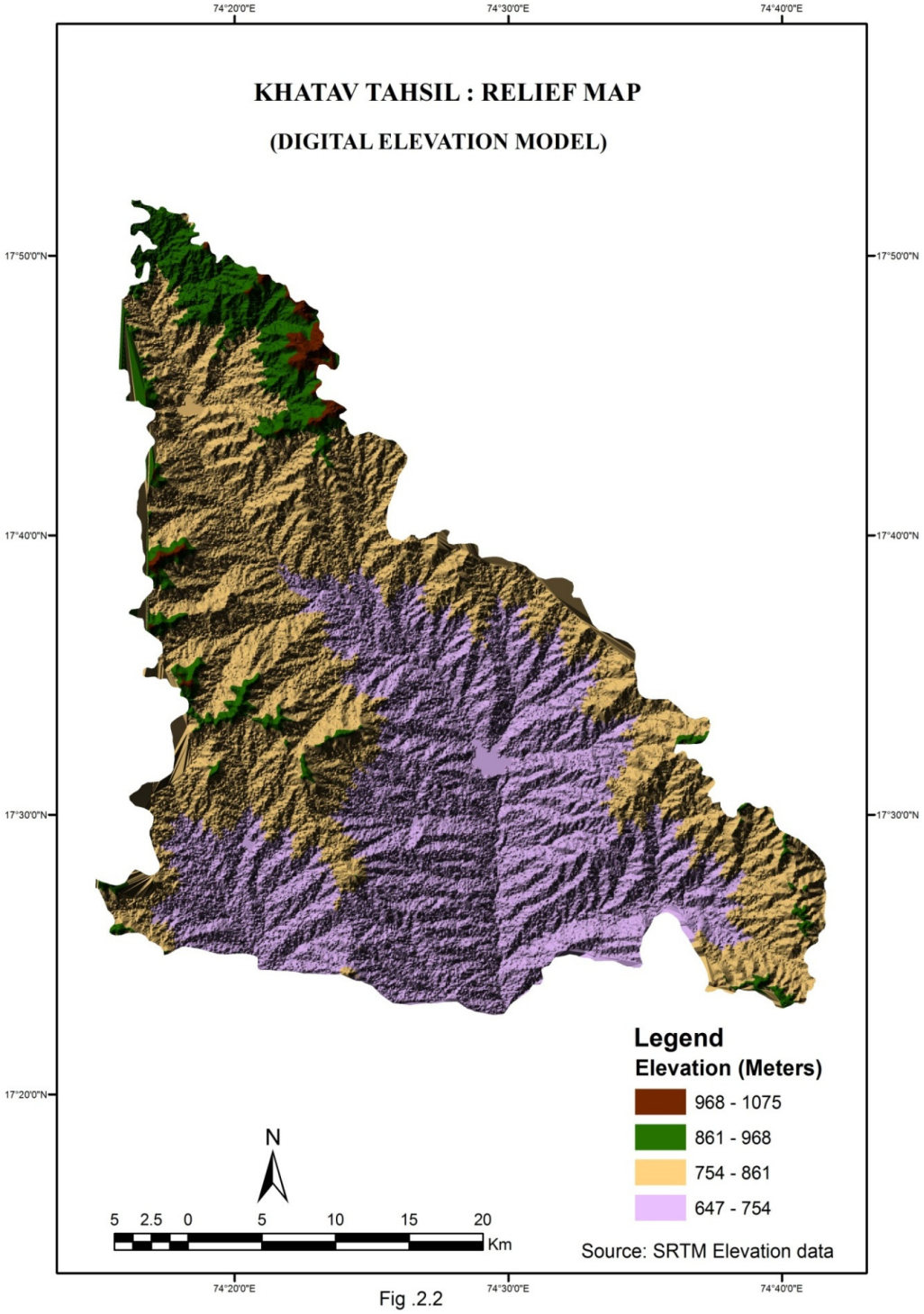

Fig .2.2

A) RELIEF DIVISION:

The study area, on the basis of altitude above mean sea level, can be divided into three relief divisions.

a) HILL RANGES b) FOOT HILLS c) PLAIN AREA

Table No. 2.1
Khatav tahsil: Areal Extent of Relief Division

Sr. No.	Particular	Altitude	Area in %
1.	Hill range	> 900 m	32.06
2.	Foot hill	600 to 900 m	44.12
3.	Plain area	< 600 m	23.82
	Total area		100.00

Source: I.S.O. Toposheet No. 47K/1 to 47K/11.

a) HILL RANGES:

This physiographic division includes area with the altitude of 900 m. to 1200 m. and above. The hilly ranges cover 32.06 percent of the entire area of the tahsil. (Table No. 2.1). The major portion of the hilly ranges comes in the north and north-western part of the study area. This zone consists of scarps of Mahadev hill range and steep basaltic walls. A large area of this division is under sparse forest cover. This area presents the picture of erosion and ruggedness of landscape. Due to the hilly topography proportion of area under cultivation is small.

b) FOOT HILLS:

The area having altitude between 600 m. to 900 m. comes under this division includes the central, South and eastern part of the study area. This division covers 44.12 percent area of the tahsil. (Table No. 2.1). The average gradient in this relief division varies from 10 to 30 meters per kilometer. Most of the area in this category is covered by the shrub, grasses and deciduous forests.

c) PLAIN AREA:

The plain area covers major portion of the river valley draining the land towards north-west to south part of Khatav tahsil. This physical division includes an altitude below 600 m. which shares 23.82 percent of the total area of the tahsil (Table No. 2.1). The average gradient of this relief division varies from 1 to 10 m. per kilometer. The soils are black deep soil. Besides these it is agriculturally developed area having dense population.

Thus the analysis reveals that there is little scope for agriculture in north part of the tahsil.

2.4 GEOLOGY

The area mapped is covered by basaltic flows and one or two patches of laterite. In all, fifty three basaltic flows have been identified in pile of 842 m thick rocks from 564 m to 1408 m above the mean sea level. Out of these, 42 are of the aa type and the remaining of pahoehoe type. The flows have been intruded by four dykes. Along the course of some streams thin alluvium has been deposited in recent times.

Basaltic flows

The are flows are recognized by a thin, impersistent basalt clinker, a middle portion of dark, dense, compact rock, and a top portion of reddish ana pinkish flow breccia. Sometimes empty or filled, drawn vesicles are also seen. The topmost layer is generally red or green clayey material, called as “red or green bole". The pahoehoe flows generally consists of more than one unit. The individual units are identified by pipe amygdules near the base, a middle massive part, and a top portion with numerous spherical vesicles filled with silica and other secondary minerals. Top surface of a pahoehoe unit sometimes show ropy structures and squeeze ups. Top most surface of a pahoehoe flow exhibits redd-ened crust or it might have got altered to form a redbole layers. The basalt flows of Deccan Traps ranges in age from upper Cretaceous to lower Eocene. Dykes and laterite are of post-Deccan Trap age. Individual flow varies in thickness from 6 m. to 61 m.

Deccan Traps

By far the greater portion of the Khatav tahsil is covered by the basaltic and amygdular lavas which have come to the surface and spread over very vast areas of the then Central India configuration of land at the commencement of the Tertiary or Cenozoic Era, nearly 60 to 100 million years ago. These lavas are spread in the form of horizontal sheets or beds. Because of their tendency to form plateaux and their dominantly basic composition, the lava flows are generally called "Plateau basalts." As these basaltic lava flows cover almost the entire Deccan region and frequently present a step-like or terraced feature on the hills, they are termed as “Deccan basalts” or more commonly the “Deccan traps.” (Fig. 2.3)

KHATAV TAHSIL: GEOLOGY

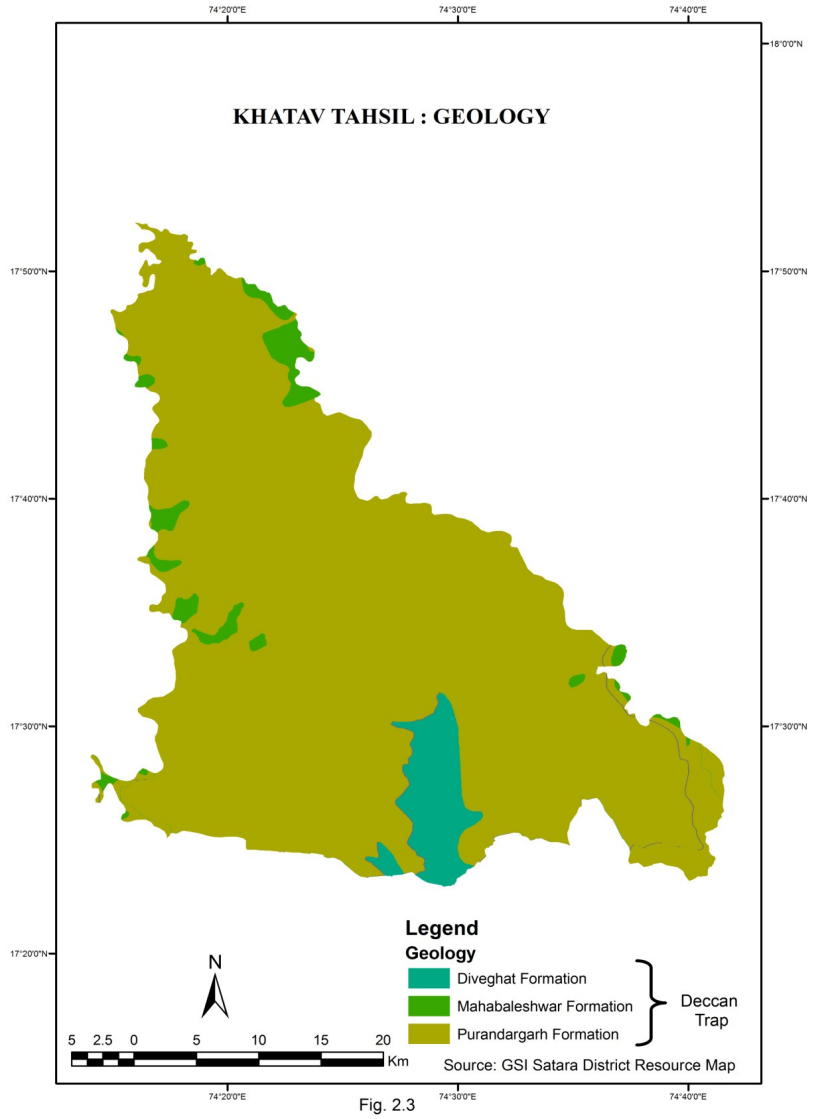

Fig. 2.3

The Deccan traps, as mentioned earlier, cover almost the whole of the tahsil and constitute the innumerable rugged and bold, flat-topped hills, forming extensive plateau. They also constitute the small hill ranges in the eastern and central parts of the tahsil. Besides, lava flows also blanket the plains with a soil covering of varied thickness. A remarkable feature of the traps is their horizontal disposition and considerable lateral extension over a wide area; sometimes a single flow covering nearly 300-400 square miles or even more. In places it also shows slight dip. Characteristic vertical, prismatic and columnar jointing are commonly observed in the hard and compact basalts. The traps weather in concentric layers giving rise to a soft, greenish grey, friable murum leaving a hard, rounded bouldery core in the centre, known as spheroidal weathering.

2.5 DRAINAGE

The drainage pattern influenced on economic and social life of people, as it is necessary to study drainage pattern to bring out changes in the population characteristics. The variation in relief division of the study region has influenced the drainage pattern. There are several rivers like mainly the Yerala river and her tributaries- the Nani river, the Karpur river and the Chand river. And also many other big and smaller streams drain in the tahsil which shown in Fig. 2.4.

KHATAV TAHSIL: DRAINAGE

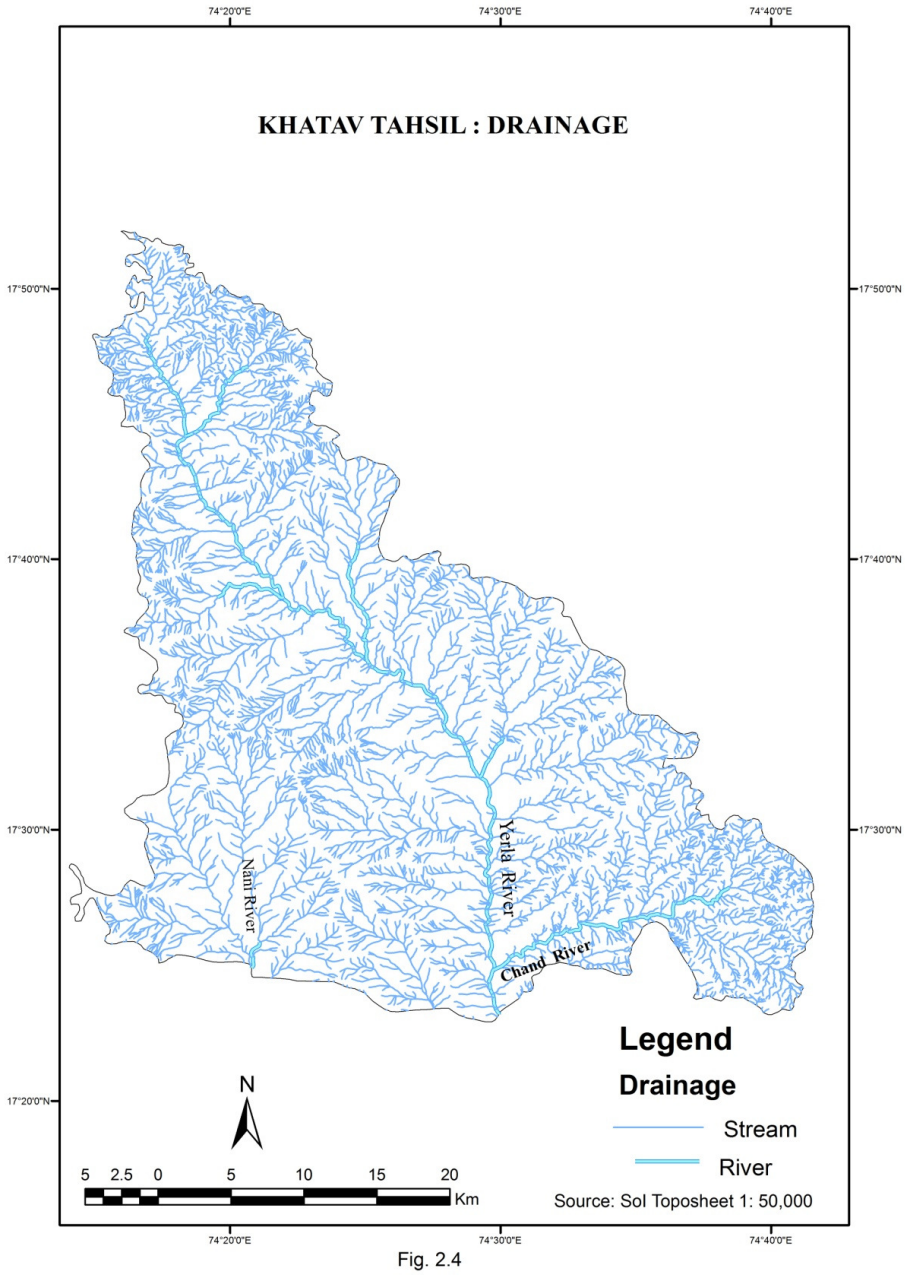

Fig. 2.4

2.5.1 THE YERALA BASIN

Yerala is the main river in the study region. It is large tributary of the Krishna river. The Yerala river originated near Manjarwadi village which located at the Solakhnath hill from the distance of 29 km. at northern direction of Vaduj village. This river originated at the height of 928 m. from above sea level. Between the Vardangarh fort and the Mahimangarh fort, Firstly it fastly flows south-east until the Vaduj village and after village she flows south ward direction. In Khatav tahsil, this river has 120 km. length and 3,977 sq. km. catchment area. Yerala river has been flowing in Mol, Diskal, Lalgun, Khatav, Vaduj, Nimsod and Chitali villages respectively in the tahsil. This river joins left side to Krishna river near Bruhmanal village which located east side of Asthta village in Sangli district. This river has well quality sandy bed and alluvial soil on two sides. In the time of British period i.e. in 1876, earthen dam near Ner village and Yeralwadi dam (1977) near Banpuri village constructed on the river Yerala. These two dams have located in Yerala basin which check and store the water to form reservoir which supports needs of drinking water and agriculture in the drought-prone area. The fertile soil, assured water supply, favorable climate and innovative sprit of famers have encouraged the sugarcane, wheat and cash crops cultivation in the Yerala basin, which is the base of the region's agricultural economy. (Fig. 2.4)

The Nani river is the largest sub-tributary of Yerala river, which originated near Aundh village. This river flows in Khatav tahsil of Satara district and Khanapur tahsil of Sangli district. This river flows south-east direction. This river joins right side to Yerala river near east side of Kadegaon village in Sangli district. (Fig. 2.4)

The Chand river is the smallest sub-tributary of Yerala river, which originated near Pachwad village in hilly area in Khatav tahsil. This river flows in Khatav tahsil of Satara district and Khanapur tahsil of Sangli district. This river flows south-east direction. This river joins right side to Yerala river near east side of Kadegaon village in Sangli district. (Fig. 2.4)

2.6 CLIMATE

The climate of the study region is monsoon type, which plays a major role and influences on settlement pattern and agriculture. In fact, the climate of region is considered as one of the important geographical factor, which influences on the socio-economic status of population and distribution of population.

An average of weather conditions at a place over a long period is called the climate of the place, various elements of climate such as temperature, rainfall, humidity, and wind influences on human life. Among them temperature and rainfall exerts more influences on the distribution of population. (Sawant and Athavale, 1994).

According to Ghosh (1985), a good climate is precondition for human settlement. The materialistic civilization is a product of physical health and mental energy imparted by good climatic environment.

Khatav tahsil comes in rain shadow area. In this tahsil, rainfall has decreasing from west to east. There occurs after every 3-4 years drought-prone condition. Normally, this tahsil is observed the rainfall between 450 mm. and 550 mm. and temperature maximum 36 ^{0}C and minimum 14 ^{0}C.

2.6.1 Temperature

In the study area, temperature data is collected from few stations i.e. Vaduj, Khatav, Pusegaon, Aundh, Pusesawali, Mayani, Katar Khatav and Ambawade. Table 2.2 shows some salient features of temperature in the study region.

A) Rainy Season:

In the study region June to September is rainy season. In the second week of June the south-west monsoon arrives in the study region. Month July and August are the rainiest months, and during this period rainfall is widely distributed. The temperature is lower than cool season. The mean daily temperature in July recorded at Vaduj is 30.4 ^{0}C, at Khatav is 30.9 ^{0}C, at Pusegaon is 28.7 ^{0}C, at Aundh is 29.1 ^{0}C, at Pusesawali is 28.4 ^{0}C, at Mayani is 30.7 ^{0}C, at Katar Khatav is 30.6 ^{0}C and at Ambwade is 29.4 ^{0}C respectively. From the end of month September climatic conditions are changing, temperature starts to rise, wind direction is mainly from north-east and east, and days are quite warm. During this period rainfall distribution is quite variable and ranges between 514 mm in the west and 487 mm in the east.

B) Winter Season

October to January is cool season in the study region. The temperature starts to rise from October but it comes down from the month of November. The month December and January recorded coldest months of the year. The daily range of temperature is highest during the cool season. Mean minimum temperature recorded at Vaduj is 15.4 ^{0}C, at Khatav is14.9 ^{0}C, at Pusegaon is 12.8 ^{0}C, at Aundh is14.5 ^{0}C,

at Pusesawali is 14.9 ^{0}C, at Mayani is 14.8 ^{0}C, at Katar Khatav is 14.2 ^{0}C and at Ambawade is 13.9 ^{0}C in the month of January respectively. (Table 2.2) Early in the morning, fog is the common climatic phenomena of this cool season. The sunshine is bright with the clear sky and from north east direction wind flows in this season.

C) Hot Summer Season

In the study region February to May is hot season. Temperature starts to rise from March and reaches to the highest in May as it is the highest warm month in the region. During the hot season higher temperature recorded in the east than in the west. The mean maximum temperature recorded at Vaduj is 39.5 ^{0}C, at Khatav is 39.7 ^{0}C, at Pusegaon is 38.2 ^{0}C, at Aundh is 38.7 ^{0}C, at Pusesawali is 38.1 ^{0}C, at Mayani is 39.8 ^{0}C, at Katar Khatav is 39.8 ^{0}C and at Ambawade is 38.9 ^{0}C in the month of May respectively. The daily range of temperature is high all over the district. During the hot season, wind directions vary but westerly winds are more common in the afternoon. The thunderstorms, which are usually, occur with heavy rainfall or hails and high speed winds.

2.6.2 Rainfall

As regard in distribution and density of population is concerned rainfall play important role. Rainfall is an important element, which is directly an influence on the drainage pattern and in turn of agricultural activity and settlement. Amount of rainfall influences on human life to a considerable extent. From the point of view of human life, it is not only the amount of rainfall that matters but it's distribution over the year is quite significant. If rainfall is well distributed over the year, it helps agricultural as well as it helps in raising ground water level. There by influences distribution of population, its density and occupational structure. The density of population decreases with a decrease in rainfall and increases with an increase in rainfall. (Sawant and Athawale, 1994)

A) Average Annual Rainfall

In the tahsil, monsoon has unequal distribution from part to part which ranges between 490 mm. to 512 mm. The average annual rainfall recorded at Vaduj is 512.2 mm, at Khatav is 516.3 mm, at Pusegaon is 521.3 mm, at Aundh is 513.9 mm, at Pusesawali is 520.8 mm, at Mayani is 513.8 mm, at Katar Khatav is 516.2 mm and at Ambawade is 517.1 mm respectively. The Pusegaon village has come near the

vardhangarh hill range, Yerala river drainage, Ner percolation tank, open scrub and reserved forest cover; hence this area gets 475 mm. to 550 mm. rainfall, which can be called heavy rainfall zone. (Table 2.2 and Fig. 2.5)

Table 2.2

KHATAV TAHSIL: AVERAGE ANNUAL RAINFALL AND TEMPERATURE

Sr. No.	Villages	Average Annual Rainfall in mm	Average Annual Temperature	
			Maxi. ^{0}C	Mini. ^{0}C
1	Vaduj	512.2	36.5	15.4
2	Khatav	516.3	36.7	14.9
3	Pusegaon	521.3	34.2	12.8
4	Aundh	513.9	36.7	14.5
5	Pusesawali	520.8	36.8	14.9
6	Mayani	513.8	37.3	14.8
7	Katar Khatav	516.2	37.3	14.2
8	Ambawade	517.1	36.1	13.9
Tahsil Average		516.3	36.4	14.4

Source: Socio-Economic Review and District Statistical Abstract of Satara district (2010-2011)

KHATAV TAHSIL: AVERAGE ANNUAL RAINFALL AND TEMPERATURE

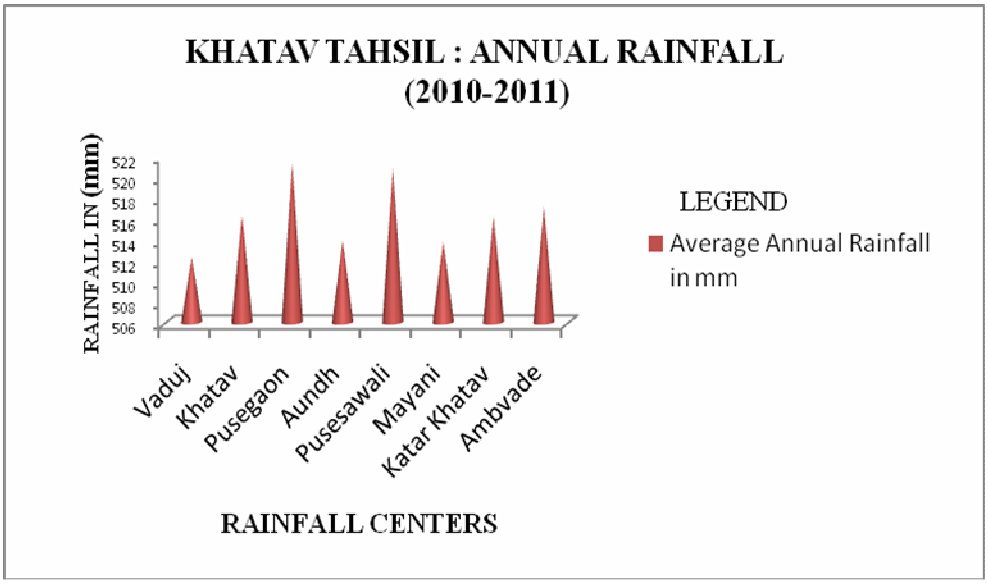

Fig. 2.5

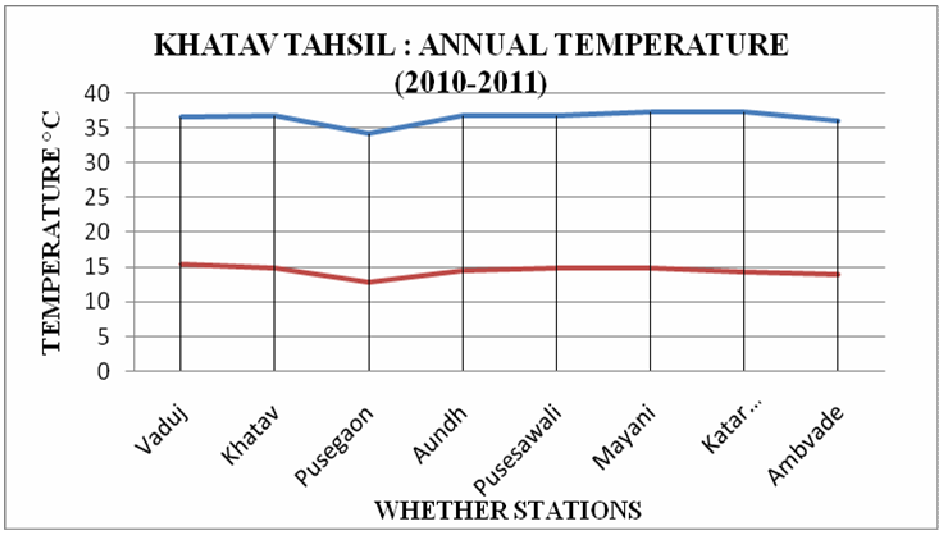

Fig. 2.6

The isohyets run in north-south direction and very close in north western part of the region are shown in table 2.2. In this zone, the rainfall decreases from western part towards the eastern part.

Normally, the central and south part has foot hill and plain zone, including village circles of Pusegaon, Khatav, Aundh and Pusesawali have been lies in moderate rainfall zone, which receives 450 mm. to 550 mm. precipitation. In this zone rainfall decreases towards west to east. Eastern part of the study region is drought-prone area, which lies in the rain shadow area, where as most eastern part of village circles Katar Khatav, Vaduj and Mayani have been lies in low moderate rainfall zone, which receives 450 mm. to 520 mm. precipitation. There is drought-prone area and always shortage of drinking water.

B) Seasonal Distribution of Rainfall

In the study region, seasonality is an important characteristic of the rainfall. Although the precipitation is all the seasons, but it is mainly during the south west monsoon, followed by the north east monsoon periods. However, 70 to 90 percent of the mean annual rainfall of the region is received during south west monsoon period from June to September. North eastern monsoon takes place from the second half of September. In these periods rainfall had decreased from east towards west.

In the cool season from October to January rainfall is very less throughout the region. It is maximum 2 percent throughout the region and decreases from east towards west. During the hot season maximum rainfall is over 8 percent received and distribution is unequal. It decreases from north western towards west. The rainfall

occurs with thunderstorms and heavy rain or hails in the hot season. (Table 2.2 and Fig. 2.5)

The analysis of seasonal distribution of rainfall indicates that the rain is insufficient in the north eastern parts and adequate in central and western part of the study region.

2.7 SOIL

The variation in soil may result in local variation in land use, and in turn of socio-economic status of population in Khatav tahsil. Soil condition and agricultural development are closely associated and strongly reflected in socio-economic status of population. The nature of soil is collectively influenced by relief, nature of parent rocks, climate and vegetation. Wherever these factors are favorable, soil has been formed and agriculture has flourished. The higher fertility of soil is good for agricultural and therefore regions having well socio-economic status of population. Socio-economic statuses of population are generally low due to thin layer of soil over slopes. The variation in soil, color, texture, fertility may result in local variation of land use, and in turn of population distribution. (Sawant and Athawale 1994)

Generally, the Khatav tahsil has following types of soil.

a. Dark Brown
b. Brown
c. Light Brown
d. Red Brown
e. Black

Table 2.3

KHATAV TAHSIL: SOIL DISTRIBUTION

Sr. No.	Soil Type	Area in Hectares	Area in %
1	Dark Brown	27467.2	20.30
2	Brown	44446.9	32.82
3	Light Brown	32461.2	23.98
4	Red Brown	30463.6	22.50
5	Black	499.4	00.40
Total		135338.2	100.00

Source: - Compiled by the Researcher from Field Survey, 2012.
* Figures above Parentheses indicates the area in hectare
** Figures in Parentheses indicates the Percentage value

Dark Brown Soil:

The regional distribution of black soil occurs along the banks of Yerala river comprising the areas of Diskal, Ner Village, Pusegaon, Katgun, Khatav, Vakeshwar, Vaduj, Ambawade and Chitali etc. villages. This soil is covering area near about 27,467.2 hectares which is the 20.30 percent area of total soil area. (Table 2.3 and Fig. 2.7)

Brown Soil

The major portion of Khatav tahsil is covered by brown soil. This soil covers area about 44,446.9 hectares which is the 32.82 percent area of total soil area. (Table 2.3 and Fig. 2.7)

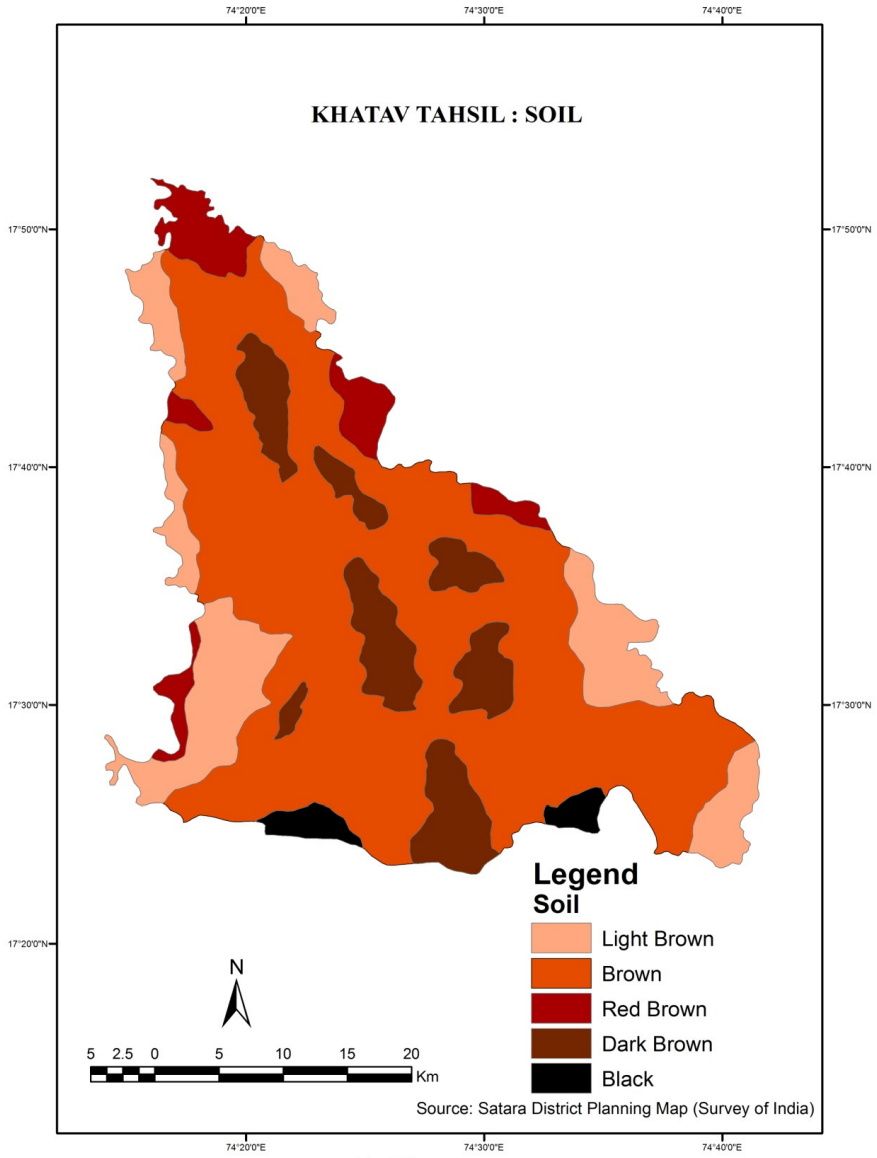

Fig. 2.7

Light Brown Soil:

This soil is found in the western and eastern foothill region occupying 32,461.2 hectares area which is the 23.98 percent area of total soil area. (Table 2.3 and Fig. 2.7)

Red Brown Soil:

Red brown soil is confined to western and eastern margins located at higher altitude above 800 m. It has covered about 30,463.6 hectares area which is the 22.50 percent area of total soil area showing deficiency in different elements. (Table 2.3 and Fig. 2.7)

Black Soil

The patches of black soil are found in the areas of Maradwak and Morale village. This soil is covering area about 499.4 hectares which is the 0.40 percent area of total soil area. (Table 2.3 and Fig. 2.7)

2.8 DEMOGRAPHIC STRUCTURE

Population provides the basic resource to agriculture in various forms. The land use gets modify based on the needs of people. Population growth and literacy are the most important factors in bringing about recommended agricultural changes in an agrarian society (Gaikwad, 2005).

2.8.1 Population in Khatav tahsil

The demographic structure may refer to many aspect of population ecology. It involves population, density of population, sex-ratio, literacy rate, illiteracy rate, migration and occupational structure.

According to 2011 census, Khatav tahsil has 2,75,274 total populations. Total male population has 1,36,802 and total female population is 1,38,472 in the tahsil. This tahsil has not the urban population, all the population comes in the rural population background. (Table 2.4 and Fig. 2.8)

Table 2.4

KHATAV TAHSIL: POPULATION

Year	Total Population	Population Growth	Male Population	Female Population
1961	1,55,930	-	79,377 (50.90%)	79,533 (49.10%)
1971	1,77,501	21571	85,600 (48.22%)	91,901 (51.78)
1981	2,02,701	25200	96,186 (47.45%)	1,06,515 (52.55%)
1991	2,34,182	31481	1,13,444 (48.44%)	1,20,738 (51.56%)
2001	2,60,951	26769	1,28,943 (49.41%)	1,32,008 (50.59%)
2011	2,75,274	14323	1,36,802 (49.70%)	1,38,472 (50.30%)

Source: District Census Handbook, Satara (2011).

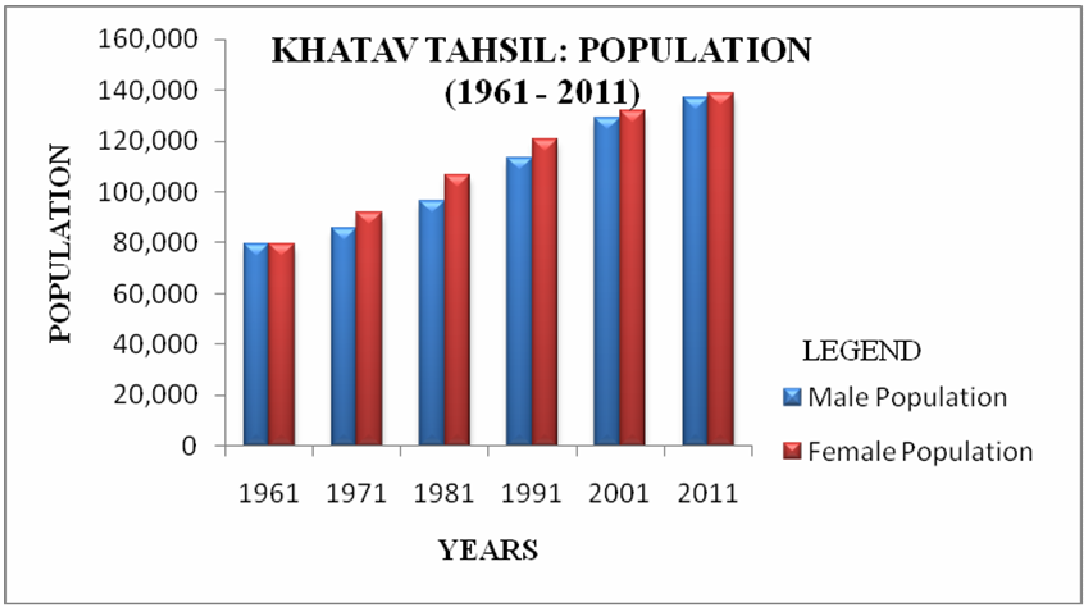

Fig. 2.8

Table 2.4 and Fig. 2.8 shows in 1961, there was 1,55,930 population, 50.90 percent male population and 49.10 percent female population which increases by 21,571 population in year 1971. In 1971, there was 1,77,501 population, 48.22 percent male population and 51.78 percent female population which increase by 25,200 population in year 1981. In 1981, there was 2,02,701 population, 47.45 percent male population and 52.55 percent female population which increase by 31,481 population in year 1991. In 1991, there was 2,34,182 population, 48.44 percent male population and 51.56 percent female population which increases by 26,769 population in year 1971. In 2001, there was 2,60,951 population, 49.41

percent male population and 50.59 percent female population which increases by 14,323 population in year 2011. In 2011, there was 2,75,274 population, 49.70 percent male population and 50.30 percent female population.

Table 2.5
KHATAV TAHSIL: MAJOR RURAL CENTERS
(Population more than 5000)

Ranking	Village Name	No. of Households (2001)	No. of Households (2011)	Population (2001)	Population (2011)
1	Vaduj	3143	3848	15547	17636
2	Khatav	1924	2201	9425	9827
3	Mayani	1813	2317	9342	10872
4	Pusegaon	1750	2018	8591	9180
5	Kaledhon	1280	1520	6825	6915
6	Nimsod	1337	1452	6753	6984
7	Chitali	1345	1309	6044	5802
8	Budh	1108	1227	5536	5828
9	Aundh	1174	1292	5510	5653
10	Kuroli	1066	1158	5389	5519
11	Pusesawali	1070	1279	5218	5982

Source: District Census Handbook, Satara (2001 and 2011).

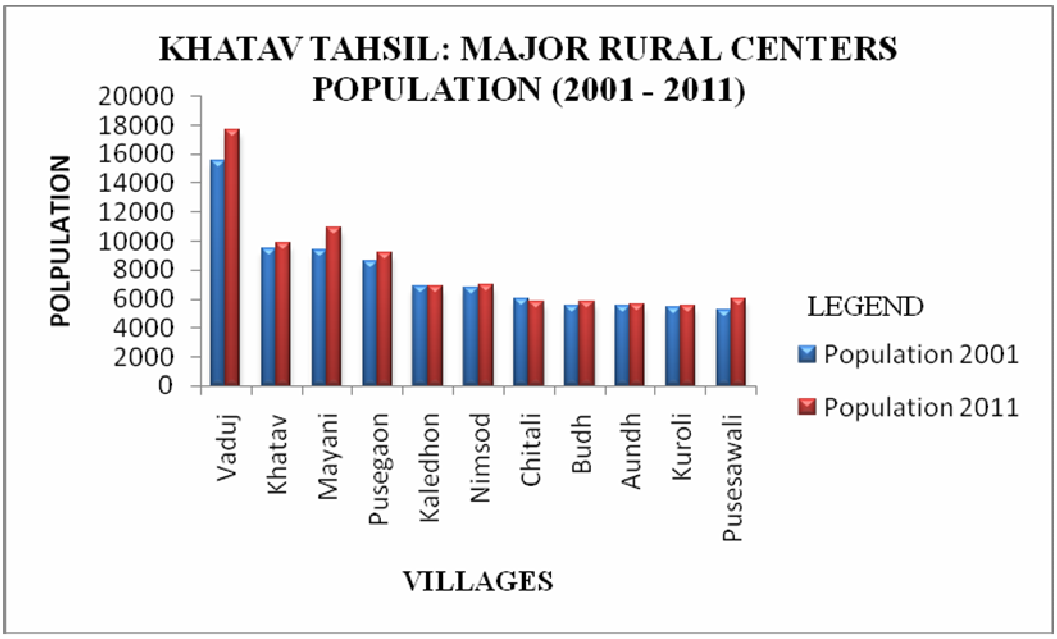

Fig. 2.9

Table 2.5 and Fig. 2.9 shows the major populous centers of Khatav tahsil in the 2001 and 2011. Vaduj village has dominant household and population in the

Khatav tahsil. This village has 15,547 household and 17,636 populations. Pusegaon village has second dominant household and population in the Khatav tahsil. This village has 9,342 household and 10,872 populations. Khatav village has third dominant household and population in the Khatav tahsil. This village has 9,425 household and 9,827 populations.

2.8.2 LITERACY IN KHATAV TAHSIL:

The term literacy is one of the very significant qualitative indictor of social development associated to the economic development. Even today education is the most intrinsic instrument for changing the socio-economic status of an individual and society as a whole. "Literacy is an index of human development and quality of human life". Poor literacy hinders economic development and in case of females even retards the progress of family planning programmes (Tiwari, 2006).

According to 2001 census, Khatav tahsil had 1,74,649 total literate populations. Total male literate population was 96,650 and total female literate population 77,999 in the tahsil. Also this tahsil had 86,302 total illiterate populations. Total male illiterate population was 32,293 and total female illiterate population was 54,009 in the tahsil. (Table 2.6)

Table 2.6

KHATAV TAHSIL: LITERACY RATE

(in Percentage)

Year	Total Population Literacy	Growth of Literacy Rate	Total Population Illiteracy	Growth of Illiteracy Rate	Male		Female	
					Literacy	Illiteracy	Literacy	Illiteracy
1991	65.13	---	34.87	----	79.17	20.83	52.25	47.75
2001	66.92	+1.79	33.08	-1.79	74.95	25.05	59.08	40.92
2011	72.11	+5.19	27.89	-5.19	77.90	22.10	66.29	33.71

Source: District Census Handbook, Satara (2011).

Table 2.6 shows, the literacy rate of Khatav tahsil. In 1991, there was 65.13 percent literate population, 79.17 percent male literate population and 52.25 percent female literate population. There is increase by 1.79 percent literate population in year 2001. In 2001, there was 66.92 percent literate population, 74.95 percent male literate population and 59.08 percent female literate population. There is increase by 5.19 percent literate population in 2011.

Also in 1991, there was 34.87 percent illiterate population, 20.83 percent male illiterate population and 47.75 percent female illiterate population. There is decrease of 1.79 percent illiterate population in 2001. In 2001, there was 33.08 percent literate population, 25.05 percent male literate population and 40.92 percent female literate population. There is decrease of minus 5.19 percent illiterate population in the 2011.

2.8.3 DENSITY OF POPULATION

Population density is the most fundamental demographic process with which all other demographic attributes are directly or indirectly associated. Population growth determines density, distribution pattern and composition of population. (Ghosh 1985)

The density of population is increasing day by day with increase in population. It affects on the resource utilization and conservation as well as impacts on social and economical development of region. The overall tahsil having the density was 113 in 1961, 129 in 1971, 147 in 1981, 170 in 1991, 189 in 2001 and 200 in 2011 per sq. km. (Table 2.7 and Fig. 2.10)

Table 2.7
KHATAV TAHSIL: POPULATION DENSITY
(in Percentage)

Year	Total Population	Population Density (in sq./km.)	Population Density Growth
1961	1,55,930	113	---
1971	1,77,501	129	16
1981	2,02,701	147	18
1991	2,34,182	170	23
2001	2,60,951	189	19
2011	2,75274	200	11

Source: District Census Handbook, Satara (1961-2011).

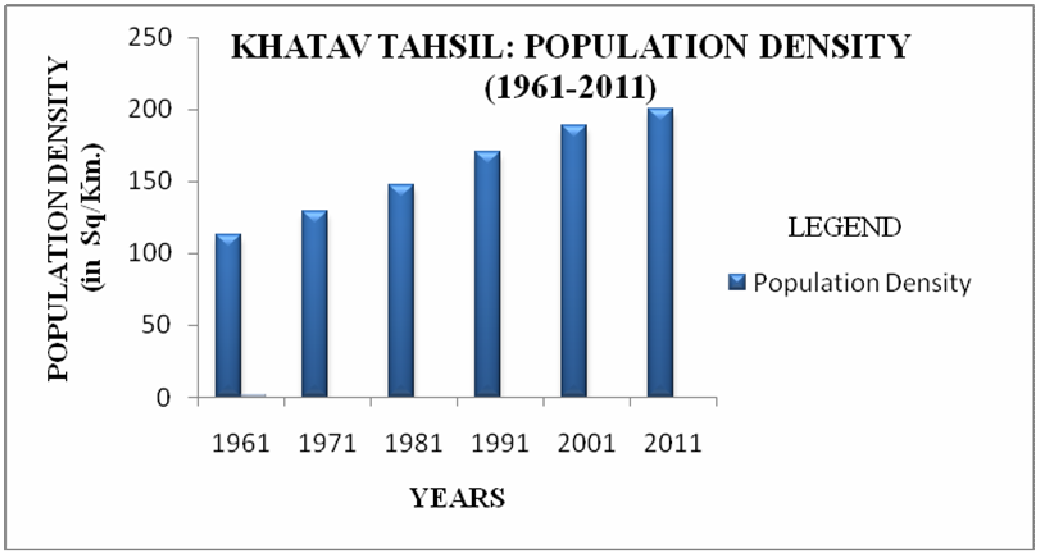

Fig. 2.10

Table 2.7 and Fig. 2.10 shows, in 1971 Khatav tahsil has 16 persons, 18 persons in 1981, 23 persons in 1991, 19 in 2001 and 11 persons in year 2011 growth increase density per sq. km. Between the year 1991 and 2001, the population density decreases by 4 person per sq. km., because during these ten years, there has increase of socio-economic status i.e. it has effect of high literacy, employment, trade and higher education migration.

2.8.4 SEX-RATIO

Sex ratio is the basic tool for the analysis of the composition of population. Apart from its directly influences of married persons in a population and birth rate, it also determines the socio-economic and political structure of the population. The Sex ratio reflects the socio-economic conditions prevailing in an area and is a useful tool for regional analysis.

Sex ratio is most commonly used measure in the analysis of sex structure, over the world. In India, sex ratio is defined as "Number of females per 1000 males in population." The sex ratio is calculated by the following formula:

Sex Ratio = $P_f / P_m * 1000$

Where,

P_f = Total Female Population,

P_m = Total Male Population

The overall tahsil having the sex-ratio was 1002 in 1961, 1074 in 1971, 1107 in 1981, 1064 in 1991, 1024 in 2001 and 1012 in 2011. (Table 2.8 and Fig. 2.11)

Table 2.8

KHATAV TAHSIL: SEX-RATIO

Year	Male Population	Female Population	Sex Ratio	Growth of Sex- Ratio
1961	79,377 (50.90%)	79,533 (49.10%)	1002	---
1971	85,600 (48.22%)	91,901 (51.78)	1074	+72
1981	96,186 (47.45%)	1,06,515 (52.55%)	1107	+33
1991	1,13,444 (48.44%)	1,20,738 (51.56)	1064	-43
2001	1,28,943 (49.41%)	1,32,008 (50.59%)	1024	-40
2011	1,36,802 (49.70%)	1,38,472 (50.30%)	1012	-12

Source: District Census Handbook, Satara (1961-2011).

KHATAV TAHSIL: SEX-RATIO

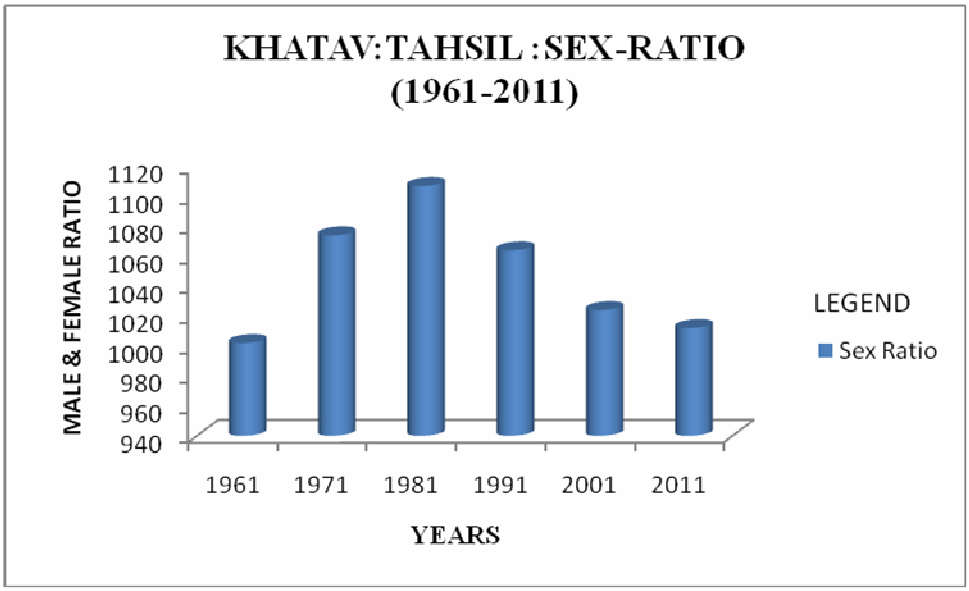

Fig. 2.11

Table 2.8 and Fig. 2.11shows +72 in 1971 and +33 in 1981 sex-ratio which has increased because of low socio-economic status i.e. it has effect of high illiteracy, low age marriage, lack of medical facilities, undeveloped transportation facilities and old traditional thoughts. After 1981, the sex-ratio rate slowly decreases because of growth of socio-economic status i.e. it has effect of education, well transportation, well medical facilities, family planning, employment, migration and high literacy of girls.

2.9 OCCUPATIONAL STRUCTURE

The study of occupational structure occupies an important position in the field of population geography. The social and economic development of any region depends on the number of persons who are economically active and the quality and regularity of their work. The proportion of economically active population in various occupations indicates that economic profile of various groups of society.

The occupational structure of a society is the product of a number of intimately related factors. The nature and variety of physical resources base of course, lays down the basic foundation in the form of good land for agriculture, intended cost for fishing, thick vegetation cover for forestry, rich geological strata for mining, etc. (Chandana,1986).

Table 2.9 indicates that workers engaged in primary, secondary and tertiary activities during study period. The Primary activities include farming, fishing, hunting, mining, livestock etc. Secondary activities include manufacturing and processing industries, household industries, construction etc. And tertiary activities involve mainly services- education, medical, tourism, trade, transportation, communication, administrative services, LIC and banking etc. (Table 2.9 and Fig. 2.12)

Table 2.9

KHATAV TAHSIL: OCCUPATIONAL STRUCTURE OF TOTAL POPULATION (1981-2011) (in Percentage)

Sr. No.	Year	Activities	Workers Population	Male Worker	Female Worker
1	1981	Primary	84.42	55.44	44.56
		Secondary	2.64	99.13	0.87
		Tertiary	12.94	98.15	1.85
2	1991	Primary	85.52	51.38	48.62
		Secondary	2.43	99.10	0.90
		Tertiary	12.05	98.27	1.73
3	2001	Primary	79.84	55.91	44.09
		Secondary	2.94	98.49	1.51
		Tertiary	17.22	95.02	4.98
4	2011	Primary	70.43	67.43	76.56
		Secondary	2.87	2.43	3.76
		Tertiary	26.7	30.14	19.68

Source: District Census Handbook, Satara (1981-2011).

KHATAV TAHSIL: OCCUPATIONAL STRUCTURE OF TOTAL POPULATION

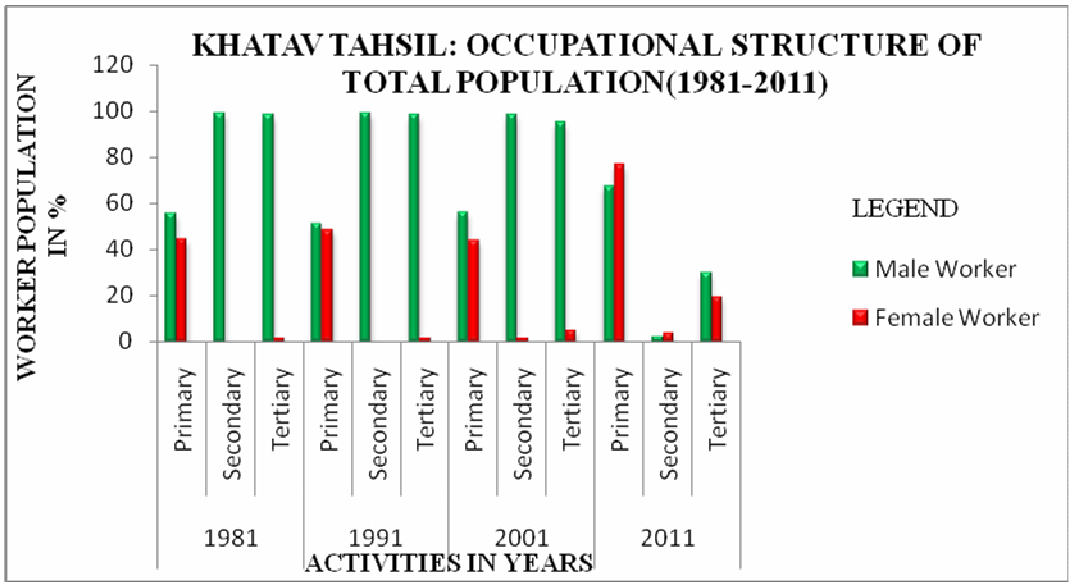

Fig. 2.12

Table 2.9 and fig. 2.12 shows in 1981, Primary activities had involved 84.42 percent worker population, 55.44 percent male worker population and 44.56 percent female worker population in Khatav tahsil. Secondary activities had involved 2.64 percent worker population, 99.13 percent male worker population and 0.87 percent female worker population in Khatav tahsil. Tertiary activities had involved 12.94 percent worker population, 98.15 percent male worker population and 1.85 percent female worker population in Khatav tahsil.

In 1991, Primary activities had involved 85.52 percent worker population, 51.38 percent male worker population and 48.62 percent female worker population in Khatav tahsil. Secondary activities had involved 2.43 percent worker population, 99.10 percent male worker population and 0.90 percent female worker population in Khatav tahsil. Tertiary activities had involved 12.05 percent worker population, 98.27 percent male worker population and 1.73 percent female worker population in Khatav tahsil.

In 2001, Primary activities had involved 79.84 percent worker population, 55.91 percent male worker population and 44.09 percent female worker population in Khatav tahsil. Secondary activities had involved 2.94 percent worker population, 98.49 percent male worker population and 1.51 percent female worker population in Khatav tahsil. Tertiary activities had involved 17.22 percent worker population, 95.02

percent male worker population and 4.98 percent female worker population in Khatav tahsil.

In 2011, Primary activities had involved 70.43 percent worker population, 67.43 percent male worker population and 76.56 percent female worker population in Khatav tahsil. Secondary activities had involved 2.87 percent worker population 2.43 percent male worker population and 3.76 percent female worker population in Khatav tahsil. Tertiary activities had involved 26.7 percent worker population, 30.14 percent male worker population and 19.68 percent female worker population in Khatav tahsil.

2.10 HISTORICAL AND RELIGIOUS CENTERS IN THE STUDY AREA

Information on historical centers is compiled to assess the possible influx of large populations on specific occasions and the service demands generated. Khatav tahsil has mainly 6 historical and religious centers. Pusegaon is the popular for Sevagiri Maharaj temple, where more than 2 lakh peoples come in December from all over Maharashtra. This religious centre has taken 'B' grade status of Government of Maharashtra. The Mayani and Aundh are also big tourism centers.

In Mayani Bird Sanctuary, Flamingoes from Siberia come here in large numbers in the Mayani village dam, for this looking purpose many people come in this village. Approximately 400 migratory birds were reported in 2005. Other birds like the Northern Shoveler, Stork and Kingfisher are also found at the sanctuary. Other resident and migratory bird species in the winter season include: Coot, Brahminy Ducks, Black Ibis, Painted Storks, Common Spoon Bills, etc. The nests of storks are also observed near the lake. Flamingos are regular winter visitors to the place. The flamingo species are observed feeding in shallow water. They mainly feed on insects, small fishes and crabs. The aquatic plant species Otolisa species can be found in shallow waters - flamingos have been observed to feed on this species as a food source. The winter season (November to January) is the best time to visit the Mayani sanctuary.

"Aundh is famous for temple of 'Yamai Devi'; it is situated on hill called 'Mulpith'. There is museum named *'Shree Bhavani Vastu Sngrahalay'*. It is very famous in whole Satara district. Before our freedom, Aundh was a Great *'Sansthan'*, of 'Raja Bhagwantrao Pant-Pratinidhi'. It has a very rich and interesting history. Along with this temple of Yamai, there are small other temples. There is small lake called 'Aundh cha Talav'. Now a day the hills around Aundh are surrounded by windmills.

The Khatav and Khatgun are the other popular religious centers; Khatgun is famous for Pirsaheb Darga of Hindu and Muslim people.

There are historical places located nearby; some of them are Gondwale (temple of Gondwalekar Maharaj), Aundh (temple of Yamai Devi) and Pusegaon (temple of Sevagiri Maharaj). (Table 2.10 and Fig. 2.13)

Table 2.10

KHATAV TAHSIL: HISTORICAL AND RELIGIOUS CENTERS

Sr. No	Name of the Villages	Historical and Religious Centre	Periods of Festive Occasions, Months	Estimated tourist or visiting population
1	Aundh	Yamai Temple, Aundh Museum, Ambabai Temple	Jane. /Feb.	25,000
2	Khatav	Bhairavanath Temple, Ganesh Temple	July/Aug	15,000
3	Khatgun	Pirsaheb Darga	March	50,000
4	Pusegaon	Sevagiri Maharaj Temple	Dec	2,75,000
5	Mayani	Natural Bird Sanctuaries, Yashvant Baba Yatra	March/ April	25000
6	Vaduj	Administrative center	--	

Source: Socio-Economic Review and District Statistical Abstract of Satara district (2010-2011)

KHATAV TAHSIL: HISTORICAL AND RELIGIOUS CENTERS

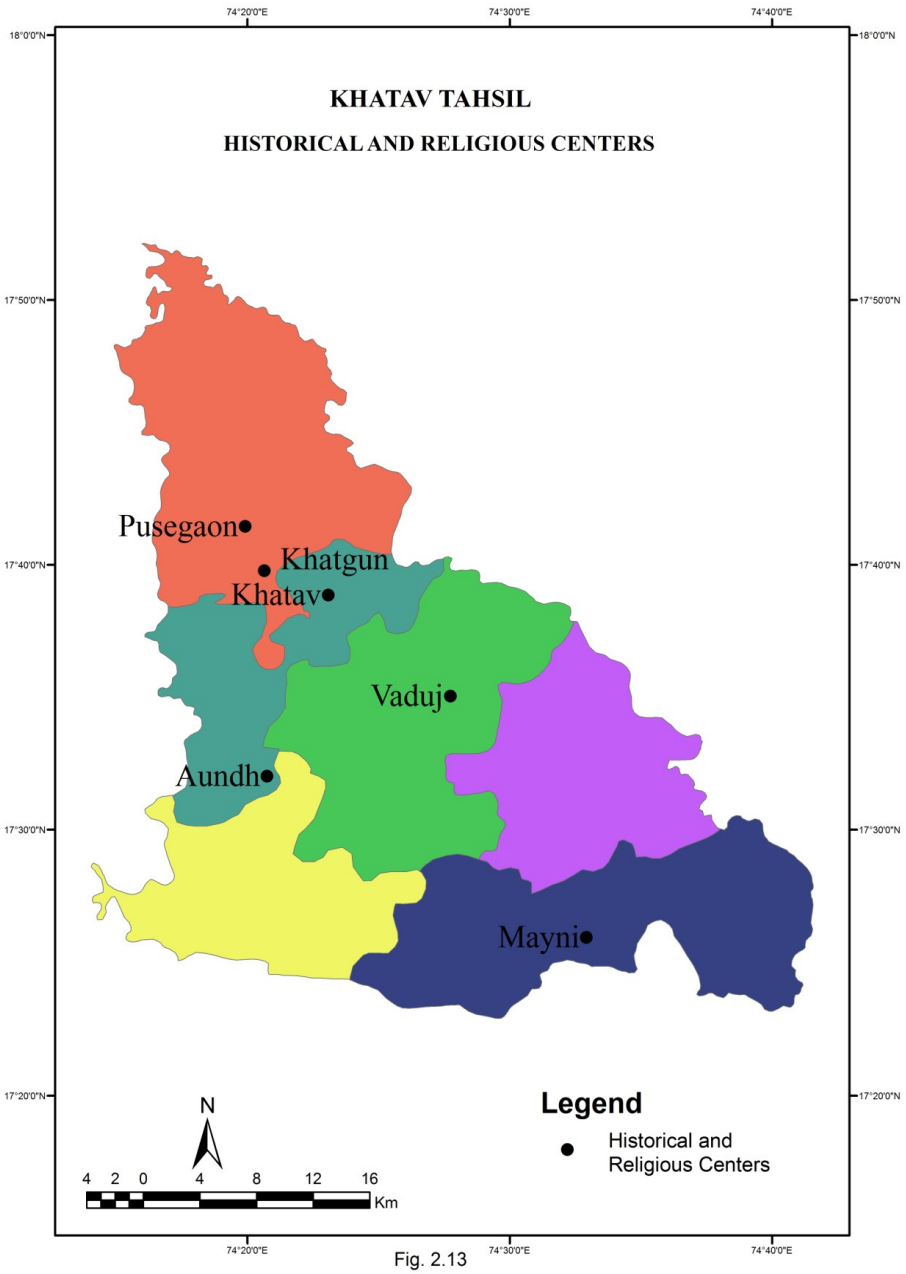

Fig. 2.13

Fig .2.13

2.11 SETTLEMENT PATTERN

The study of settlements is important geographic thought. Since the country is dominated by agrarian economy and most of the population is concentrated in rural settlements. As it is the study of settlements are important to discuss the socio-economic status of population analysis in particular region. Settlements occupy some space at a particular point of time. This occupancy reflects effect of certain factors including socio-cultural and socio-functional aspects concerned with economy.

Therefore the study of settlement form is the most important theme of human geography. Physiography and agricultural practices of an area influenced on distribution pattern of settlement, and in turn of population distribution and density. (Singh 1994) The regency of discovery and settlement of the areas of human occupancy goes a long way in giving an insight to the understanding of the factors explaining the existing pattern of population distribution and density. The contrasts between the new world and the old world with regard to their present population situations have their basic explanations in this factor of the history of their settlements. (Table 2.11 and Fig. 2.14)

Table 2.11
KHATAV TAHSIL: DISTRIBUTION OF SETTLEMENTS AND HOUSEHOLDS (2011)

Sr. No.	Name of Circle	Area in Hect.	No. of Villages	No. of Rural Households (2011)
1	Pusegaon	30746.24	34	13,595
2	Khatav	17195.26	27	9,134
3	Pusesawali	17582.35	21	7,716
4	Vaduj	26415.40	22	12,392
5	Katar Khatav	19390.83	21	6,282
6	Mayani	26486.42	18	10,580
	Total	**137816.50**	**143**	**59,699**

Source: District Census Handbook, Satara (2011).

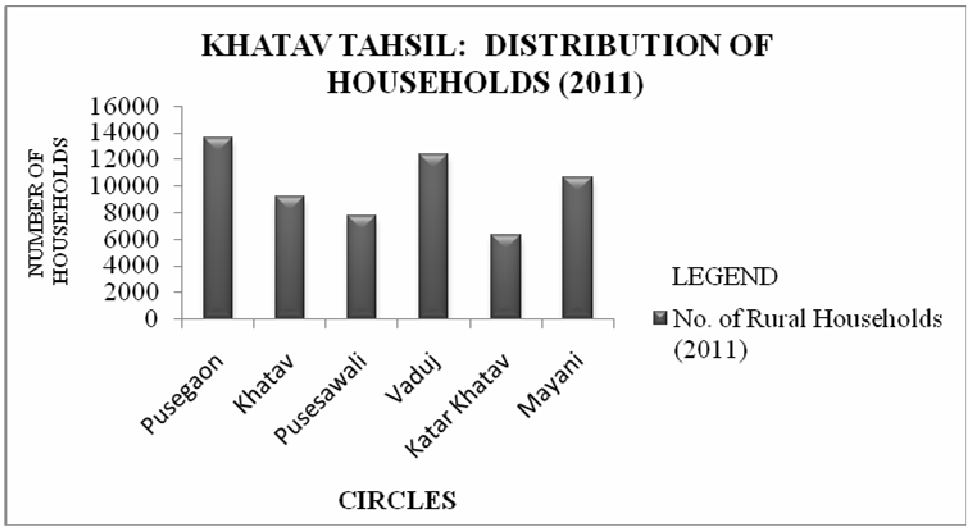

Fig. 2.14

In the study region, there are 6 administrative circles which have 59,699 numbers of rural households according to census 2011(Table 2.11 and Fig. 2.14). Pusegaon, Khatav, Pusesawali, Vaduj, Katar Khatav and Mayani are the administrative circles which shown in the table 2.11 Pusegaon circle is the big rural settlement of tahsil, which is located in the northern part of tahsil. This circle has included 34 villages and 13,595 numbers of rural households. Vaduj circle is the second big rural settlement of tahsil, which is located in the central part of tahsil. This circle has included 23 villages and 12,392 numbers of rural households. Mayani circle is the third big rural settlement of tahsil, which is located in the southern part of tahsil. This circle has included 18 villages and 10,580 numbers of rural households. Remaining, Khatav circle has 9,134 number of rural households and 23 villages, Pusesawali circle has 7,716 number of rural households and 19 villages and lastly Katar Khatav circle has 6,282 number of rural households and 21 villages respectively.

Khatav tahsil has ribbon or linear pattern rural settlement because there mostly villages have situated mostly on the bank of Yerala river. There are nearly about 20 large and small villages situated which contains Manjarwadi, Mol, Diskal, Lalgun, Ner, Pusegaon, Khatgun, Bhandewadi, Bhurkavadi, Wakeswar, Vaduj, Nadval, Goregaon, Maradwak, Morale, Chitali etc. villages. Also compact or agglomerated settlement pattern reached in the eastern as well as western part of tahsil which contains villages like Vaduj, Katar Khatav, Mayani, Aundh, Pusesawali, Kaledhon etc.

2.12 LAND USE PATTERN

The land use pattern has got importance in the economy of the region. Human activity is depending on land use, socio-economic picture and the status of community indicated by land use pattern. Table 2.12 and fig. 2.15 shows the general land use pattern of the study region. The study region having 1,37,816 hectares the total geographical area. The net agricultural usable area is 1,11,378 hectares area of the region, whereas 4,911 hectares area under Forest. The table 2.12 shows circle-wise general land use pattern that the tahsil included in high land zone, the cultivated land is vary less amount. Due to physiographic and other favorable condition in the central part of the study region having more cultivated land. The highest net sown area is

recorded in Pusegaon circle and the lowest in Katar Khatav circle. This is below shown as compared to tahsil average.

Khatav tahsil has 10,296 hectares cropped area as well as 5,540 hectares grazing area. And 8,173 hectares land is not available for the agricultural activities in the tahsil. Cereal crop has largest i.e. more than 70 percent cropped area in a year and Cash crop has the lowest i.e. equal to 3 percent cropped area in a year. Also Bajara (52 percent) and Jowar (48 percent) are the main cereal crops in tahsil. (Table 2.12 and Fig. 2.15)

Table 2.12
KHATAV TAHSIL: GENERAL LAND USE
2011-2012 (in Hectares)

Sr. No.	Circle Name	Total Geographical Area	Land Under Forest	Area Not Available for Cultivation	Non-Agricult-ural Use	Total Follow Land	Cultivable Land	Net Sown Area	Grazing Land
1	Pusegaon	30746	1055	851	213	15499	17313	1814	926
2	Khatav	17195	374	1402	191	16847	18558	1711	923
3	Pusesawali	17582	567	890	204	16808	18588	1780	849
4	Vaduj	26415	718	1362	271	15163	16908	1745	831
5	Katar Khatav	19390	952	1938	174	18571	20140	1569	997
6	Mayani	26486	1245	1730	172	18194	19871	1677	1014
Total		**137816**	**4911**	**8173**	**1225**	**101082**	**111378**	**10296**	**5540**

Source: Socio-Economic Review and District Statistical Abstract of Satara district (2011-2012).

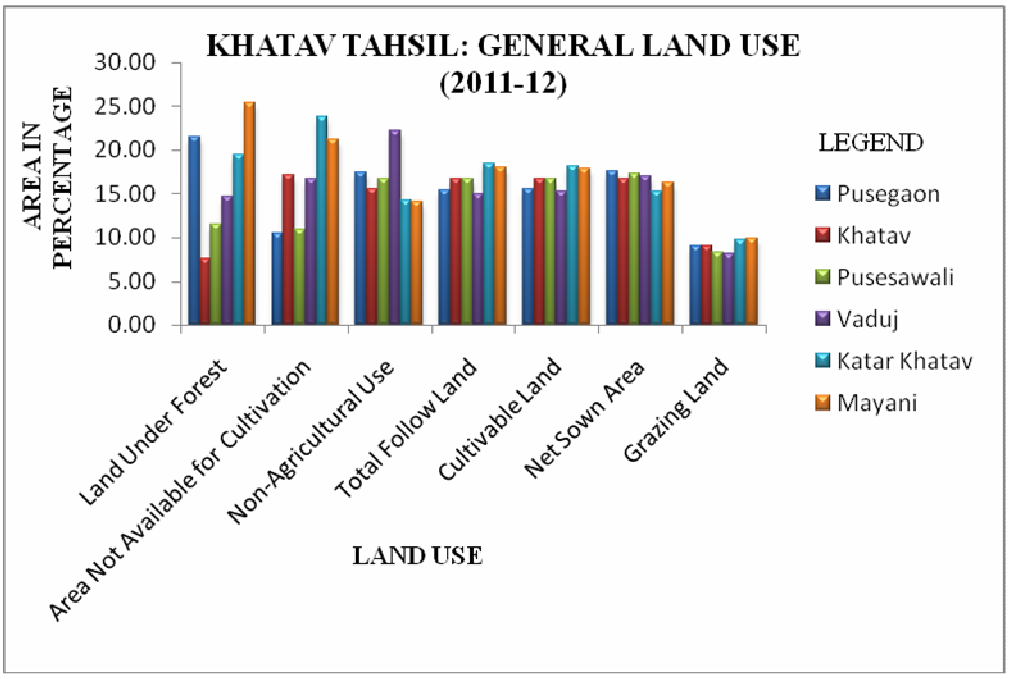

Fig. 2.15

2.13 TRANSPORT NETWORK

Transportation activities are closely linked with economic factors concentration and urbanization. Hence, developments of transportation facilities play a significant role in increasing the capacity of the region to the support of the socio-economic development.

Ease of transportation also plays an important role in influencing distribution of socio-economic activities. Socio-economic status is high in low- lying flat areas and alluvial plains due to ease of transportation and Socio-economic status is low hilly area. Transportation facilities increase mobility, expand trade and commerce, and minimize the difficulties of movement. With the development of the modern transport system, urban growth is concentrating in large cities and towns. (Chakrawarthy, 2006)

Table 2.13

KHATAV TAHSIL: TYPES AND LENGTH OF ROADS:

Sr. No.	Types of Roads	Length in kms.	Length in %
1	National Highway	00.00	00.00
2	State Highway	266.96	21.25
3	Major District Roads	138.87	11.05
4	Other District Roads	176.45	14.04
5	Village Roads	674.26	53.66
	Total	1256.54	100.00

Source: Socio-Economic Review and District Statistical Abstract of Satara district (2011-2012).

KHATAV TAHSIL: TRANSPORTATION

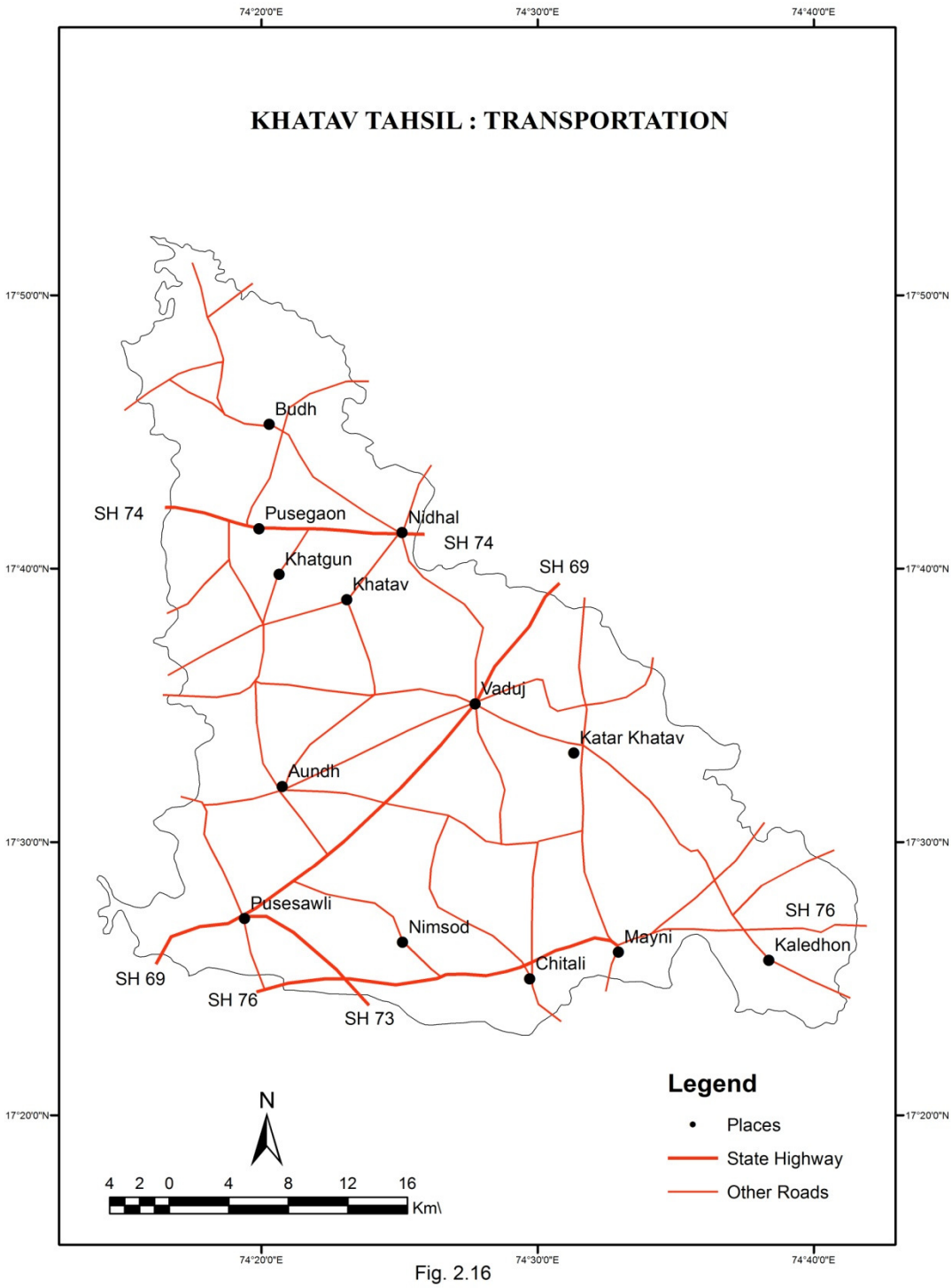

Fig. 2.16

The study region has relatively medium network of transport by roads. Railway facilities are not available for transportation in tahsil. The total lengths of roads are 1256.54 km having an average density of 91.20 kms. of road length per 100 sq. kms. in tahsil (Table 2.13 and Fig. 2.16). The policy of Maharashtra government

under minimum need program that the village having 500 populations should be linked by roads. From this point of view most of the villages having population above 500 are linked by the roads in the study region. Table 2.13 and Fig. 2.16 shows the several roads i.e. state highways (no. 10), major district roads (no.07), other district roads and village roads are constructed in the study region. Satara–Pandharpur, Malharpeth-Pandharpur, Dahiwadi-Karad, Sangli-Phaltan, and Vita-Vaduj-Phaltan state and district roads pass through the study region, and they accounts for the total length of 1256.54 kms. The major district roads connect the tahsil and other important places of the study region. In general, western highland zone has seasonal roads are the major means of transportation because of rugged topography, but in the central and eastern part, many village roads are constructed by zilla parishad, which are linked to settlement.

2.14 Conclusion

The physical condition of Khatav tahsil has examined and discussed in this chapter. Western Mahadev hill mountain range, Central and eastern foothilly and the Yerala river basin regions are three physiographic divisions of Khatav tahsil. In western Mahadev Mountain range altitude is over 1000 meters above mean sea level, while in east part has 566 meters height. Rainfall in study region shows variation from 550 millimeter in west to 450 millimeters in east. The study region has typical monsoon forest in west part and scrub and poor grass in east part. The Yerala river basin is the largest region in Khatav tahsil lying in central part in study region. The central and eastern foothill regions experience dry climate. Yerala river system and her sub-tributaries river system are present covering largest part in study area. The rainy, winter and summer seasons are experienced in study region. The maximum temperature is observed in May (36.8° Centigrade) and minimum in December (18.7° Centigrade). Temperature goes on increasing from west to east with decreasing altitudes. Black and laterite soils are dominant in study region. The study area is served by state highways, major district roads, and other district roads. Major district roads help to collect and distribute agricultural products. Village roads support farmers for their daily trips. 17 weekly market centers have identified in study region. Most of these market centers are lying on tahsil and district roads.

Population has its own impact on regional development. The growth of population from 1981 to 1991 was 21,571 and it was 25,200 from 1991 to 2001.

Population of Khatav tahsil is classified into cultivators, agricultural labourers and other workers. The primary activities in study area have found increase by nearly equal to 1 percent from 1981 to 1991 and secondary activities decrease by 0.02 percent in Khatav tahsil.

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* * *

CHAPTER III

WATERSHED DEVELOPMENT PROGRAMME

3.1 Introduction

The environment is an area where in the human community lives and makes its livelihood. When the economic and natural conditions of the community deteriorate, the community tends to overexploit and degrade the natural resources, which in turn further aggravate poverty. Degradation of any of the natural resources directly leads to fall in productivity (Mani, 2005).

Natural resource regeneration and management should be founded on strategy for rural development. Unlike other rural development programme, an environment generation and management programmes should have an environmental unit for planning and implementation, since the environment does not recognize manmade administrative boundaries. Thus watershed is the best environmental unit for a development initiative.

India is an agricultural country. More than 70 percent of population depends on agriculture. India's agricultural production has increased from 50 million tons in 1950 to 2000 million tons in 1998-99. Still we are not surplus in food production in the real sense. In India rainfed agriculture is complex, diverse, erosion prone, characterized by low level of productivity and low input usage.

3.2 Philosophy of Watershed

It is geo-hydrological unit draining at a common point by a system of streams. All land everywhere is part of some watershed. Essentially, a watershed is all the land and water area which contributes a runoff to a common point. It is a land area that captures rainfall and conveys the overland flow and runoff to and outlet in the main flow channel. It is topographically delineated area draining into a single channel (Kar, 2008).

Every watershed in the world is a unique as a fingerprint. No two watersheds are extremely same. Two contiguous watersheds, lying side by actually different in details, even though they may look alike.

Watershed can be defined as the drainage basin of a catchments area of a particular stream or river including glacier. Simply put, it refers to the area above any

point water into it. A watershed from a few hectares to several thousands of hectares (Govt. of Maharashtra, Watershed Management Report, 2011).

Watersheds are convenient units for performing economic analysis and for considering many physical changes that are linked to resource development including on site projects and off site changes and impacts can be evaluated.

Watershed is a Physical, biological, economical and social system. It is a land mass bounded vertically by the area influenced by human activities and horizontally by the water that drains into the points in a channel (Hazare, 2001).

Watershed is a natural geohydrological entry. It is an area, the runoff from which drains through a pre-determined single outlet on the drainage system. It is an aerial expanse of the land surface from which the runoff flows through a defined drain, channel, streams or river. Its synonyms are 'catchments area' and 'drainage basin' (Murty, 2005).

A watershed may be defined as a geo-hydrological entry or an area that drains at a common point in the drainage system. It is bounded by the ridgeline, which starts from a tap and closes at the same common draining point duly encircling the watershed (Mani, 2005).

The water can be managed efficiently only if a watershed is taken as a unit. Since soil and vegetation can also be conveniently and efficiently managed in this unit, the watershed is considered an ideal unit for managing three vital and interdependent natural resources of soil, water and vegetation.

The watershed approach is being increasingly used in various development programmes like soil and water conservation, erosion control, command area development, rainfed farming, ravine reclamation and waste land development.

3.3 Concept of Watershed Development and Management

Watershed Development consists of conservation, regeneration and judicious use of all the resources, natural resources like land, water, plants, animals and human-within the watershed area. (Mani 2005).

Watershed management envisages systematic and scientific approach towards conservation, harvesting, proper utilization and safe disposal of flowing water from the movement it falls on the land surface in a form of rain (Ranade, 2004).

Watershed Development refers to the conservation, regeneration and judicious utilization of all the resources like land, water, plants, animals and human- within a particular watershed (Govt. of Maharashtra, 2003)

Watershed Development attempts to bring about best possible balance in the environment between natural resources on one side and man and grazing animals on the other. It requires participation of people because conservation is possible only through the whole hearted involvement of the entire community.

3.4 Types of Watershed

All India Soil and Land Use Survey Organization, Government of India has prepared a watershed Atlas of India delineating country in five stages viz. Region, Basin, Catchment, Sub catchment and watershed. Watershed is a natural geo-hydrological unit. Every stream has its own catchment area. The watershed does not having the limit of administrative boundaries such as village, tahsil, district, state etc.

The Government of Maharashtra in its guideline for Watershed Development gives four types of watershed.

1. **Micro Watershed-**

   The micro watershed covers the area upto 500 to 600 hectares.

2. **Mini Watersheds -**

   The mini watershed covers the area upto 3,000 to 5,000 hectares.

3. **Sub Watersheds-**

   The sub watershed covers the area upto 15,000 to 20,000 hectares.

4. **G. S. D. A. Watershed-**

   The G. S. D. A. watershed covers the area upto 30,000 to 40,000 hectares.

5. **River Valley-**

   The river valley has no limit of areas which includes number of sub watersheds, mini watersheds and micro- watersheds.

   There are 143 villages in Khatav tahsil out of which nearly 50 villages are having water scarcity. Only 36.66% villages are selected for the Watershed Development and from 1992 to 2004 the Watershed Development work was done only in 32 villages.

GSDA has divided the area of Maharashtra in 1505 watersheds. According to groundwater level, GSDA has divided the watersheds into three types.

1) White Watershed
2) Gray Watershed
3) Dark Watershed

If the total groundwater exploitation is less than 65% of water recharge, such watershed is categorized as 'White Watershed'. In Maharashtra 1392 (92.55%) watershed are of this category. If the groundwater exploitation is near about or equal to ground water recharge then this type of watershed is called 'Gray Watershed'. There are 87(5.78%) watersheds. If the groundwater exploitation is greater (85 percent of recharge capacity) than the groundwater recharges then it includes in black watersheds. There are 26 (1.73%) watersheds of this category.

Department of Agriculture, Government of Maharashtra with the help of Maharashtra Remote Sensing Application Centre Nagpur, the GSDA watersheds are divided into sub watersheds, mini watersheds and micro watersheds and watershed Atlas has prepared for every district of Maharashtra.

GSDA has divided Khatav tahsil in one major river Yerala river basin. Yerala is the tributary of Krishna so, this basin comes in elementary watershed No. KR-10. Yerala is the main river and its other smaller tributaries- Nani river, Karpur river and Chand river drains the tahsil.

3.5 Physiography and Surface Water Harvesting Structures of Watershed Development

Topography, slope, stream order, length of stream are the factors responsible for Watershed Development. According to government of Maharashtra guidelines, the work of Watershed Development should be carried out from ridge to valley. (GoM 2003). For surface water harvesting various structures are suggested. These structures are helpful for soil and water conservation. In the upper part of watershed the structures are constructed from the local material available at the region. So it is cost effective.

In the study region the tank irrigation is still widely used, but dependence on it has declined due to some social, economic and technical reasons. Silting of the medium irrigation tank is the major problem and when big irrigation projects are developed then it causes the problem of rehabilitation of people. So to stop such type of problems, it is need of the time to concentrate on Watershed Development.

Traditionally, the SWH activity was mainly meant for irrigation and domestic use. Construction of check dams or percolation ponds for recharging the aquifers has come into practice only during the last three- four decades (Athavale, 2003).

Three factors are important while constructing the proper surface water harvesting structure namely the area of the catchment, hydrological data for designing the structure and optimal depth of the structure to reduce evaporation.

The work of Watershed Development is divided into three parts.

1) Upper part of watershed
2) Middle part of watershed
3) Lower part of the watershed

In upper part of the ridge CCT (continuous Contour Trenching) and forest development or plantation is carried out. In middle part of ridge Vegetative Contour and Graded Bunding, Bench Terracing and Ill drain land improvement trenches is done in lower part where the slope is gentle i.e. the treatment on streams and nalas following WHS are constructed.

1) Earthen Structure
2) Loose Boulder Structure
3) Gabion Bandhara
4) Farm Pond
5) Under Ground Bund
6) Drought Sunkan Pond
7) Recharging Trench
8) Nala Bank Stabilization
9) Cement Nala Bund
10) Diversion Bandhara

Upper part of Watershed

1) CCT (Continuous Contour Trench)

Land is most important source in development of human being. So the conservation of the land has to be priority. According to Economic Advisory of Agriculture in Maharashtra, there is 23% (70.60 lakh hact.) area is uncultivable (GoM-2003).

The CCT is constructed on the land not available for cultivation (class 5 and 6). For the construction of the CCT the prior permission of the landowner is must.

The CCT work is done in upper and middle part of the watershed, which has upto 33 percent slope.

CCT is helpful to prevent 450 cubic meter runoff per hectare. On the upper part of CCT the plantation is done which prevent the soil erosion and the CCT help for the surface runoff reduction and water seepage in lower part of soil and rock strata. The distance between two CCT is decided according to slope of land. For 0 to 4 percent slope, the distance between two CCT is 10 to 12 meter; for 4 to 8 percent slope, the distance is 8 meter; for 8 to 15 percent slope, the distance is 6 meter and for 15 to 33 percent slope, the distance is 3 meter.

2) Plantation and Forest Development on Fallow and Eroded Land

Plantation helps to reduce the velocity of water running from top of the hill and prevent the soil erosion. For the implementation of this programme, the village is selected under Integrated Watershed Development Programme. The soil depth is required upto 20 cm and the slope of the land is upto 15 percent. The 5 hectare minimum land is required for the plantation, but the condition is not mandatory. The plantation of clustered apple, bor, shiras, kashid, rain tree is suggested.

Middle part of Watershed

1) Vegetative Contour and Graded Bunding

This is the chief and effective measure of soil conservation. Vegetative contour means plantation of the grass or ghaypath according to contour instead of earthen and loose boulder structures. It is useful on steep sloping land. The all type of land having 4 percent slope is suggested for the vegetative contour. The graded bund is constructed between two vegetative contours. If there is 0 to 2 percent slope, the two graded bunds are constructed between two vegetative bunds and if the slope is 2 to 4 percent, one graded bund is constructed between two vegetative contours. This type of live structure is useful in heavy, moderate and low rainfall regions.

2) Ill Drain Land Improvement Trenches

The excess amount of sodium is removed through making trenches in waterlogged areas. The length of the trench is 15 meter; the distance between two trenches is 10 to 20 meter according to type and slope of the land. The lower portion of the trench is filled with big boulder and upper portion with small cobbles. This boulders and sand act as a filter. For the improvement of waterlogged land after

making a trench, the green and chemical manures are provided to the soil, which helps for increasing soil fertility and crop production. Composite manure and vermin compost is used for the increasing soil fertility.

Lower Portion of Watersheds

Earthen Structure

The earthen bund is constructed where the loose boulders are not available. The soil of the surrounding area is used for the construction of bund. The earthen bund is supported by the vegetation plantation on it. The top of the earthen bund is of 0.60 meter. The height of the bund is upto 1 meter. This type of bunds are constructed in low rainfall and upto 10 ha catchment area of watershed. This bunds helps to decrease soil erosion, slows the surface runoff and the vegetation planted on it creates the greenery, help in ecological improvement.

Loose Boulder Structure

Loose boulder structures are constructed to prevent the gully and stream erosion. These bunds are constructed where the catchment area is not more than 10 hectare. The small loose boulder structure is constructed where the catchment area is not more than 5 hectare. The boulder from the surrounding area is selected for bund construction. For support of this bund, the plantation of grass and other plants is done.

Gabion Bandhara

When loose boulder is covered with iron grid, this is called as gabion bandhara. The gabion bandhara is constructed where the slope of nala is 3 percent. The length of the bund is not more than 10 meter.

Underground Bandhara

The bund constructed beneath the surface of watershed is called as underground bund. These bunds are created where the slope of nala is 3 percent. The depth of the underground bund is not more than 6 meter. This underground bund helps to increase the ground water level of the surrounding wells and tubewells. The region of gray and dark watershed is suitable for construction of underground bunds.

Dugout Sankan Pond

Dugout Sankan pond is constructed on the bed of the nala. This pond is always filled with water when water is flowing through nalas. It helps to reduce the velocity

of water in nalas and the soil from the sankan pond is used in a nearby field as manure which helps to improve soil fertility. The loose boulder structure and gabion bunds are constructed in the upper reaches of sankan pond which reduces the soil loss and filing of pond with soil.

Farm Pond

This is the most effective water harvesting structure but Indian farmers do not put it to regular use. Farm pond is of small size depression mode for collection of surface runoff and the collected water will be used in scarcity time. These farm ponds are helpful for ground water recharge, if a dug well or a bore well is located near such a farm pond.

Recharging Trench

Recharging trench is constructed from 100 meter off wells upper part. The recharging trench is duged out in Nala bed. The villages which require the tankers for drinking water; those are only selected for recharging trench.

Nalla Bank Stabilization

Due to bends in nalas, in the rainy season the nalas overflows and flood occurs. If the Nala bank stabilization is done, it helps to reduce the flood. The slope of the Nala bed is not more than 3 percent and the total length of the Nala from the source to mouth is not more than 5 km. such Nala is selected for Nala bank stabilization.

Cement Nalla Bunds

Since 1972-73, under the Integrated Watershed Development Programme, the work of cement nala bunding is being done for raising ground water level and prevention of soil erosion. This is a permanent structure having long life sustainability. The farmers are also coming forward with the demand of cement bandharas on the nalas. In Khatav tahsil, number of cement Nala bunds are constructed on the strategic location.

Diversion Bund

The diversion bandhara also known as gravity flow irrigation bunds. In December-January the farmers usually barrage the water flowing through nalas and

use it for irrigating the crops in the field. The bund is constructed on nalas with stone and lime or with stone and cement. The bund of 1 to 2 meter height is usually constructed where the Nala or a river takes a turn and where there is hard rock in the river bed. Trenches are taken out off the impounded water and then is carried to beneficiary areas.

Vanarai Bandhara

This model of bandhara is developed by Sri Mohan Dharia chairman of Vanarai Trust, Pune. This is very simple and cost effective structure of water harvesting. This structure is very popular among farmers and the experts working in Watershed Development. The sand is filled in plastic or empty cement sacks. These sacks are placed one above another in the Nala bed and the joints between two sacks is filled with black soil or the soil available in nearby areas. This temporary bandharas are effectively prevents water flow and increase the durability of water. The height of the bandhara should not be more than 4 to 5 feet.

Percolation Tanks

Percolation tank is important structures in Watershed Development. These are most prevalent form of traditional water harvesting system. While water stored in them was useful for domestic purpose also, they were essentially a mechanism to overcome the seasonal nature of rain these tanks are mostly constructed all and create availability of water for agriculture. These tanks are constructed in drought-prone regions for ground water recharge and employment generation. The site for the tank construction should be at the bottom of ridge and the slope of the Nala is not more than 2 percent. The benefits of percolation tank are 1) they provide the solution to drought-prone condition to some extent. 2) employment is generated during construction period to local peoples. 3) Helps to increase the sub-surface water level (Bhosale, 2008).

3.6 Watersheds in Khatav tahsil

The Khatav tahsil is the part of 8 sub-watersheds. Actually, this tahsil is involved mini watershed area which is the part of Krishna watersheds (about 99 percent) and Bhima river (nearly 1 percent). Krishna river basin covers 141 villages and and Bhima river basin covers just 2 villages. The KR 11 sub-watershed has

highest number of watersheds villages in Khatav tahsil. The KR 12 sub-watershed has represents only one village.

Table 3.1

KHATAV TAHSIL: SUB-WATERSHEDS AND VILLAGES

Sr.No	Sub-Watershed Name	No. of Villages	Percentage in Villages
1	KR 9	17	11.89
2	KR 10	19	13.29
3	KR 11	39	27.27
4	KR 12	01	00.70
5	KR 22	25	17.48
6	KR 23	15	10.49
7	KR 24	25	17.48
8	BM 104	02	01.40
	Total	143	100.00

Source: Watershed Department GSDA, Pune.

The number of sub-watersheds in Khatav tahsil is eight. Among these sub watersheds Krishna River has seven sub watersheds No. KR 9, KR 10, KR 11, KR 12, KR 22, KR 23 and KR 24 etc. The numbers of villages under Krishna river sub watersheds are 141 villages. Total area of villages covered 98.60 percent. 39 villages came under KR 11 sub watersheds (27.27 %), 25 villages came under KR 22 (17.48 %), as a same 25 villages came under KR 24 (17.48 %), 19 villages came under KR10 (13.29 %), 17 villages came under KR 9 (11.89 %) and only one village came under KR 12 (0.70 %)(Table 3.1 and Fig. 3.1). Maximum area is covered under Krishna River watershed (98.60 %). There are only 2 villages came under Bhima river No. BM 104 sub watershed and percentage of village is 1.40 percent. BM 85, BM 101, BM 102, KR 8, and KR 21 very few areas cover in Khatav tahsil.

KHATAV TAHSIL: WATERSHEDS

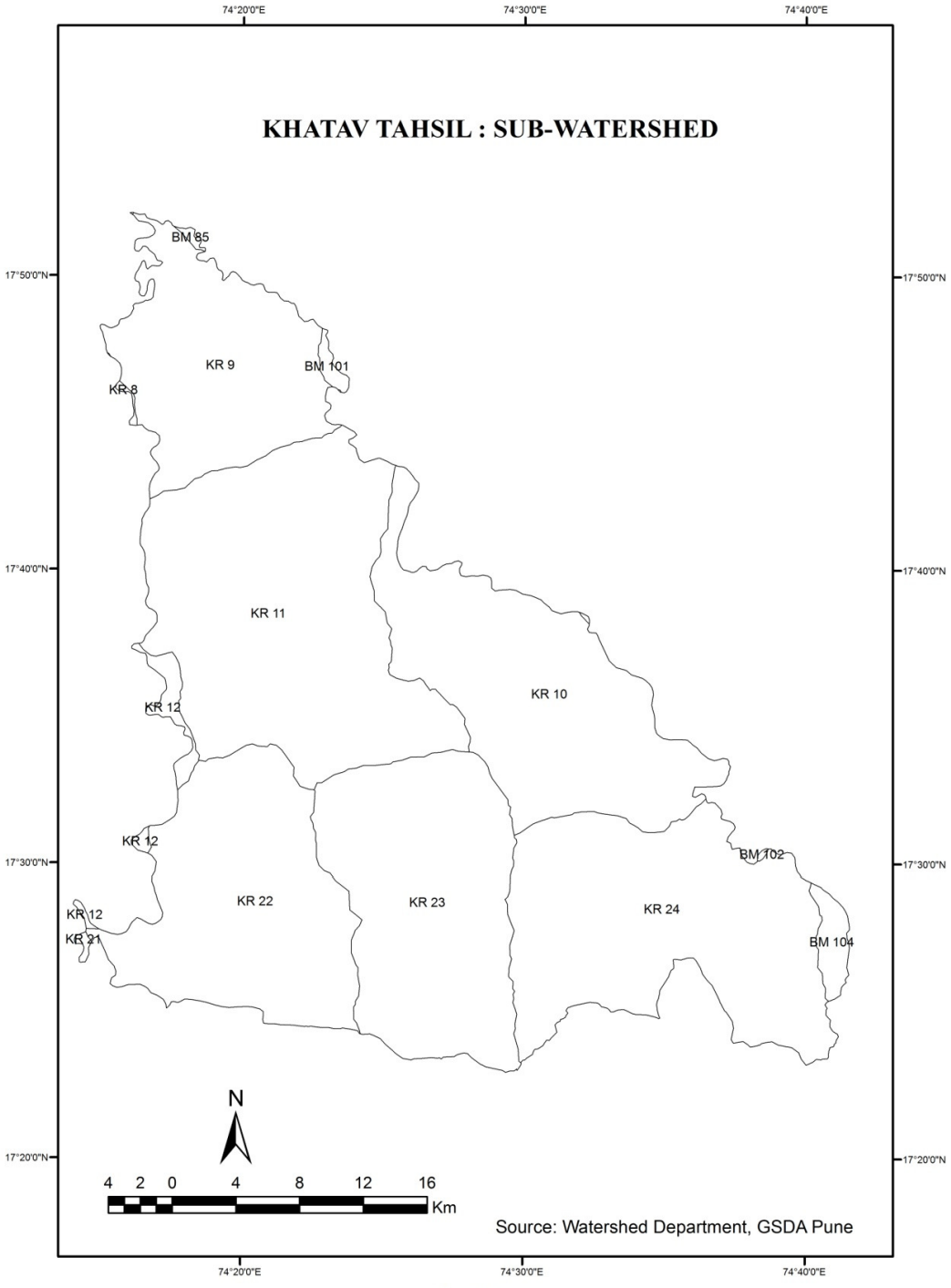

Fig. 3.1

3.7 Objectives of Watershed Development Projects

The watershed project often distribute costs and benefits unevenly, with cost incurred disproportional up stream, typically among poorer farmers and benefits realized disproportionately downstream, where irrigation is concentrated and the rich farmers own majority of land.

The objectives of each Watershed Development projects are as follows:

1) To promote of each Watershed Development of village community through,
    a) Optimum utilization of the natural resources like land, water, vegetation etc. that will mitigate the adverse effects of drought and prevent further ecological degradation.
    b) Employment generation and development of the human resources and promote them for saving money and water.
    c) To aware the villagers about income generation activities.
2) To encourage restoration of ecological balance in village through,
    a) Active participation of the people for maintenance and operation of assets created and further development of resources in a watershed.
    b)Use of Local resources, in-situ conservation of soil and water level technology and material must be used for watershed conservation.
3) Emphasis on economically weaker sections resource poor area and disadvantage sections of the 'watershed community' such as the asset less and the women through.
    a) More equitable distribution of the benefits of land and water resources development and the consequent biomass production.
    b) Greater access to income-generating opportunities and focus on their human resource development.

3.8 Components of Watershed Development

When the environment gets degraded, the quality of life of the human community within that region also deteriorates. Watershed Development thus aims at the rejuvenation of the environment in an integrated and comprehensive manner.

Watershed Development involves conservation, regeneration, and judicious utilization of natural resources. It aims to bring about an optimum balance between the demand and use of natural resources so that they remain sustainable over time.

Watershed Development involves the following components

1. Human resources development (HRD)
2. Soil and land management (conservation and use)
3. Water management (conservation and use)
4. A forestation
5. Fodder development

6. Agricultural development
7. Livestock management
8. Rural energy management.

3.9 Characteristics Preferred for Inclusion of Villages in the Watershed Development Programme

The Budget announcement envisages coverage of 100 districts in three years. The districts will be selected in consultation with the concerned state government. For selecting districts, preference will be given where the percentage of irrigation is less than 30%, where there is a concentration of SC/ST population and where the extent of rainfed farming and potential for Watershed Development is large.

Priority will be given to the districts having the lowest proportion of irrigated area in the state, subject to the availability of basic ingredients needed for successful implementation of Watershed Development projects.

Watersheds covering villages with the following physical and socio-economic characteristics are preferred for inclusion in the programme:

Physical Characteristics

- Villages with noticeable soil erosion, land degradation, resource depletion or water scarcity problems.
- Dry and drought-prone villages. In any case the proportion of irrigated area may not exceed the average for the state or 30% whichever is lower.
- Villages in the upper part of drainage systems.
- Well defined watersheds with the village boundaries coinciding to the greatest extent possible with the watershed boundary. As far as possible, Watershed encompassing one village is ideal.
- The size of a watershed project should be around 1000 hectares (but not less than 500 hectares).
- Villages where the general cropping sequence does not include high water demanding and long duration crops like sugarcane, banana etc. and if such crops are grown in small pockets in the watershed, the villagers should be agree that the area under such crops will not be extended during implementation or after completion of the Watershed Development project.

Socio-economic Characteristics

- Predominantly poor villages.
- High proportion of SC/ST in the total population.
- There should not be much difference in the size of the land holdings.
- Villages with a known history of coming together for common causes.
- Villages with alternative source of employment must be selected as the past experience indicates that the programme in such areas would not pick up.

3.10 WDP Schemes Work in Khatav tahsil

Khatav tahsil has eastern part of Satara district, comes in drought-prone climate. Summer season has shortage of water for drinking as well as agriculture. Hence, this tahsil has highly Watershed Development Programme Work (WDP) in district, compare to other tahsil. Until now days, Different WDP schemes has 1990.16 lakh rupees expenditure and irrigated 1451 hectares area irrigated in tahsil. Different WDP has 610 water storage number of work which storage 40,580 cubic meter water storage capacity. Percolation Tank, Village Tank, Kolhapur Type Bunds, Corner Bunds, Underground Bunds, Cement Bandharas, Earthen Bunds, Lift Irrigation, Storage Irrigation Scheme, Bridge Mixed Bunds etc. works occur in WDP scheme in the tahsil.

Table 3.2

KHATAV TAHSIL: DIFFERENT WDP SCHEMES WORK (2011-12)

Name of Circles and Schemes		Numbers	Expenditure (in Rs. Lakh)	Water Storage Capacity (in cubic m.)	Irrigation (in hect.)
PUSEGAON					
1.	Percolation Tank	57	321.36	6126	1311
2.	Village Tank	10	20.95	397	109
3.	Kolhapur Type Bunds	39	97.27	1536	527
4.	Corner Bunds	18	11.75	--	280
5.	Underground Bunds	7	2.77	--	--
6.	Lift Irrigation	4	2.75	--	140
7.	Storage Irrigation Scheme	2	29.75	47	32
8.	Bridge Mixed Bunds	--	--	--	--
TOTAL		**137**	**486.6**	**8106**	**2399**

	KHATAV				
1.	Percolation Tank	31	103.66	3572	640
2.	Village Tank	11	32.36	264	142
3.	Kolhapur Type Bunds	35	110.32	1301	486
4.	Corner Bunds	21	9.53	--	293
5.	Underground Bunds	4	0.41	--	--
6.	Lift Irrigation	2	2.39	--	55
7.	Storage Irrigation Scheme	00	00.00	--	--
8	Bridge Mixed Bunds	--	--	--	--
	TOTAL	**104**	**258.67**	**5137**	**1616**
	PUSESAWALI				
1.	Percolation Tank	23	98.77	4492	607
2.	Village Tank	6	13.16	132	53
3.	Kolhapur Type Bunds	10	20.37	361	148
4.	Corner Bunds	32	10.97	35	536
5.	Underground Bunds	7	2.71	10	7
6.	Lift Irrigation	4	1.05	--	64
7.	Storage Irrigation Scheme	3	39.33	--	36
8	Bridge Mixed Bunds	--	--	--	--
	TOTAL	**85**	**186.36**	**5030**	**1451**
	VADUJ				
1.	Percolation Tank	34	205.73	6716	1105
2.	Village Tank	15	23.48	373	200
3.	Kolhapur Type Bunds	39	118.68	1187	601
4.	Corner Bunds	15	8.61	--	304
5.	Underground Bunds	11	4.48	--	--
6.	Lift Irrigation	2	1.29	--	30
7.	Storage Irrigation Scheme	2	--	--	--
8.	Bridge Mixed Bunds	--	--	--	--
	TOTAL	**118**	**362.27**	**8276**	**2240**
	KATAR KHATAV				
1.	Percolation Tank	38	211.31	4048	872
2.	Village Tank	6	3.98	131	99
3.	Kolhapur Type Bunds	31	76.59	654	267
4.	Corner Bunds	15	6.77		246
5.	Underground Bunds	2	1.08	--	--
6.	Lift Irrigation	6	4.08	--	157
7.	Storage Irrigation Scheme	3	10.34	48	17
8.	Bridge Mixed Bunds	--	--	--	--
	TOTAL	**101**	**314.15**	**4881**	**1658**

	MAYANI				
1.	Percolation Tank	49	219.72	8088	1472
2.	Village Tank	3	1.28	48	42
3.	Kolhapur Type Bunds	34	141.6	975	431
4.	Corner Bunds	13	5.41	--	208
5.	Underground Bunds	2	5.04	--	--
6.	Lift Irrigation	3	2.14	--	70
7.	Storage Irrigation Scheme	6	5.07	15	5
8	Bridge Mixed Bunds	1	1.85	24	20
	TOTAL	**105**	**382.11**	**9150**	**2248**
TAHSIL TOTAL		**650**	**1990.16**	**40580**	**11612**

Source: Irrigation Department Division, Satara (2011-12).

KHATAV TAHSIL: DIFFERENTS WDP SCHEMES WORK

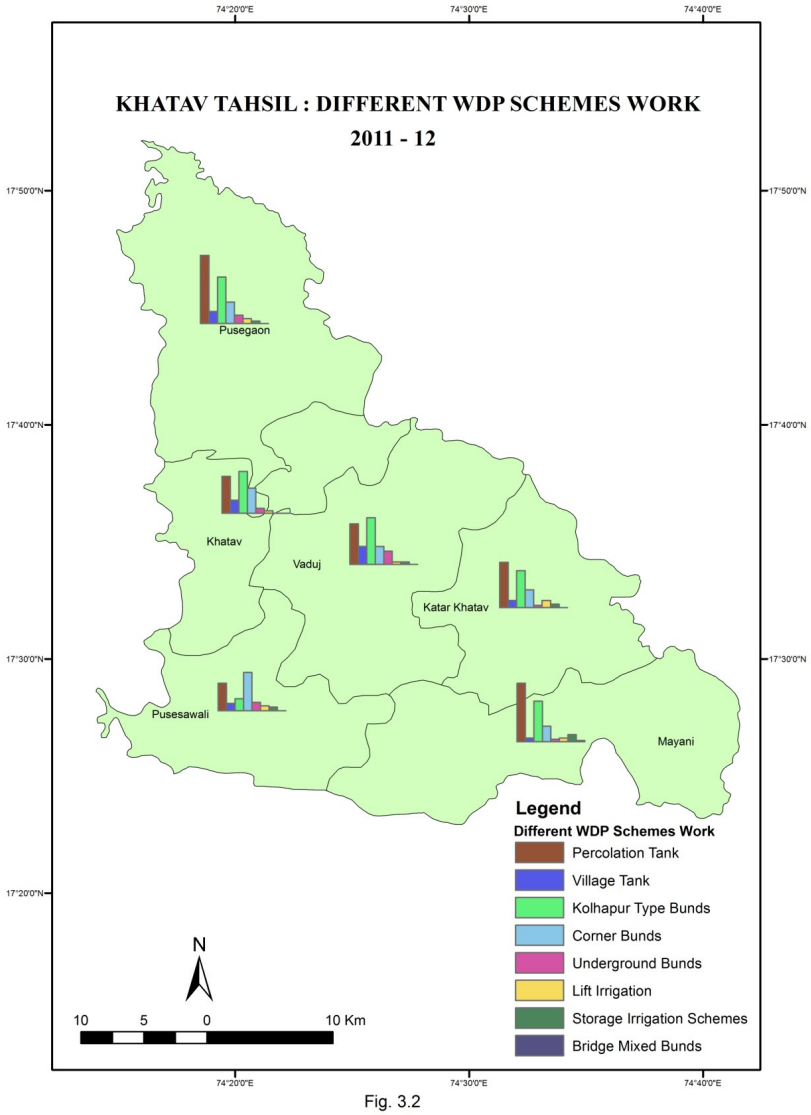

Fig. 3.2

Table 3.2 and Fig. 3.2 shows the different WDP schemes work in Khatav tahsil in until now-a-days. Pusegaon circle has highly WDP work in tahsil. This circle involves 486.6 lakh rupees expenditure in different WDP schemes, which has 2,399 hectare area irrigated. This work has 137 water storage number of work which storage 8,106 cubic meter water storage capacity. Specially, Nidhal village has more than 40 water storage number of work; hence village does not occur shortage in summer season as well as in drought condition.

Mayani circle has secondly in WDP work in tahsil. This circle involves 382.11 lakh rupees expenditure in different WDP schemes, which has 2,248 hectares area irrigated. This work has 105 water storage number of work which storage 9,150 cubic meter water storage capacity. (Table 3.2 and Fig. 3.2)

Vaduj circle has third in WDP work in tahsil. This circle involves 362.27 lakh rupees expenditure in different WDP schemes, which has 2,240 hectares area irrigated. This work has 118 water storage number of work which storage 8,276 cubic meter water storage capacity.

Khatav, Pusesawali and Katar Khatav circles has involved about 3 crore rupees expenditure in different WDP schemes, which irrigated nearly 1,500 hectares area irrigated. This work has about 90 water storage number of work which storage 5,000 cubic meter water storage capacity.

3.11 Role of NGO's in Watershed Development in Khatav tahsil.

The NGOs for implementing Watershed Development projects will be identified based on the following criteria:

a) Reputation and financial management capacity.
b) Methods of operation and report with people and local government agencies.
c) Perspective on Watershed Development.
d) Nature of project handled in the past.
e) Technical and managing capability.
f) Sensitivity towards group action / conflict resolution and equity for poor and women.
g) Ability to motivate the community for providing 'Shramdan' (voluntary work) in the village where they propose to work**.**

The NGO should have been active in the area for a significant period before proposing a watershed project for the area. NGOs and watershed communities willing

to implement a watershed project, if selected have to go through a proofing stage and meet the qualifying criteria before they undertake a large scale project.

There are 5 NGO's workings in Watershed Development in Khatav tahsil. These NGO's are viz. Phenix Organization, Vaduj; Panlot Vikas Sanstha, Nidhal; Gram Parivarthan Sanstha, Katgun; Sevagiri Devasthan Trust, Pusegaon; Sankalp Foundation, Vaduj etc. Each NGO has more than 3,000 hectares. Watershed allotted for development.

3.12 Schemes for Watershed Development

Most of people are living in rural areas. Near about 60 % population is engaged in agriculture. So the development of the nation depends upon the development of agriculture and rural areas. So that the government implements schemes which are entered for rural development. There are various schemes implemented by the state and central government as follows:

3.12.1 Central Government Funded Schemes

A. River Valley Project [RVP] (1972-73)
B. Western Ghat Development Programme[WGDP] (1974-75)
C. Drought-prone Area Development Programme [DPAP] (1974-75)
D. National Watershed Development Programme [NWDP] (1987-88)
E. National Watershed Development Project for Rainfed Areas (NWDPRA) (1990-91)
F. Integrated Watershed Development Programme [IWDP] (1995-96)
G. Hariyali Scheme (2001)

3.12.2 State Government Funded Schemes

1. Land Development Programme (1964-65)
2. Indo-German Watershed Development Programme(1989)
3. Ideal Village Scheme (1992)
4. Mahatma Phule Jal Va Bhoomi Sandharan Abhiyan (2002)
   (Mahatma Phule Land and Water Conservation Movement)

Central Government Funded Schemes

A) River Valley Project [RVP] (1972-73)

For the implementation of this programme 50 percent grant is allotted by the central Government and remaining 50% is allotted in the form of long term loan. This

programme is announced in third five year plan. This programme includes 7 projects of Maharashtra state namely, Damanganga (Thane and Nashik), Pochmpad (Nanded), Ukai (Dhule, Jalgaon and Nashik), Arjunsager (Solapur), Narmadasagar (Dhule and Nandurbar), Ghod and Nijamsagar (This is completed).

Objectives

1) To reduce soil erosion in catchment area of the rivers.
2) To increase the water holding capacity of soil and productivity of the land in Watershed Development.
3) Use of land according to its capability.
4) Decreasing siltation of tanks through Watershed Development.
5) To increase the active participation of people in Watershed Development.

Works in Khatav tahsil

Khatav tahsil has only one major river. Yerala is the major seasonal river in tahsil. This river empty in the summer season. Hence, River Valley Project scheme has greatly followed in the Yerala river in tahsil.

Table 3.3
KHATAV TAHSIL: RIVER VALLEY PROJECT

Sr. No.	Year	Scheme Fund (in Lakh Rs.)	Expenditure (in Lakh Rs.)
1	2009	0.00	52.15
2	2010	40.20	20.20
3	2011	67.18	10.55
4	2012	58.74	20.66
Total		**166.12**	**103.56**

Source: Irrigation Department Division, Satara (2011-12).

Table 3.3 shows the River Valley Project scheme fund and expenditure of Khatav tahsil in 2009, 2010, 2011 and 2012. This scheme gives about 50 lakh rupees yearly fund for Khatav tahsil. And about 20 lakh rupees yearly expenditure in the tahsil especially for Yerala basin in the tahsil.

B) Western Ghat Development Programme[WGDP] (1974 -75)

This scheme is sponsored by the central government and implemented by the soil Forestry Department since 1983-84. This scheme is going on in Thane, Raygarh, Ratnagiri, Sinddurag, Ahmadnager, Dhule, Nashik, Pune, Satara, Sangli and Kolhapur

district of 62 tahsil. The town of this scheme is the plantation on private land, the plantation on bunds of field and plantation on the common land. Khatav tahsil does not come in this programme.

C) Drought-prone Area Development Programme [DPAP] (1974-75)

This programme was one of the area development programme launched by the government in 1973-74 to tackle the special problems faced by those fragile areas which are constantly affected by severe drought conditions. The DPAP was introduced with an aim to conserve, develop and harnessing, conserving and developing natural resources, i.e. land, water, vegetation cover, raising land productivity.

Objective of DPAP

* Reduction of severity of the impact of drought.
* Stabilization of income of the people, particularly of the weaker sections of society.
* To restore the ecological balance.

Based on the recommendations of the Hanumantha Rao Committee, comprehensive guidelines for Watershed Development, commonly applicable to Drought-prone Areas Programme, Desert Development Programme and Integrated

Wastelands Development Programme was issued in October 1994 and was made applicable with effect from 1.4.1995. Subsequently, based on the feedback received from States, Project Implementation Agencies and others concerned, the Guidelines were revised in September 2001.

Funding Pattern

Until March, 1999 the funds were shared on 50:50 basis between the Central Government and the State Government. However, with effect from 1st April, 1999, the funding is shared on 75:25 bases between the Central and State Government. For completion of ongoing projects that were sanctioned prior to April 1999, the old funding pattern will continue. The projects of 500 hectares are sanctioned under the programme. Until March, 2000 following cost norms were adopted under DPAP for various eco-systems.

However with effect from 1.4.2000, uniform cost norms Rs.6,000/- per hectares have been introduced. These norms are applicable to projects sanctioned

during and after 2000-2001. In respect of earlier projects sanctioned upto 1999-2000, the pre-revised cost norms will be applicable.

Table 3.4
DPAP: FUNDING PATTERN

Sr. No.	Ecosystem Type	Per Hect. No. of Average Cost (in Rs.)	Watershed Project Cost (Rs. in lakh)
1	Semi-Arid Region	4,000	20.00
2	Dry-Sub-Humid Region	3,000	15.00
3	Dry Sub-Humid (Hill) Region	4,000	20.00

Source: Irrigation Department Division, INDIA, (2011-12).

In 1991-2000 the allocation of share is 75:25 bases between central and state for the project sanctioned after 1.4.1999. In the first 4 years of the plan an estimated to treat incurring amount of Rs.61.31 crore in the Khatav tahsil.(Table 3.4)

DPAP Scheme in Khatav tahsil

Khatav tahsil is droughtic area or eastern part of Satara district. This tahsil highly follows DPAP scheme in the district. In 2011-12 year, DPAP scheme has followed in 143 villages in tahsil.

Table 3.5
KHATAV TAHSIL: DPAP SCHEME (2011-12)

Sr. No.	Name of Circles	No. of Villages	Area (in Hectares)	Area (in %)
1	Pusegaon	34	30746.2	22.39
2	Khatav	27	16729.71	12.18
3	Pusesawali	21	17582.35	12.80
4	Vaduj	22	26415.4	19.23
5	Katar Khatav	21	19390.83	14.12
6	Mayani	18	26486.42	19.28
Total		**143**	**137350.90**	**100**

Source: Irrigation Department Division, Satara (2011-12).

Table 3.5 shows the circle-wise DPAP scheme area of Khatav tahsil in 2011-12 year. Pusegaon circle has predominant number of villages in tahsil. This circle has followed DPAP scheme in 33 villages and 30,746.2 hectares (22.39 percent) area. Mayani circle has second dominant number of villages in tahsil for DPAP scheme. This circle has followed DPAP scheme in 19 villages and 26,486.42 hectares (19.28 percent) area. Vaduj circle has third dominant number of villages in tahsil for DPAP

scheme. This circle has followed DPAP scheme in 21 villages and 26,415.40 hectares (19.23 percent) area. Katar Khatav, Pusesawali and Khatav circles follow the less than 15 percent area.

Bhandewadi in Khatav circle and Landewadi (N.V.) in Pusesawali circle does not follow the DPAP scheme in the tahsil. Phenix Organization, Vaduj; Panlot Vikas Sanstha, Nidhal; Gram Parivarthan Sanstha, Katgun; Sevagiri Devasthan Trust, Pusegaon; Sankalp Foundation, Vaduj etc. are the NGO's selected for the implementation of this project. The work is going on.

D) National Watershed Development Project for Rainfed Areas (NWDPRA) (1990-91)

Rainfed areas constitute about 57% of the total 140.30 million hectares cultivated in the country. Rainfed agriculture is characterized by low levels of productivity and low input usage. Variability in rainfall results in wide variation and instability in yields. The bulk of the rural poor live in the rainfed regions. Therefore, Government of India accords highest priority to the holistic and sustainable development of rainfed areas through Watershed Development approach.

The scheme of National Watershed Development Project for Rainfed Areas (NWDPRA) was launched in 1990-91 in 25 States and 2 Union Territories based on twin concepts of integrated watershed management and sustainable farming systems. During IXth Plan, the scheme was extended to 3 newly formed States of Uttaranchal, Jharkhand and Chhattisgarh. The scheme of NWDPRA has been subsumed under the Scheme for Macro Management of Agriculture (MMA) from 2000-2001. At present, this scheme is being implemented as a programme of Centrally Sponsored Scheme of Macro Management of Agriculture in 28 States and 2 UTs. Funds are released to the States based on Approved Annual Work Plan. The Scheme is presently being implemented on the basis of Common Guidelines for Watershed Development Projects issued by National Rainfed Area Authority (NRAA).

Objectives

The main objectives of the scheme are as follows:-

1. Conservation, development and sustainable management of natural resources.
2. Enhancement of agricultural production and productivity in a sustainable manner.

3. Restoration of ecological balance in the degraded and fragile rainfed ecosystems by greening these areas through appropriate mix of trees, shrubs and grasses.
4. Reduction in regional disparity between irrigated and rainfed areas.
5. Creation of sustained employment opportunities for the rural community including the landless.

Financing Pattern

Financing pattern of NWDPRA programme is applicable as per the financing pattern of MMA i.e. 90:10 of Central and State Government. For North Eastern States it is 100 % grant.

Main Components of the NWDPRA

The main components include:-

- **Prefatory phase:**
  - i. Entry point activities
  - ii. Institution and capacity building
  - iii. Detailed Project Report (DPR)
- **Watershed Works Phase:**
  - i. Watershed Development works
  - ii. Livelihood activities for the asset less persons
  - iii. Production system and micro enterprises
- **Consolidation phase**

Progress of NWDPRA

Plan-wise area developed and expenditure made under NWDPRA programme are as under:

Table 3.6

INDIA: DETAILED PLAN-WISE PROGRESS OF NWDPRA SCHEME

Sr. No.	5 year Plan period	No. of Micro Watersheds	Area Developed (in lakh Hectares)	Expenditure (Rs. in crore)
1.	VIII	2554	42.232	966.93
2.	IX	3007	27.663	910.81
3	X	6315	24.133	1156.92
	Total up to X Plan	11876	94.028	33034.66
4.	XI	3854		
5.	2007-08	--	3.736	219.08
6.	2008-09	--	2.532	271.82
7.	2009-10	--	2.534	252.68
8.	2010-11(Target)	--	2.976	300.79

Source: Irrigation Department Division, INDIA, (2011-12).

Major Achievements

Impact evaluation studies both on the ground and through remote sensing techniques have shown that watershed based interventions have led to:

a. Increase in groundwater recharge.
b. Increase in number of wells and water bodies.
c. Enhancement of cropping intensity.
d. Changes in cropping pattern.
e. Higher yields of crops and reduction in soil losses.

NWDPRA programme involves the rainfed areas, but Khatav tahsil belongs to drought area. Hence, this scheme does not follow in Khatav tahsil.

E) National Watershed Development Programme [NWDP] (1987-88)

This programme is implemented through central government. 75% share of fund is given by the central government and remaining 25% share is given as loan amount to state government. This programme is implemented in Maharashtra since 1987-1988.

Objectives of the programme

1) Conservation and utility of natural resources.
2) Environmental conservation through scientific management of soil and water resources.
3) Upliftment of farmers and landless people through Watershed Development.

4) Increase the employment.
5) Development in rainfed agriculture and making the balance between irrigated agriculture and rainfed agriculture.
6) To reduce the migration of people from rural to urban area.

Table 3.7

MAHARASHTRA: DETAILED PLAN-WISE PROGRESS OF NWDP SCHEME

Sr. No.	5 year Plan period	No. of Micro Watersheds	Area Developed (in hectares)	Expenditure (Rs. in lakh)
1.	VIII	266	8,79,886	16,518.11
2.	IX	271	2,81,256	8,940.00
3	X	433	1,55,223	7,483.08
4.	Cumulative Progress	712	4,39,356	16,557.11

Source: Irrigation Department Division, Maharashtra, (2011-12).

Until now days, Khatav tahsil has only 20 percent area in NWDP scheme. Katar Khatav circle has highly followed NWDP scheme, in 8 watershed area. Also Vaduj circle has followed NWDP scheme in 5 watershed area. Pusegaon, Khatav, Pusesawali, Mayani etc. other circles have followed some Watershed Development under NWDP scheme. (Table 3.7)

F) Integrated Watershed Development Programme [IWDP] (1995-96)

The national watershed board was established in 1985 under the Ministry of Forest and environment, majority to tackle to the problem of degradation of lands restoration of ecology and to meet the growing demands of fuel wood and fodder at the national level.

Integrated Watershed Development Programme (IWDP) scheme is under implementation since 1989-90, and has come to this Department along with the National Wastelands Development Board. The development of non-forest wastelands is taken up under this Scheme. The scheme provides for the development of an entire micro watershed in a holistic manner rather than piecemeal treatment in sporadic patches. The thrust of the scheme continues to be on development of wastelands.

The IWDP is implemented by the department of land resources for improving the productivity of waste and degraded land, keeping in view poverty, backwardness, gender and equity.

Objectives:

1. To provide rural employment.
2. To enhance people participation in the Watershed Development programme at all stages, this is to be ensured by equitable and sustainable sharing of benefits and usufructs accruing from such projects.
3. To start pilot projects in the states for integrated land management and Watershed Development based on village / micro watershed plan.
4. Conserving, developing and management of water resource like ponds, earthen check dam, gully plugs, LBS, contour trenches, Graded bunds, Percolation Tank, lift Irrigation system, Irrigation channels.
5. Forming community-based organizations like self help group, village watershed Committees, User groups, Kisan Clubs etc.
6. Practicing a forestation, agro horticulture, dry land horticulture, fodder development in private and GM land.
7. Introducing micro-enterprises with unit setups and facilitate skill development training like soaps and detergents making, piggery, poultry, nursery, vermin-compost, fishery, bamboo crafting, tailoring, goatery etc. and promoting rural trading and castration for livestock under breed improvement.

Funding Pattern (Distribution)

Table 3.8

IWDP: FUNDING PATTERN

Sr. No.	Components	Funds
1	Assistance	Rs.4,000 per hect.
2	Admn. Cost	10 %
3	Community Organization	5 %
4	Training	5 %
5	Works	80 %

Source: Irrigation Department Division, Satara.

The project under IWDP is being implemented in 216 districts of the country. Since inception the programme an area of 2.84 lakh hectares has been covered by various development measures with an expenditure of Rs. 216.16 crore. In the first four year of the plan an area of 35.65 hectares has been covered with an expenditure of Rs. 496.32 crore. (Table 3.8)

IWDP Schemes in Khatav tahsil

Khatav tahsil has highly worked under the IWDP scheme in Satara district. After every 3-4 years this tahsil has drought-prone situation. In every year summer season, the eastern part specially Mayani and Katar Khatav circle has high water problems as well as low agricultural crop production in tahsil. Also, according to one report, this tahsil has critical groundwater watershed. Hence, not only central government but also state government gives high funds and fallow big projects in the tahsil. IWDP scheme fallow big projects in the tahsil for Integrated Watershed Development.

The table 3.9 shows the IWDP Project-cost and funds of Khatav tahsil in 2002, 2004, 2007 and 2011. In 2002, Khatav tahsil has 454.50 hectares area and 27.27 lakh rupees project cost for IWDP scheme project. Central government has shared 25 lakh rupees and state government has shared 2.27 lakh rupees. But expenditure had 3.64 lakh rupees. (Table 3.9)

Table 3.9

KHATAV TAHSIL: IWDP PROJECT-COST AND FUNDS

(in Lakh Rupees)

PROJECT-COST AND FUNDS	YEAR			
	2002	**2004**	**2007**	**2011**
Total Area of Project: (in hectare)	454.50	680.68	1135.18	1589.68
Project-cost in Lakh Rs.				
a) Central Share:	25.00	37.43	62.43	87.43
b) State Share:	2.27	3.40	5.67	7.94
Total Cost:	**27.27**	**40.83**	**68.11**	**95.37**
Funds in Lakh Rs.				
Total Funds Received:	4.38	4.98	9.36	13.74
Total Expenditure:	**3.64**	**2.32**	**5.96**	**9.60**

Source: Irrigation Department, Satara (2002-2011).

In 2004, Khatav tahsil has 680.68 hectares area and 40.83 lakh rupees project cost for IWDP scheme project (Table 3.9). Central government has shared 37.43 lakh rupees and state government has shared 3.40 lakh rupees. But expenditure had 2.32 lakh rupees.

In 2007, Khatav tahsil has 1,135.18 hectares area and 68.11 lakh rupees project cost for IWDP scheme project. Central government has shared 62.43 lakh rupees and state government has shared 5.67 lakh rupees. But expenditure had 5.96 lakh rupees.

In 2011, Khatav tahsil has 1,589.68 hectare area and 95.37 rupees project cost for IWDP scheme project. Central government has shared 87.43 lakh rupees and state government has shared 7.94 lakh rupees. But expenditure had 9.60 lakh rupees.

G) Hariyali Scheme (2001)

Hariyali is the new scheme, in August 2001 has started work for Watershed Development. This scheme involves the Panchayat Raj Institutions (PRIs) for more meaningfully in planning, implementation and management of economic development activities in rural areas with the help of local people's participation.

Applicability:

New projects under the area development programmes shall be implemented in accordance with the Guidelines for Hariyali with effect from 1.4.2003. Projects under DPAP and DDP will be taken up in the blocks identified under the respective programme and projects under IWDP shall generally be taken up in the remaining blocks. Projects sanctioned prior to this date shall continue to be implemented as per the Guidelines of 2001.

Objectives:

The objectives of projects under HARIYALI are the: -

1. Harvesting every drop of rainwater for purposes of irrigation, plantations including horticulture and floriculture, pasture development, fisheries etc. to create sustainable sources of income for the village community as well as for drinking water supplies.
2. Ensuring overall development of rural areas through the Gram Panchayats and creating regular sources of income for the Panchayats from rainwater harvesting and management.
3. Employment generation, poverty alleviation, community empowerment and development of human and other economic resources of the rural areas.
4. Mitigating the adverse effects of extreme climatic conditions such as drought and desertification on crops, human and livestock population for the overall improvement of rural areas.

5. Restoring ecological balance by harnessing, conserving and developing natural resources i.e. land, water, vegetative cover especially plantations.
6. Encouraging village community towards sustained community action for the operation and maintenance of assets created and further development of the potential of the natural resources in the watershed.
7. Promoting use of simple, easy and affordable technological solutions and institutional arrangements that make use of, and build upon, local technical knowledge and available materials.

Criteria on Selection of Watersheds

The following criteria may broadly be used in selection of the watersheds:

1. Watersheds where People's participation is assured through contribution of labour, cash, material etc. for its development as well as for the operation and maintenance of the assets created.
2. Watershed areas having acute shortage of drinking water.
3. Watersheds having large population of scheduled castes/scheduled tribes dependent on it.
4. Watershed having a preponderance of non-forest wastelands/degraded lands.
5. Watersheds having preponderance of common lands.
6. Watersheds where actual wages are significantly lower than the minimum wages.
7. Watershed which is contiguous to another watershed that has already been developed/ treated.
8. Watershed area may be of an average size of 500 hectares, preferably covering an entire village. However, if on actual survey, a watershed is found to have less or more area, the total area may be taken up for development as a project.

In case a watershed covers two or more villages, it should be divided into village-wise sub-watersheds confined to the designated villages. Care should be taken to treat all the sub-watersheds simultaneously.

Funding Pattern

The present cost norm is Rs 6,000 per hectare. This amount shall be divided amongst the following project components subject to the percentage ceiling mentioned against each: -

Table 3.10

HARIYALI SCHEME: FUNDING PATTERN

Sr. No.	Components	Funds (in %)
1	Watershed Treatment/ Development Works/ Activities	85
2	Community Mobilization and Training	5
3	Administrative Overheads	10
	Total	**100**

Source: Irrigation Department Division, Pune (2001).

Savings, if any, in the administrative costs can be utilized for undertaking activities under the other two heads viz. training and watershed works, but not vice-versa. Purchase of vehicles, office equipment, furniture, construction of buildings, and payment of salaries of government staff will not be permissible under administrative costs.

Hariyali Scheme work in Khatav tahsil

Hariyali scheme has followed only in the Katar Khatav circle. Katar Khatav has 21 villages and 12 watershed villages in tahsil. Hivarwadi, Kanasewadi, Khatwal, Palasgaon, Yelmarwadi etc. villages, 3,539.68 hectares area involves in this scheme for 5 years.

From 2007-08, Hariyali scheme has harvested every drop of rainwater for purposes of irrigation, plantations including horticulture and floriculture, pasture development, fisheries etc. in the Hivarwadi, Kanasewadi, Khatwal, Palasgaon, Yelmarwadi etc villages. This scheme involves Check dam, earthen bunds, cement bunds, farm ponds and plantation etc. activities. Also, this scheme has *'top to bottom'* work in hilly region. High plantation in rural areas is the main aim of Hariyali scheme. (Table 3.11, Fig. 3.3 and 3.4)

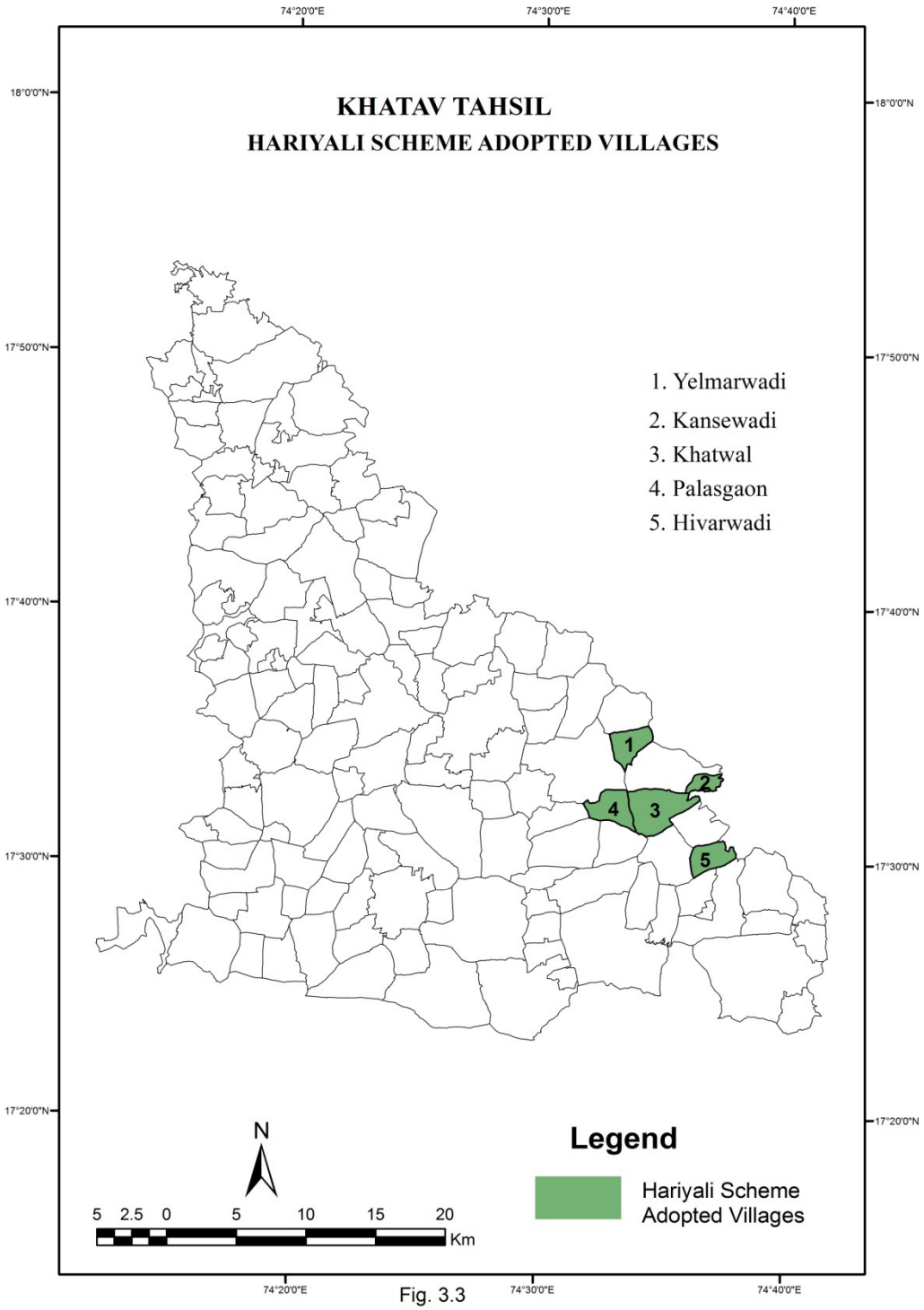
KHATAV TAHSIL
HARIYALI SCHEME ADOPTED VILLAGES
1. Yelmarwadi
2. Kansewadi
3. Khatwal
4. Palasgaon
5. Hivarwadi
74°20'0"E
74°30'0"E
74°40'0"E
18°0'0"N
17°50'0"N
17°40'0"N
17°30'0"N
17°20'0"N
N
5 2.5 0 5 10 15 20
Km
Legend
Hariyali Scheme
Adopted Villages

Fig. 3.3

Table 3.11

KHATAV TAHSIL: HARIYALI SCHEME

(in March, 2012-13)

Sr. No.	Hariyali Village	Area (in hectares)	Fund (Rs. in Lakh)	Expenditure (Rs. in Lakh)
1	Hivarwadi	539.92	30	13
2	Kanasewadi	625.23	30	12
3	Khatvwl	1149.45	30	13
4	Palasgaon	670.95	30	12
5	Yelmarwadi	554.13	30	10
Total		**3,539.68**	**180**	**65**

Source: Irrigation Department, Satara (2012-13).

KHATAV TAHSIL: HARIYALI SCHEME
(in March, 2012-13)

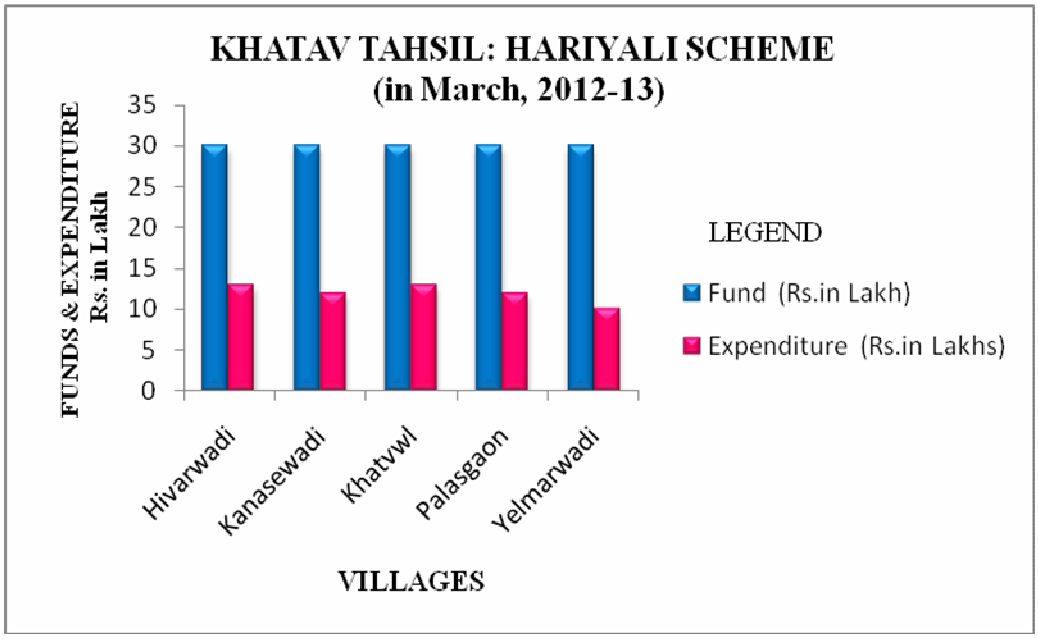

Fig. 3.4

The table 3.11, fig. 3.3 and 3.4 shows the Hariyali Scheme of Khatav tahsil in March 2013. Khatwal has pre-dominant area in circle in Hariyali scheme. This village has 1149.45 hectares area and 30 lakh rupees fund but after 5 years expenditure has 13 lakh rupees only.

Palasgaon has second dominant area in circle in Hariyali scheme. This village has 670.95 hectares area and 30 lakh rupees fund but after 5 years expenditure has 12

lakh rupees only. Hivarwadi has not watershed village, but this village also involved in Hariyali scheme. This village has 539.92 hectares area and 30 lakh rupees fund but after 5 years expenditure has 13 lakh rupees only. (Table 3.11, Fig. 3.3 and 3.4)

Kanasewadi and Yelmarwadi villages have also more than 500 hectares area and 30 lakh rupees fund, but after 5 years these villages have used about 10 lakh rupees for Hariyali scheme work.

Mega Watershed Development with NABARD-

Rural poverty is invariably linked to poor resource access, further defined to refer to the degraded landholding or landless status of poor and marginalized communities. Strengthen this resource base providing alternate livelihood options will have direct benefits in terms of improving livelihood opportunities of these communities. While this forms one of the key objectives of rural development, promoting a culture of efficient and sustainable resource use also needs to be addressed. Focus on watershed as unit to promote rural development based on natural resource management helps to address both the issues of rural poverty and sustainable natural resource management. From this base, key livelihood elements such as self-employment, self-help groups and value addition for market linkages can be built up. AFPRO has provided NABARD with socio-technical support for Mega Watershed Development in Maharashtra during the year of reporting. AFPRO's experience in Integrated Watershed Development both in terms of technical facilitation for implementation as well as monitoring and evolution has enabled it to have strong institutional knowledge and understanding on the watershed approach. This Mega watershed Project is being funded out of the Rural Infrastructure Development Fund (RIDF), a government of India fund with NABARD for sustainable rural infrastructural development. RIDF has been created out of deficit priority sector lending of public sector banks.

Overall objectives of the Mega Watershed Development Programme are restoration of ecological balance in the region and improving the standard of living of the community. The specific objectives of the programme are:-

1. To strengthen the indigenous resource base, mainly primary resource of land, water and human being for increasing their Productivity.
2. To increase the earning capacity of people in order to reduce their migration from villages.

3. To regenerate the ecology by increasing vegetative covers for drought proofing and creation of sustainable livelihood opportunities for all.
4. To increase the availability of biomass for consumption and market purpose.
5. To ensure year round availability of employment avenues, particularly for women and labours.
6. To avoid silting of ponds and reservoirs.
7. To enable people manage and maintain their assets.

The Mega watershed assigned to AFPRO is spread over 38,177 hectares in Man Block of District Satara and inhabited by 37 villages with 14,707 households and total population of 73,476. Implementation activities will be done by the State Agriculture Department. The process adopted included a socio-economic survey of 10 percent sample households from the project villages, conducting net planning exercises, well inventories and drainage line survey of selected sites.

State Government Funded Schemes

1. Land Development Programme (1964-65)

Water and soil plays important role in agricultural development. There is limitation in development of irrigation, so judicial use of available water is important. Taken into consideration of this fact after completion of tanks and canals, government has taken the efforts for the land development programme in the beneficial areas of tanks and canals. The work is done in the form of Graded bunds, land leveling, Cement bunds etc; by the Department of Agriculture Government of Maharashtra since 1964.

This type of work is going on under this programme in 6 large, 174 medium, 115 small irrigation tanks and 127 lift irrigation schemes. Out of which 4 large, 81 medium, 25 small, and 124 lift irrigation project works is completed.

2. Indo-German Watershed Development Programme [IGWDP](1989).

The Indo-German Watershed Development Programme is an integrated environmental regeneration programme implemented in the State of Maharashtra, by village Self-Help Groups, accompanied and mobilized by NGOs. It is bilaterally assisted programme which was initiated in 1989 by Fr. Hermann, Bacher, S.J., and the moving spirit behind the programme. The programme was operationalised in December, 1992.

The Programme consists of two Phases:

i) Capacity Building Phase (Phase I)

This phase is funded by the German Agency for Technical Cooperation the GTZ and administered by WOTR and is meant for NGOs who would like to undertake watershed projects, but who do not at present, have the necessary skills and capabilities. It enables NGOs to qualify for inclusion in Phase II.

ii) Full Implementation Phase (Phase II)

This is the main programme funded by the German Development Bank- the KFW and administered by NABARD and is meant for NGOs who have sufficient experience and demonstrated capabilities in the area of Watershed Development.

WOTR is the link between VSHGs and NGOs desirous of undertaking watersheds activates and the programme which accepts only "qualified" VSHGs and NGOs WOTR thus acts as a coordinating and support of the Capacity Building Programme of the IGWEP.

The objectives of the Indo German Watershed Development are:

i) To develop micro-watersheds in a comprehensive manner, so as to create adequate and sustainable livelihood opportunities for the inhabitants of that area.

ii) To form and to catalyze village groups for optimal utilization of natural resources on sustainable basis.

iii) To catalyze the village groups to stabilize and regenerate their degraded environment through participatory approach.

Partners and their Roles:

- The Gramsabha, the body representing the entire village, accepts and ratifies the project.
- The Village Watershed Committee (VWC) plans, implements and supervises the project.
- The NGO motivates and mobilizes the watershed communities and plays the role of facilitator and guide to the VWC during the project period.
- Concerned Government Departments, Technical Support Organizations and Agricultural Universities provide extension support during the implementation process as and when sought for.
- NABARD and RSOs give technical training and managerial support, besides monitoring the programme.
- The German Technical Cooperation (GTZ) and German Development Bank (KFW) provide financial assistance to the Capacity Building Phase (CBP) and

Full Implementation Phase (FIP) of Indo-German Watershed Development Programme through the GoI and NABARD.

- The Programme Coordination Unit with representation from NABARD and RSOs coordinates the implementation of the programme.

Major Project Components:

- Community mobilizations
- Area treatment
- Drainage line treatments
- Women's development activities
- Livelihood development activities
- Agriculture trainings and demonstrations

IGWDP work in Khatav tahsil

Nidhal village has the work of IGWDP work in 1998. This village belongs to Pusegaon circle, covers 1422.98 hectares area. According to 2001 census, this village has 702 households and 1750 population.

In the 1998, the IGWDP scheme has highly changed face of Nidhal village. This village has significant achievements about village development.

The Nidhal village achievements are:

1. Establishment of employee's organization consisting of 550 and more servants/ officials who have given Rs 100/-per year per individual. This donation amount was raised to Rs 365/- for village development and Rs 500/- per individual for Saint Gadagebaba cleaning campaign.
2. Villagers and Nokardar (servants) organization donated 10 acres land and 17 rooms high school built worth Rs 12.50 lakh. This amount was from Villagers contributions.
3. Students of Hanuman Vidyalaya High School presented their cultural program on Doordarshan.
4. There was 100 % successfully passed students from 10th standard who appeared to SSC Examination.
5. "Karmavir Bhaurao Patil Puraskar" was bagged by Hanuman Vidyalaya, Nidhal in the year 1993.
6. Satara Zilla Parishad gave First prize to village for removing untouchability in the village.

7. Dnyaneshwari parayan of the village celebrated its silver jubilee during 2001.
8. Rehabilitation of Nilkanteshwar Mahadev Temple was made at cost of Rs. 6 lakh from the Nidhal Villagers contribution.
9. Through campaign, production of country liquor was stopped and drinking of liquor has prohibited.
10. 2000 hectare sizes Mini-water shed development program with the assistance of Indo-German Watershed Development Program was implemented.
11. Integrated Watershed Development activities worth Rs. 34.67 lakh consisting of 6 Nala cement Bandharas, 19 Nala (earthen) Bandharas and 476 loose bolder were carried out.
12. Election of village Panchayat was unanimous with nominations of women in position of *"Sarpanch"* in June 2000.

3. Ideal Village Scheme (1992)

This is one of the most important schemes of the Government of Maharashtra for rural development. From 1994 this scheme is implemented at district level. For the selection of the village the five principles are must be accepted by the village by willingly want to participate in this programme. These principles are prevention on grazing, prevention on tree cutting, family planning, prevention on Alcoholism and voluntary work. The Government of Maharashtra has decided to select one village from each tahsil and develop it as an ideal village. In Khatav tahsil the survey of selection of villages is going on.

The main objective of Watershed Development, as outlined in the guidelines, is to improve the production potential of dry land areas, through conservation, mobilization and sustainable use of natural resources such as water, soil, and biomass. Watershed is also visualized as a strategy to bring development into drought-prone and socio-economically backward area.

4. Mahatma Phule Jal Va Bhoomi Sandharan Abhiyan [MPJBSA] (2002)
(Mahatma Phule Land and Water Reform Movement)

This programme was implemented by government of Maharashtra in 2002. This programme involves harmonious development of land utilization, water, and vegetation, human, animal and other resources.

Objective

1. To develop the rainfed agriculture with the help of Watershed Development and water harvesting structures. Development of fallow land and to enhance the employment. To implement *"water literacy movement",* proper use of water, groundwater recharge, developing the cropping pattern which rescue the water and to prevent the soil erosion.
2. The programme of the people and participation of the government.
3. To found the water utilization societies and with the help of these, society's provision of water is made from the dams with the help of canals or lift irrigations**.**
4. To solve the problem of drinking water of drought-prone areas and to consolidate drinking water sources. With help of conventional and non conventional methods.

Nala bunding, Gabion bunds, Vanrai bandharas, the desiltation of tanks, construction of percolation tanks, repairing of the nala bunding etc. work is done under this programme. For implementation of this programme was given a limit of 2 years.

MPJBSA Scheme in Khatav tahsil

Khatav tahsil has most work under the MPJBSA scheme in Satara district. This tahsil has drought-prone climate in every summer season. MPJBSA scheme is the best scheme for Watershed Development. According to one report, this tahsil has critical groundwater level in the district. Hence, MPJBSA scheme is also usable in tahsil.

Table 3.12

MAHATMA PHULE JAL VA BHOOMI SANDHARAN ABHIYAN: KHATAV TAHSIL (2012-13)

Sr. No.	Name of the Circles	No. of Villages	Area (hectares)	Fund (in Lakh Rs.)	Expenditure (in Lakh Rs.)
1	Katar Khatav	1	1388.12	20.48	20.63
2	Pusegaon	6	6735.48	14.48	11.26
3	Khatav	3	2852.88	2.41,	2.41
4	Vaduj	1	1078	3.73	30.94
Total		**11**	**12054.48**	**38.69**	**65.24**

Source: Irrigation Department, Satara (2012-13).

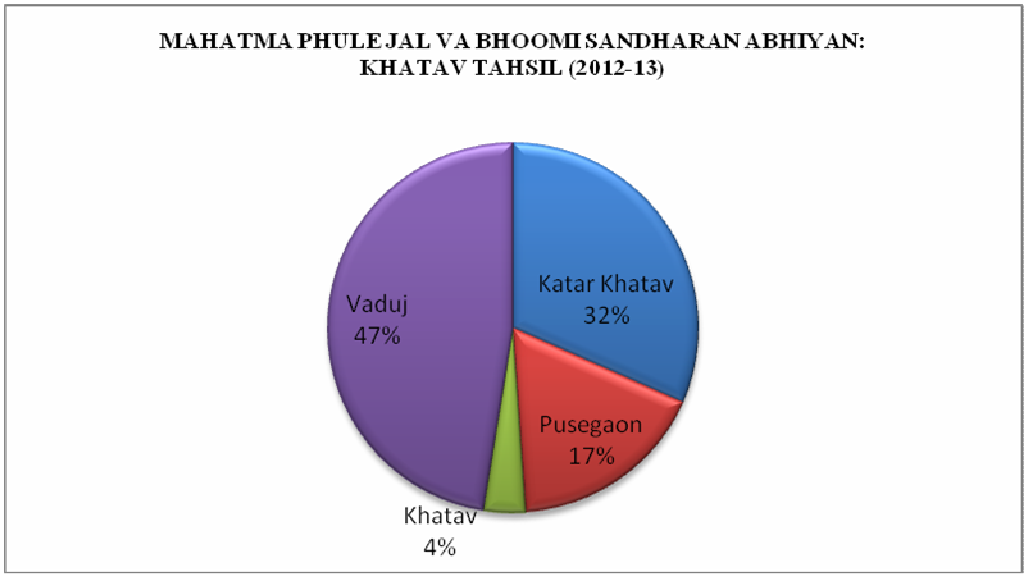

Fig. 3.5

The table 3.12 and fig. 3.5 shows the Mahatma Phule Jal Va Bhoomi Sandharan Abhiyan (MPJBSA) of Khatav tahsil in February 2013. Pusegaon circle has 6735.48 hectares area and 14.48 lakh rupees fund for MPJBSA scheme project. But expenditure is 11.26 lakh rupees.

Khatav circle has 2852.88 hectares area and 2.41 lakh rupees fund for MPJBSA scheme project. But expenditure is 2.41 lakh rupees. Katar Khatav and Vaduj circle has one village each and more than 3 lakh rupees fund for MPJBSA scheme project.

Recent work in tahsil (Chained Cement Bunds) (2012-13)

Maharashtra's present Chief Minister honorable Mr. Prithiviraj Chavan has set up model of cement bunds in drought-prone Khatav and Mann tahsil in order to stop run off rain water. For this reason the present MLA Mr. Jaikumar Gore has put the concept of Chained Cement Bunds before chief Minister taken into consideration the future water revolution by to stop run off rain water. In order to implementation of the project greater amount of the fund should be required. So the decision of building 400 cement bunds was taken in the assembly of Maharashtra with continuous effort by Jaykumar Gore and honorable Chief Minister of Maharashtra. Chief Minister has granted fund of 10 crore for pailat project in Khatav tahsil. It was the first stronger step to make water revolution in drought-prone area. The project of Chained Cement Bunds has been set up fastly. Due to such project availability of water increases spreading over 300 to 400 meters by giving importance on depth and width while

building bunds. At every low cost and low period 106 cement bunds has been built in Khatav tahsil, by providing permanent water availability of for dry land. It was greater achievement of MLA Mr. Jaykumar Gore and his consistent efforts.

Water was stored in such cement bunds without wasting it, which is based on the pattern of Ralegansiddhi and Shirpur. On 9th June 2013 Chief Minister has done boating in the cement bunds of Katar Khatav in Khatav tahsil. He has shown the people the capacity of water storage in such bunds by expending eight to ten lakh rupees. Near about 1423 chained cement bunds have been built up in Maharashtra's 6 drought-prone districts, among 15 tahsil and 474 villages. On the 9th June 2013 handover ceremony was arranged all over the Maharashtra by implementing permanent water scheme for dry land in Maharashtra.

Tahsils selected for Chained cement Bund Model:

The following tahsils were selected for model chained cement bund model. They are Khatav, Man, Jat, Kavthemahankal, Khanapur, Kadegaon, Miraj, Tasgaon, Atpadi, Sangola, Mangalvedha, Parner, Sangamner, Bhoom and Purandhar. The fund of 10 crore rupees provided to each tahsil for constructing chained cement bunds.

Many works are in progress since 1972-73 like CCT, nala bunds etc. percolation of water in land stopping erosion under the programme. Water table level of wells and underground water level increased by building earthen nala bunds. Greater area of watershed turned into fertile land. Also fallow land, barren land and dry land turned into fertile land. Farmers are insisting concrete cement bunds instead of earthen nala buns to avoid leakage of water from stoned cement bunds. Concrete bunds have been built in Khatav tahsil to remove the problem of leakage of and water was stored in concrete bunds from monsoon rain. Due to this water table level increased leading dry land to fertile land.

In Khatav tahsil 106 chained cement bunds have been made into 30 villages of tahsil expanding 10 crore 80 lakh 29 thousand rupees whose water storage capacity is 1503.89 TCM in the month of June of last year. In 52 cement bunds have over flown in the tahsil. GSDA reports it is seen that water table level increased from 2 to 5 meters in Khatav tahsil due to the construction of Chained Cement Bunds.

Table 3.13
Works and Expenditure of Chained Cement Bunds in Khatav tahsil

Sr.No.	Circle	No. of Cement Bunds	Expenditure (in Lakh Rs.)
1	Pusegaon	14	140.89
2	Khatav	04	43.09
3	Vaduj	19	152.72
4	Pusesawali	12	139.53
5	Katar Khatav	30	274.24
6	Mayani	27	329.79
	Total	**106**	**1080.26**

Source: 9th June 2013 daily Pudhari and Agricultural Dept. Khatav tahsil.

* Need and Importance of Chained Cement Bunds.

1) To do permanent facility of drinking water.

2) To increase water table level

3) To provide facility of protracted irrigation for crops.

4) To stop soil erosion

5) To increase agricultural income

6) To reduce the speed of flowing rainwater form surface of earth.

7) To increase irrigation area

8) To control flood situation

9) To increase water level of wells from surrounding area of bunds.

3.12 Conclusion

Watershed Development consists of conservation, regeneration and judicious use of all the natural resources. Watershed Development attempts to bring about best possible balance in the environment between natural resources on one side and man and grazing animals on the other. It requires people participation because conservation is possible only through the whole hearted involvement of the entire community. Watershed Development scheme is an ideal unit for environmental planning, soil and water conservation, resource generation and socio-economic development of the people.

The Khatav tahsil has 32 villages covered under mini watershed, 34129.32 cover hectares area. The Katar Khatav circle has highest number of watersheds. It

includes 12 mini watersheds. Also this circle has highly WDP work in the tahsil. Especially, Hariyali scheme has only followed in 5 villages of Katar Khatav circle.

The Vaduj circle has second highest number of watersheds. This circle includes 10840.59 hectares area and 9 mini watersheds. After Katar Khatav, this circle has mostly WDP work in tahsil.

Pusegaon, Khatav, Pusesawali, Mayani etc. circles have about 5 mini watersheds. Also these circles have few WDP work.

Khatav tahsil has 2002, 2004, 2007 and 2011 year followed IWDP scheme, 3860.04 hectares cover area and 231.58 lakh rupees project cost. Central government has shared 212.29 lakh rupees and state government has shared 19.28 lakh rupees. But expenditure had 21.52 lakh rupees.

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CHAPTER IV

CROPPING PATTERN

4.1 INTRODUCTION

Cropping pattern is the proportion of area under various crops at a point of as it changes over space and time. The cropping patterns of a region are closely influenced by the geo-climatic, socio-economic, historical and political factors (Hussain, M. 1996). Patterns of crop land-use of a region are manifestation of combined influence of physical and human environment. Differences in attitude towards the rural land in the level of prosperity and technology have produced changes in emphasis. Their effects on both landscape and land-use studies are likely to be far reaching (Coppock, 1968).

The present chapter has studied the general cropping pattern of tahsil. The Watershed Development Programme (WDP) is followed in the only 25-30 villages in the tahsil. Hence, on the tahsil level, cropping pattern has minimum impact of WDP. Therefore, WDP has not noted effectively impact on cropping pattern in the tahsil. But some villages have mostly noted impact on cropping pattern, which has studied in the chapter 5^{th} and 6^{th}.

4.2 CROPPING PATTERN

In the simple word cropping pattern means the production of area under various crops at a point of time. It is dynamic concept because no cropping pattern can be said to be ideal for all times to a particular region. It changes in space and time with a view to meet requirements and is governed largely by the physical as well as cultural and technological factors. The change in cropping pattern in particular span of time clearly indicates the changes that have taken place in the agricultural development. These changes are brought about by socio-economic influences.

Weather plays a decisive role in determining the existing cropping pattern. Cropping pattern is also depending on terrain, topography, slope, kinds of soil, availability of water for irrigation, use of pesticides, fertilizers and mechanization.

4.2.1 TYPES OF CROPPING PATTERN

There are five main types of cropping patterns. They are:

1. Multiple Cropping

2. Strip-Intercropping
3. Mixed Cropping
4. Crop Rotation
5. Planting for Genetic Diversity

1. Multiple Cropping

Two or more crops are grown in the same field within a given year. Annual and permanent plants can be organized in fields together. Another example might be planting rows of fruit trees with cereal grains or vegetables in between and windbreaks planted around the field perimeter.

2. Strip-Intercropping

Two or more crops are planted in the same field in alternate rows. The two crops generally have their main production period at different times of the year. This system more evenly uses water throughout the growing season, and ensures some level of productivity during the dry season by the more drought tolerant crops. For example, wheat or peas can be spring sown in one- meter strips with an adjacent fallow one-meter strip area. Later this area can be planted with two rows of corn.

3. Mixed Cropping

It refers to seeds of two or more crops are mixed before sowing. In this type, plants of crops are not grown in a set of patterns, where fertilizer cannot be applied to each crop as per its requirement.

4. Crop Rotation

Crops are changed in the field from year to year according to a planned sequence rather than the same crop being grown in the same field. The crop rotation can include both annual and permanent crops which are seeded for several years.

5. Planting for Genetic Diversity

Using several varieties of seeds in the same field can be a good strategy to increase crop diversity and reduce vulnerability to disease and insect outbreaks.

4.3 CROPPING PATTERN IN KHATAV TAHSIL

The cropping pattern in any region always shows variations or changes. This change occurs due to variations in amount of rainfall, availability of irrigation, agricultural inputs like capital, fertilizers, pesticides, variety of seeds, technical knowledge etc.

Crop pattern includes the proportion of area under different crops at a particular period of time. Khatav tahsil has 60 percent foothill region. Hence, this area is mostly cereal as well as pulse crop area. A sugarcane and cotton crop has just 10 percent area in the tahsil. Also there is the effect of change in climate and distribution of crops.

State and Central government organize Watershed Development Programme on village level in drought-prone area in droughtic condition. Khatav tahsil is the drought- prone area of Satara district. This tahsil faces drought condition after every 4-5 years. 1971-72, 2002-03 and 2011-12 years are the highly droughtic period in Khatav tahsil. In these years, government had organized Watershed Development Programme in Khatav tahsil. Government had created check dams, percolation tanks, earthen nala bunds, form ponds, graded bundings and sankan ponds in the tahsil.

The Khatav tahsil had occurred drought condition in 2011 to 2013. There had decreased the groundwater level. Most well had gone in dry condition. There had created potable water problems. Hence, government had started 142 water tankers for drinking water purpose. Also, 45 cattle chara chavani had started for cattle saving purpose in the tahsil. Lastly, in the 2012-13, drought condition was increased and created severe drought. Therefore, in the 2012-13, the cropping pattern was purely collapsed in the tahsil. Nearly 60 percent cropping area has deceased in that period. In this period, about 37129 hectare area are under the agricultural land use.(Table 4.1 and Fig. 4.1)

Pusegaon, Pusesawali and Vaduj circles have best condition of water because of Watershed Development Programme work. Hence, this area has more than 60 percent sown area. Also eastern part of tahsil includes Mayani and Katar Khatav circle has WDP work but nature of geomorphology of this area has low water storage capacity. So, Eastern part of tahsil has less sown area as compared to central part of tahsil. (Table 4.1 and Fig. 4.1)

Table 4.1

KHATAV TAHSIL: ALL CROPS (2012-13)

(in Hectares)

Sr. No.	Crops	Pusegaon-on	Khatav	Pusesawali	Vaduj	Katar Khatav	Mayani	Total	Ranking of Crops
1	Cereals	4187	4539	4328	4559	4761	4933	27307	**1** (73.55%)
2	Pulses	898	878	1106	948	972	912	5714	**2** (15.38%)
3	Oilseeds	292	177	264	239	172	154	1298	**4** (3.50%)
4	Cash Crops	680	443	632	504	272	279	2810	**3** (7.57%)
Total		**6057**	**6037**	**6330**	**6250**	**6177**	**6278**	**37129**	**100.00%**

Source: Agricultural Department of Khatav, Tahsil (2012-13).

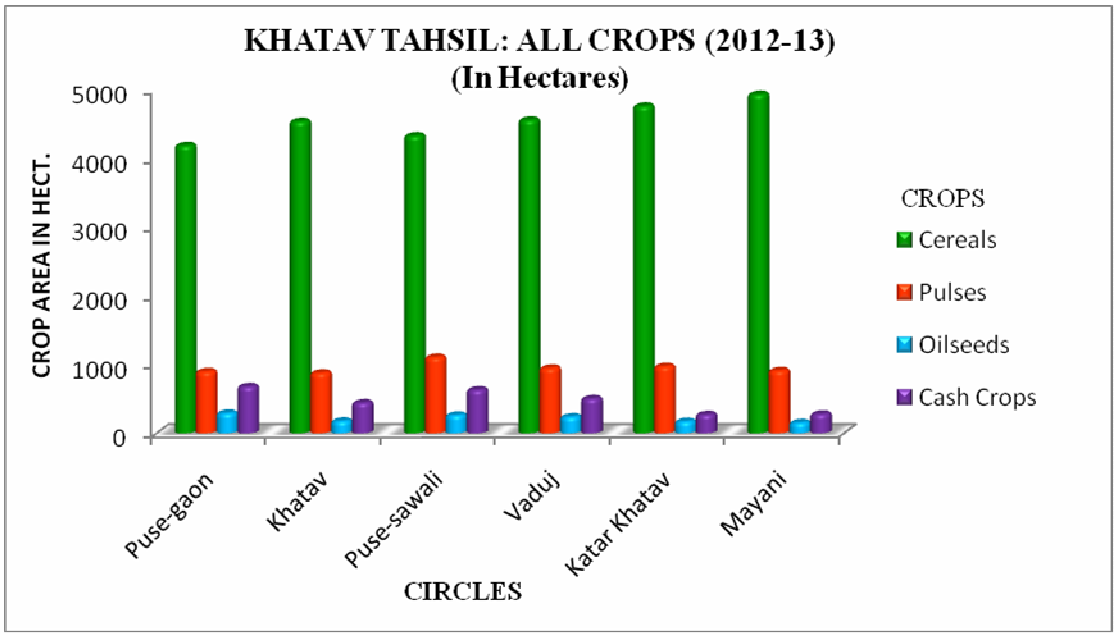

Fig. 4.1

Table 4.1 and Fig. 4.1 shows the circle-wise sown crop area variations in Khatav tahsil in 2012-13. Cereals crops are the predominant crop, which has 27,307 hectares. This tahsil has 73.55 percent cereal crops area; hence this area is the "Cereal Tahsil" of Satara district. Pulses crops are the second dominant crop, which has 5,714 hectares means 15.38 percent area in tahsil. Cash crops have very lowest area, which has 2,810 hectares, means just 7.57 percent areas in tahsil. And lastly Oilseed crops are important but very lowest area, which has 1,298 hectares, means just 3.50 percent areas in tahsil. Cereal crops include Paddy, Jowar, Bajara, Ragi, Wheat, Maize etc. crops. Pulses crops include Tur, Mung, Grams, and Udid etc. Oilseed crops include Groundnut, Seasum, Niger, Sunflower, Soyabean etc. Cotton as well as Sugarcane crop includes in Cash crops.

4.3.1 Ranking of Crops

Ranking of the crop depend on geographical reality and cropping structure. It is founded by seeing the percentage of area occupied by a crop to the total cropped area. The ranking of crop show the nature of farmer or cultivator i.e. whether the farmer is traditional or market oriented or partly subsistent and partly market oriented farmer. In this method crop occupy the highest percentage of the total cultivated area, is chosen as first rank crop and after it, crops are taken in decreasing order. It includes first, second, third and so on ranking of crops.

Table 4.2

KHATAV TAHSIL: RANKING OF CROPS (2012-13)

Sr. No.	Circle	Area in Hectares	Area in %	Ranks
1	Pusesawali	6330	17.05	**1**
2	Mayani	6278	16.90	**2**
3	Vaduj	6250	16.84	**3**
4	Katar Khatav	6177	16.64	**4**
5	Pusegaon	6057	16.32	**5**
6	Khatav	6037	16.25	**6**
	Total	37129	100.00	

Source: Agricultural Department of Khatav, Tahsil (2012-13).

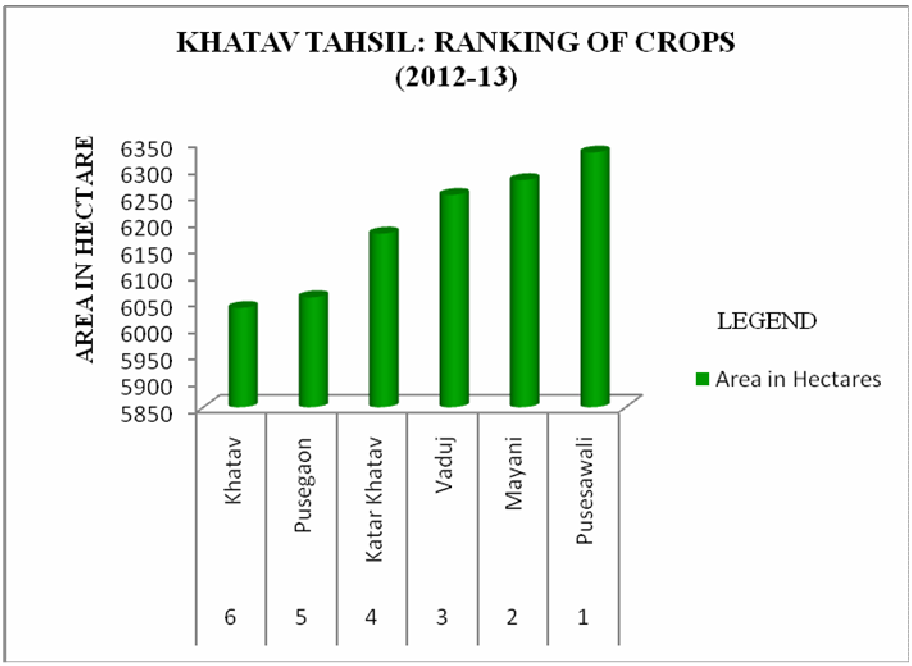

Fig. 4.2

Table 4.2 and Fig. 4.2 shows the circle-wise spatial sown crops ranking of Khatav tahsil in 2012-13. Pusesawali is the predominant crop sown circle, which has 6,330 hectares means 17.04 percent area in tahsil. Khatav is the second dominant crop sown circle, which has 6,278 hectares means 16.78 percent area in tahsil. Vaduj is the third dominant crop sown circle, which has 6,250 hectares means 16.83 percent area in tahsil.

4.3.2 Crop Season and Crop Area

Any crop has three seasons in year for cultivation, sowing and harvesting. Kharif is the first season whish has mainly June, July, August and September months of year. Rabbi is the second season whish has mainly October, November, December and January months of year. And summer or Zaid is the third or last season which has mainly February, March, April and May months of year.

Table 4.3
KHATAV TAHSIL: SEASON-WISE ALL CROPS (2012-13) (in Hectares)

Sr. No	Season	Crops	Pusegaon	Khatav	Pusesawali	Vaduj	Katar Khatav	Mayani	Total
		Cereals	447	479	459	482	489	514	**2870**
		Pulses	301	291	342	272	275	281	**1762**
1	Kharif	Oilseeds	178	161	167	157	148	135	**946**
		Cash Crops	547	443	515	428	272	279	**2484**
		Total	**1473**	**1374**	**1483**	**1339**	**1184**	**1209**	**8062**
		Cereals	3564	3948	3741	3975	4214	4377	**23819**
		Pulses	597	467	764	676	659	599	**3762**
2	Rabbi	Oilseeds	--	16	--	9	24	19	**68**
		Cash Crops	128	112	91	77	58	42	**508**
		Total	**4289**	**4543**	**4596**	**4737**	**4955**	**5037**	**28157**
		Cereals	**48**	**--**	**37**	**25**	**--**	**--**	**110**
		Pulses	--	--	--	--	--	--	--
3	Summer	Oilseeds	114	--	97	73	--	--	**284**
		Cash Crops	133	120	117	76	38	32	**516**
		Total	**295**	**120**	**251**	**174**	**38**	**32**	**910**
Total Crop Area			**6057**	**6037**	**6330**	**6250**	**6177**	**6278**	**37129**

Source: Agricultural Department of Khatav, Tahsil (2012-13).

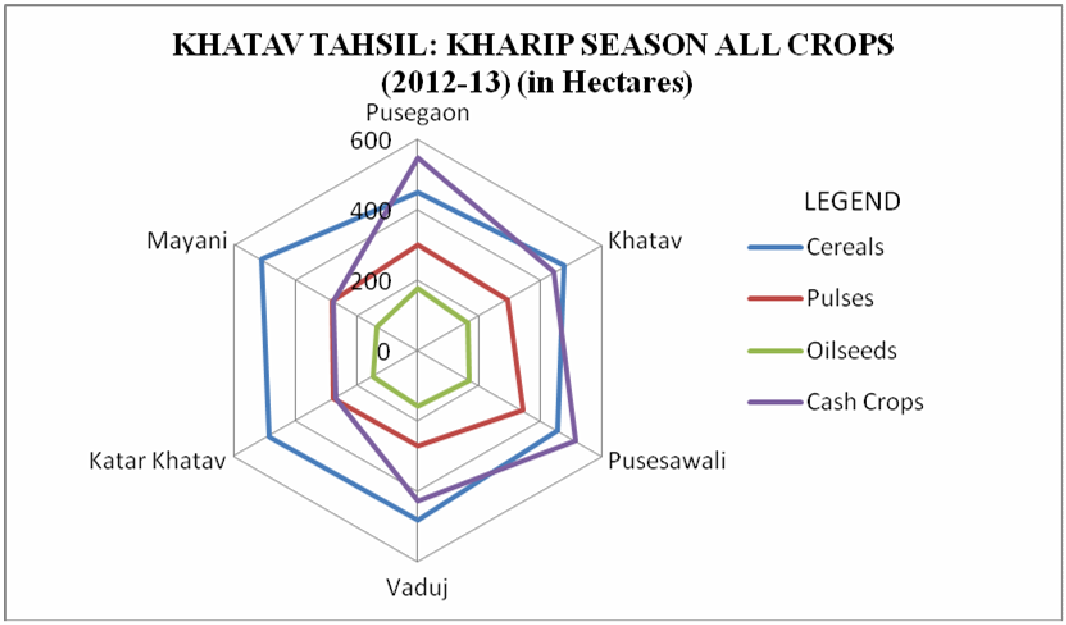

Fig. 4.3 (A)

KHATAV TAHSIL: RABBI SEASON ALL CROPS (2012-13) (in Hectares)

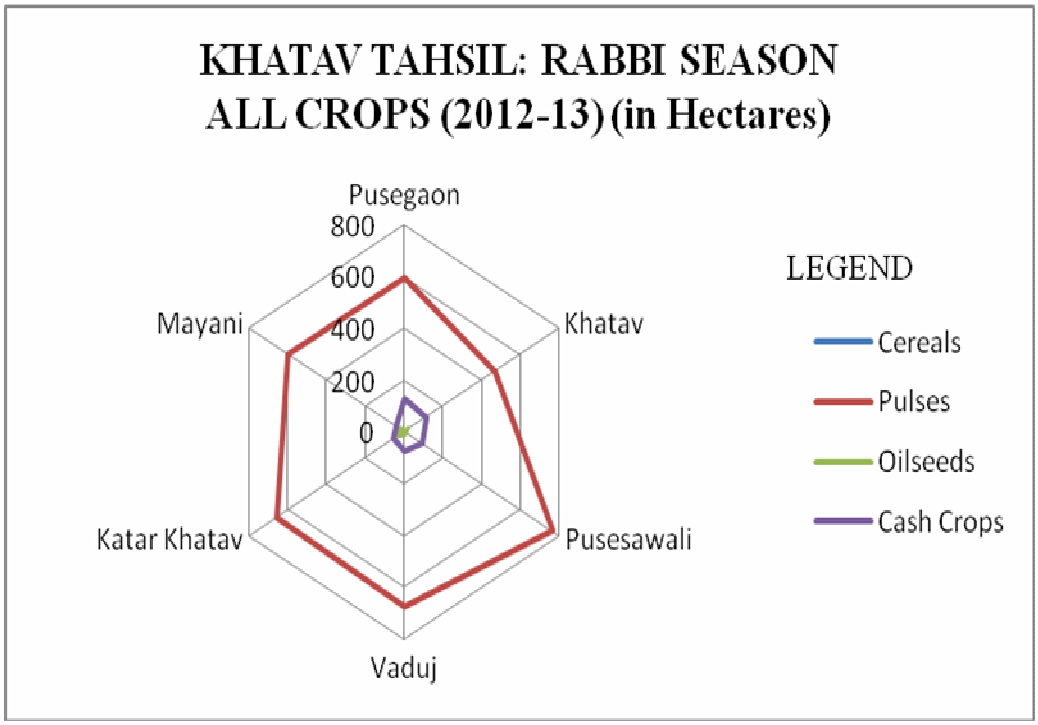

Fig. 4.3 (B)

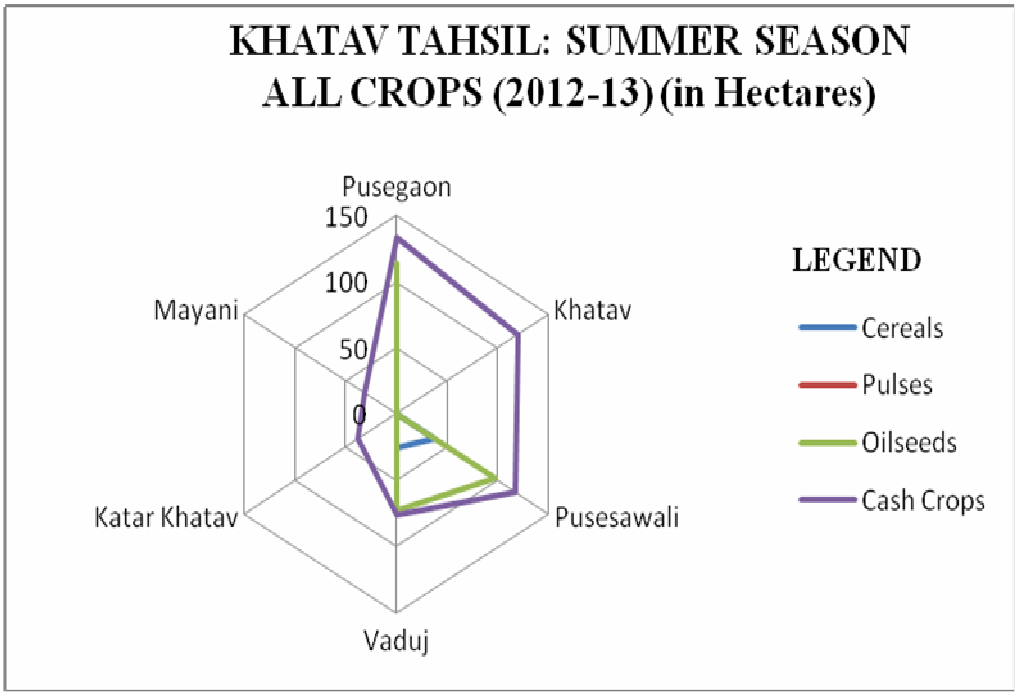

Fig. 4.3 (C)

Table 4.3 and Fig. 4.3 (A, B,C) shows the season-wise as well as circle-wise spatial sown crop area of Khatav tahsil in 2012-13. Cereal crops are the predominant crop in all three seasons, which has 2,870 hectares in Kharif, 23,819 hectares in rabbi and 110 hectares in summer season sown area. Pulse crops are the second dominant crop, which has 1,762 hectares in Kharif and 3,762 hectares in rabbi season sown area. Summer season has not pulses crops sown area. Oilseed crops are the third dominant crop in all three seasons, which has 946 hectares in Kharif, 68 hectares in rabbi and 284 hectares in summer season sown area. Cash crops are the last but important dominant crop, which has 2,484 hectares in Kharif and 508 hectares in Rabbi season sown area. Summer season has just 326 hectare cash crops sown area.

Pusesawali, Vaduj and Mayani circles have more than 50 percent sown area situation because of Watershed Development Programme work in 2011-12. Pusesawali circle has 6,330 hectares crop sown area because of canal irrigation. Vaduj circle has 6,250 hectares crop sown be area because of dam and canal irrigation. Mayani circle has 6,278 hectares crop sown area because of Mayani and Kankatre lake irrigation and percolation. Also Pusegaon and Khatav circle has better crop sown area because of Ner lake or dam irrigation.

Cereal Crops

Khatav tahsil is the "Cereal Tahsil" of Satara district because Cereals crops are the predominant crop of tahsil, which has 26,799 hectares i.e. 72.17 percent

sown area. Paddy, Jowar, Bajara, Wheat, Maize etc. are the cereal crops of tahsil. (Table 4.4)

Table 4.4
KHATAV TAHSIL: CEREAL CROPS (2012-13) (in hectares)

Sr. No.	Season	Crops	Pusegaon.	Khatav	Pusesawali	Vaduj	Katar Khatav	Mayani	Total
1	Kharif	Paddy	--	--	--	--	--	--	**--**
		Jowar	86	92	91	95	101	105	**570**
		Bajara	273	304	287	309	320	337	**1830**
		Wheat	--	--	--	--	--	--	**--**
		Maize	88	83	81	78	68	72	**470**
		Other	--	--	--	--	--	--	**--**
		Total	**447**	**479**	**459**	**482**	**489**	**514**	**2870**
2	Rabbi	Paddy	--	--	--	--	--	--	**--**
		Jowar	3342	3744	3532	3778	4028	4198	**22622**
		Bajara	--	--	--	--	--	--	**--**
		Wheat	154	142	149	138	131	126	**840**
		Maize	68	62	60	59	55	53	**357**
		Other	--	--	--	--	--	--	**--**
		Total	**3564**	**3948**	**3741**	**3975**	**4214**	**4377**	**23819**
3	Summer	Paddy	--	--	--	--	--	--	**--**
		Jowar	--	--	--	--	--	--	**--**
		Bajara	--	--	--	--	--	--	**--**
		Wheat	--	--	--	--	--	--	**--**
		Maize	48	--	37	25	--	--	**110**
		Other	--	--	--	--	--	--	**--**
		Total	**48**	**--**	**37**	**25**	**--**	**--**	**110**
Total Cereal Crops			**4059**	**4427**	**4237**	**4482**	**4703**	**4891**	**26799**

Source: Agricultural Department of Khatav, Tahsil (2012-13).

Table 4.4 shows the season-wise as well as circle-wise spatial sown cereal crops area of Khatav tahsil in 2012-13. Jowar crop is the predominant crop in tahsil, which has 570 hectares in Kharif and 22,622 hectares in rabbi season sown area. Summer season has not Jowar crops sown area. Bajara crop is the second dominant crop, which has 1,830 hectares in Kharif season sown area. But Rabbi and summer season has not Bajara crop sown area. Maize crop is the third dominant crop, which has 470 hectares in Kharif, 357 hectares in rabbi and 110 hectares in summer season sown area. Wheat crop is the significant crop which has 840 hectares rabbi season sown area. But Kharif and summer season has not Wheat crop sown area. Paddy crop has not sown area in all seasons in the tahsil because of very low rainfall, high temperature in tahsil and high water requirement of paddy crop.

Mayani, Katar Khatav and Khatav circle has more than 50 percent sown area situation because of Watershed Development Programme work in 2011-12. Mayani circle has 4,891 hectares cereal crop sown area because Mayani and Kankatre Lake irrigation and percolation. Katar Khatav circle has 4,703 hectares Cereal crop sown area because of dam and canal irrigation. Vaduj circle has 4,482 hectares cereal crop sown area because of dam and canal irrigation. Khatav circle has 4,427 hectares cereal crop sown area because of Ner lake or dam irrigation. Also Pusegaon and Pusesawali circle has better crop sown area because of Ner lake or dam irrigation.

Pulse Crops

Pulses crops are the second dominant crop, which has 5,714 hectares means 15.38 percent area in tahsil. Tur, Mung, Udid etc. are the cereal crops of tahsil. (Table 4.5)

Table 4.5

KHATAV TAHSIL: PULSE CROPS (2012-13) (in Hectares)

Sr. No.	Season	Crops	Pusegaon.	Khatav	Pusesawali	Vaduj	Katar Khatav	Mayani	Total
1	Kharif	Tur	9	7	17	11	12	6	62
		Mung	99	108	115	102	95	111	630
		Udid	20	17	28	15	18	12	110
		Other Pulses	173	159	182	144	150	152	960
		Total	**301**	**291**	**342**	**272**	**275**	**281**	**1762**
2	Rabbi	Grams	453	360	614	557	540	504	3028
		Mung	--	--	--	--	--	--	--
		Udid	102	75	113	89	90	71	540
		Other Pulses	42	32	37	30	29	24	194
		Total	**597**	**467**	**764**	**676**	**659**	**599**	**3762**
3	Summer	Tur	--	--	--	--	--	--	--
		Mung	--	--	--	--	--	--	--
		Udid	--	--	--	--	--	--	--
		Other Pulses	--	--	--	--	--	--	--
		Total	--	--	--	--	--	--	--
Total Pulse Crops			**898**	**758**	**1106**	**948**	**934**	**880**	**5524**

Source: Agricultural Department of Khatav tahsil, (2012-13).

Table 4.5 shows the season-wise as well as circle-wise spatial sown pulse crops area of Khatav tahsil in 2012-13. Grams crop is the predominant crop in tahsil,

which has 3,028 hectares in rabbi season sown area. Kharif and summer season has not Gram crops sown area. Udid crop is the second dominant crop, which has 110 hectares in Kharif and 540 hectares in rabbi season sown area. But summer season has not Udid crop sown area. Mung crop is the third dominant crop, which has 630 hectares in Kharif season sown area. Rabbi and summer has not Mung crop sown area. Other pulses are also important crops, which has 960 hectares in Kharif and 194 hectares in rabbi season. These crops are sown in rainy or Kharif season, mixed in small percent in other crops according to farmers need. So this crop has not sown in summer season.

Pusesawali, Katar Khatav and Vaduj circle has more than 50 percent sown area. Pusesawali circle has highest pulse crop (1106 hectares) sown area in tahsil. Next highest pulse crop has Katar Khatav circle, which has 934 hectares sown area in tahsil. Vaduj circle has third (948 hectares) pulse crop sown area in tahsil. Mayani circle has 880 hectares pulse crop sown area. Also Pusegaon and Khatav circle has better pulse crop sown area.

Cash crops

Cash crops are the very lowest area, which has 2,810 hectares i. e. just 7.57 percent area in tahsil. (Table 4.6)

Table 4.6

KHATAV TAHSIL: CASH CROPS (2012-13) (in Hectares)

Sr.	Season	Crops	Pusegaon	Khatav	Pusesawali	Vaduj	Katar	Mayani	Total
1	Kharif	Cotton	140	106	129	92	--	--	**467**
		Sugarcane	407	337	386	336	272	279	**2017**
		Total	**547**	**443**	**515**	**428**	**272**	**279**	**2484**
2	Rabbi	Cotton	--	--	--	--	--	--	**--**
		Sugarcane	128	112	91	77	58	42	**508**
		Total	**128**	**112**	**91**	**77**	**58**	**42**	**508**
3	Summer	Cotton	133	120	117	76	38	32	**516**
		Sugarcane	--	--	--	--	--	--	**--**
		Total	**133**	**120**	**117**	**76**	**38**	**32**	**516**
Total Cash Crops			**808**	**675**	**723**	**581**	**368**	**353**	**3508**

Source: Agricultural Department of Khatav, Tahsil (2012-13)

Table 4.6 shows the season-wise as well as circle-wise spatial sown cash crops area of Khatav tahsil in 2012-13. Sugarcane crop is the predominant crop in tahsil, which has 2,017 hectares in Kharif season and 508 hectares in Rabbi season sown area. And summer season has not Sugarcane crops sown area. Cotton crop is the

second dominant crop, which has 467 hectares in Kharif and 326 hectares in summer season sown area. But rabbi season has not cotton crop sown area.

Pusegaon, Pusesawali, and Vaduj circle has more than 50 percent cash crop sown area. Pusegaon circle has highest cash crop (808 hectares) sown area in tahsil. Next highest cash crop has Pusesawali circle, which has 723 hectares sown area in tahsil. Khatav circle has third dominant, in 675 hectares cash crop sown area. Vaduj circle has 581 hectares cash crop sown area in tahsil. Also Katar Khatav and Mayani circle has lowest cash crop sown area.

Oilseed Crops

Lastly, Oilseed crops are important but very lowest area, which has 1,298 hectares i.e. just 3.50 percent area in tahsil. (Table 4.7)

Table 4.7
KHATAV TAHSIL: OILSEED CROPS (2012-13) (in Hectares)

S. N	Season	Crops	Pusegaon	Khatav	Pusesawali	Vaduj	Katar Khatav	Mayani	Total
1	Kharif	Groundnut	--	--	--	--	--	--	--
		Seasum	--	--	--	--	--	--	--
		Niger	13	20	15	19	28	21	116
		Sunflower	--	--	--	--	--	--	--
		Soyabean	165	141	152	138	120	114	830
		Total	**178**	**161**	**167**	**157**	**148**	**135**	**946**
2	Rabbi	Groundnut	--	--	--	--	--	--	--
		Seasum	--	--	--	--	--	--	--
		Niger	--	16	--	09	24	19	68
		Sunflower	--	--	--	--	--	--	--
		Soyabean	--	--	--	--	--	--	--
		Total	**--**	**16**	**--**	**9**	**24**	**19**	**68**
3	Summer	Groundnut	114	--	97	73	--	--	284
		Seasum	--	--	--	--	--	--	--
		Niger	--	--	--	--	--	--	--
		Sunflower	--	--	--	--	--	--	--
		Soyabean	--	--	--	--	--	--	--
		Total	**114**	**--**	**97**	**73**	**--**	**--**	**284**
Total Oilseed Crops			**292**	**177**	**264**	**239**	**172**	**154**	**1298**

Source: Agricultural Department of Khatav, Tahsil (2012-13).

Table 4.7 shows the season-wise as well as circle-wise spatial sown oilseed crop area of Khatav tahsil in 2012-13. Soyabean crop is the predominant oilseed crop in tahsil, which has 830 hectares in Kharif season sown area. Rabbi and summer season has not Soyabean crops sown area. Groundnut crop is the second dominant

crop, which has 284 hectares in summer season sown area. But Kharif and rabbi season has not Groundnut crop sown area.

Pusegaon circle has more than 50 percent oilseed crop sown area. Pusegaon circle has highest oilseed crop (**292** hectares) sown area in tahsil. Next highest oilseed crop has Pusesawali circle, which has **264** hectares sown area in tahsil. Vaduj circle has third (**239** hectares) oilseed crop sown area in tahsil. Khatav, Katar Khatav and Mayani circle has equal to 180 hectares oilseed crops sown area.

4.3.3 CROP COMBINATION REGIONS

The crops are generally grown in combination and it is rarely find that particular crop occupies a position of total isolation rather than other crops in a given time. The physical factors determine the shape of area of crop, while socio-economic relationship determines their extent. The government policies can decide to select the type of crop to grow. With the development of better irrigation facilities, new varieties of crops can be induced in place of traditional and profitable agricultural system**.**

Crop combination is a technique evolved by Weaver to delimit agricultural regions which, he argued, are not regions of simple monoculture as suggested by the names Corn Belt, Cotton Belt, or Spring Wheat Belt, but are areas of combinations of crops.

Theoretical values of crop combinations are established so that two-crop combinations take 50% each of the available land; three-crop combinations take 33% of land each, and so on. The real life figures for each crop in the combination are compared with the theoretical figures and the crop combination with the best 'fit' to the theoretical figures are used to classify the area.

The crop data has been computed with the help of Weaver's technique of crop combination. These formulas may be stated as follows.

Standard deviation (δ) = $\sum d^2/n$

Where,

d- is the sum of the square of individual deviations

n- is the number of crops in a given combination.

Table 4.8
KHATAV TAHSIL: CIRCLE-WISE ALL CROPS (2012-13) (in Hectares)

Sr. No.	Crops	Pusegaon.	Khatav	Pusesawali	Vaduj	Katar	Mayani	Total
1	Jowar	3428	3836	3623	3873	4129	4303	23192
2	Grams	453	360	614	557	540	504	3028
3	Sugarcane	535	449	477	413	330	321	2525
4	Bajara	273	304	287	309	320	337	1830
5	Cotton	273	226	246	168	38	32	983
6	Maize	204	145	178	162	123	125	937
7	Wheat	154	142	149	138	131	126	840
8	Soyabean	165	141	152	138	120	114	830
9	Udid	122	92	141	104	108	83	650
10	Mung	99	108	115	102	95	111	630
11	Groundnut	114	--	97	73	--	--	284
12	Niger	13	36	15	28	52	40	184
13	Tur	9	7	17	11	12	6	62
Total		**5842**	**5846**	**6111**	**6076**	**5998**	**6102**	**35975**

Source: Agricultural Department of Khatav, Tahsil (2012-13).

As a result of statistical processing of the data based on Weaver's method, eight crop combination regions emerged out. In 2012-13 among the total of 13 crops only 8 crops (Jowar, Grams, Bajara, Maize, Wheat, Soyabean, Cotton, Udid etc.) were included in various crop combinations (Table 4.8). The area has from monoculture combinations to eight crop combinations. (Table 4.9)

Table 4.9
KHATAV TAHSIL: CROP COMBINATION (2012-13)

Sr. No.	Crop Combination	Crops in Combination	Area in Hectares	Area in %
1	Monoculture	Jw	1164.85	20.78
2	Two	Jw, Gm	955.88	17.05
3	Three	Jw, Gm, Bj,	807.55	14.40
4	Four	Jw, Gm, Bj, Mz	674.7	12.03
5	Five	Jw, Gm, Bj, Mz, W	591.18	10.54
6	Six	Jw, Gm, Bj, Mz,W, Sb	523.15	9.33
7	Seven	Jw, Gm, Bj, Mz, W, Sb, Ct	467.33	8.34
8	Eight	Jw, Gm, Bj, Mz,W, Sb, Ct, Ud	421.74	7.52

Crops - (Jw = Jowar, Gm = Grams, Bj = Bajara, Mz = Maize, W = Wheat, Sb = Soyabean, Ct = Cotton, Ud = Udid) Source: Compiled by Researcher

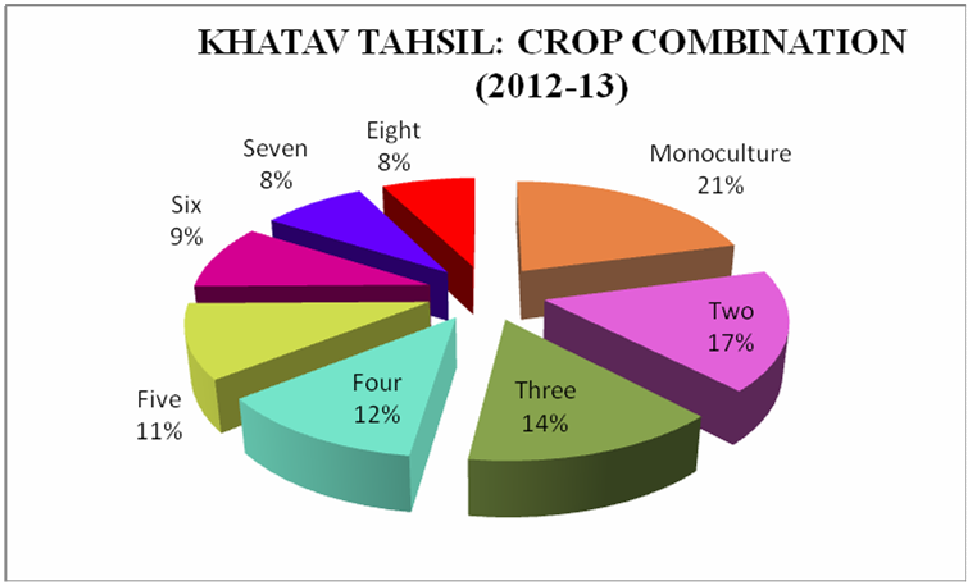

Fig. 4.4

In Khatav tahsil, Monoculture crop combination have dominant area comprises about above 21 percent of Jowar crop in all the six circles (Table 4.9 and fig.4.4). Because, the climatic condition and soil nature are the very favourable for Jowar crop. Two crop combinations have nearly 17 percent of especially Jowar and Gram crops. There is because of Watershed Development Programme works, increased the cash crops area, specially about sugarecane. Also the three-crop combinations have seen 14 percent area of Jowar, Gram and Bajara crops. The Bajara have needs minimum water for its growth and this food grain is the most liked to local people. Therefore, there is maximum area under Bajara crop. Whereas, the fourth and fifth crop combination has involved about 10 percent Jowar, Gram, Bajara, Maize, Wheat etc. crops area. And sixth, seventh and eighth crop combination has involved below 10 percent Jowar, Gram, Bajara, Maize, Wheat, Soyabean, Cotton, Udid, Tur etc. crops area. Where, Pulse crops cultivate in the mixed in the other crops, so that reason, these crops have noted minimum crops.

Pusegaon Circle

Pusegaon circle is covered north-western part of tahsil. This circle has maximum WDP work in tahsil. This circle involves 486.6 lakh rupees expenditure in different WDP schemes, which has 2,399 hectare area irrigated. Jowar is the monoculture crop having 22.79 percent area (Table 4.10 (A) and fig. 4.5). Two crop combinations have about 16.12 percent of especially Jowar and Sugarcane crops. Also the three-crop combinations have seen 13.16 percent area of Jowar, Sugarcane and

Gram crops. Whereas, other crop combination have involved less than 12 percent area. (Table 4.10 (A) and fig. 4.5)

Table 4.10 (A)
PUSEGAON CIRCLE: CROP COMBINATION (2012-13)

Sr. No.	Crop Combination	Crops in Combination	Area in Hectares	Area in %
1	Monoculture	Jw	2978.6	22.79
2	Two	Jw, Sc	2107.06	16.12
3	Three	Jw, Sc, Gm	1720.41	13.16
4	Four	Jw, Sc, Gm, Bj	1492.53	11.42
5	Five	Jw, Sc, Gm, Bj, Ct	1337.28	10.23
6	Six	Jw, Sc, Gm, Bj, Ct, Mz	1224.87	9.37
7	Seven	Jw, Sc, Gm, Bj, Ct, Mz, Sb	1139.09	8.71
8	Eight	Jw, Sc, Gm, Bj, Ct, Mz, Sb, Wt	1070.63	8.19

Crops - (Jw = Jowar, Sc = Sugarcane, Gm = Grams, Bj = Bajara, Mz = Maize, Sb = Soyabean , Wt = Wheat,) Source: Compiled by Researcher.

Khatav Circle

Khatav circle is covered western part of tahsil. This circle has involved about 3 crore rupees expenditure in different WDP schemes, which irrigated nearly 1,500 hectares area irrigated. Jowar is the monoculture crop having 22.80 percent area(Table 4.10 (B) and fig. 4.5). Two crop combinations have about 16.12 percent of especially Jowar and Sugarcane crops. Also the three-crop combination has seen 13.17 percent area of Jowar, Sugarcane and Gram crops. Whereas, the other crop combination have comprised less than 10 percent area. (Table 4.10 (B) and fig. 4.5).

Table 4.10 (B)
KHATAV CIRCLE: CROP COMBINATION (2012-13)

Sr. No.	Crop Combination	Crops in Combination	Area in Hectares	Area in %
1	Monoculture	Jw	3386.31	22.80
2	Two	Jw, Sc	2394.48	16.12
3	Three	Jw, Sc, Gm	1955.77	13.17
4	Four	Jw, Sc, Gm, Bj	1695.31	11.41
5	Five	Jw, Sc, Gm, Bj, Ct	1519.63	10.23
6	Six	Jw, Sc, Gm, Bj, Ct, Mz	1392.79	9.38
7	Seven	Jw, Sc, Gm, Bj, Ct, Mz, Wt	1294.71	8.72
8	Eight	Jw, Sc, Gm, Bj, Ct, Mz, Wt, Sb	1216	8.19

Crops - (Jw = Jowar, Sc = Sugarcane, Gm = Grams, Bj = Bajara, Ct = Cotton, Mz = Maize, Wt = Wheat, Sb = Soyabean) Source: Compiled by Researcher.

Pusesawali Circle

Pusesawali circle is occupied south-western part of tahsil. This circle has also involved about 3 crore rupees expenditure in different WDP schemes, which irrigated nearly 1,200 hectares area irrigated. Jowar is the monoculture crop having 22.76 percent area (Table 4.10 (C) and fig. 4.5). Two crop combinations have about 16.11 percent of especially Jowar and Gram crops. Also the three-crop combination has seen 13.16 percent area of Jowar, Gram and Sugarcane crops. Whereas, the other crop combination have included less than 12 percent area. (Table 4.10 (C) and fig. 4.5)

Table 4.10 (C)
PUSESAWALI CIRCLE: CROP COMBINATION (2012-13)

Sr. No.	Crop	Crops in Combination	Area in	Area in %
1	Monoculture	Jw	3152.92	22.76
2	Two	Jw, Gm	2231.77	16.11
3	Three	Jw, Gm, Sc	1822.24	13.16
4	Four	Jw, Gm, Sc, Bj	1580.76	11.41
5	Five	Jw, Gm, Sc, Bj, Ct	1417.42	10.23
6	Six	Jw, Gm, Sc, Bj, Ct, Mz	1299.4	9.38
7	Seven	Jw, Gm, Sc, Bj, Ct, Mz, Sb	1209.00	8.73
8	Eight	Jw, Gm, Sc, Bj, Ct, Mz, Sb,	1136.60	8.21

Crops - (Jw = Jowar, Gm = Grams, Sc = Sugarcane, Bj = Bajara, Ct = Cotton, Mz = Maize, Sb = Soyabean, Wt = Wheat,) Source: Compiled by Researcher.

Vaduj Circle

Vaduj circle is occupied central part of tahsil. This circle involves 362.27 lakh rupees expenditure in different WDP schemes, which has 2,240 hectares area irrigated. Jowar is the monoculture crop having 22.77 percent area (Table 4.10 (D) and fig. 4.5). Two crop combinations have about 16.11 percent of especially Jowar and Gram crops. Also the three-crop combination has seen 13.16 percent area of Jowar, Gram and Sugarcane crops. Whereas, the other crop combination have contained less than 13 percent area. (Table 4.10 (D) and fig. 4.5)

Table 4.10 (D)
VADUJ CIRCLE: CROP COMBINATION (2012-13)

Sr. No.	Crop Combination	Crops in Combination	Area in Hectares	Area in %
1	Monoculture	Jw	3405.61	22.77
2	Two	Jw, Gm	2408.96	16.11
3	Three	Jw, Gm, Sc	1967.16	13.16
4	Four	Jw, Gm, Sc, Bj	1705.45	11.4
5	Five	Jw, Gm, Sc, Bj, Ct	1531.27	10.24
6	Six	Jw, Gm, Sc, Bj, Ct, Mz	1403.4	9.39
7	Seven	Jw, Gm, Sc, Bj, Ct, Mz, Sb	1305.24	8.73
8	Eight	Jw, Gm, Sc, Bj, Ct, Mz, Sb, Wt	1226.48	8.2

Crops - (Jw = Jowar, Gm = Grams, Sc = Sugarcane, Bj = Bajara, Ct = Cotton, Mz = Maize, Sb = Soyabean, Wt = Wheat,) Source: Compiled by Researcher.

Katar Khatav Circle

Katar Khatav circle is occupied eastern part of tahsil. This circle has also involved about 3 crore rupees expenditure in different WDP schemes, which irrigated nearly 2,100 hectares area irrigated. Jowar is the monoculture crop having 22.77 percent area (Table 4.10 (E) and fig. 4.5). Two crop combinations have about 16.11 percent of especially Jowar and Gram crops. Also the three-crop combination has seen 13.16 percent area of Jowar, Gram and Sugarcane crops. Whereas, the other crop combination have included less than 12 percent area. (Table 4.10 (E) and fig. 4.5)

Table 4.10 (E)
KATAR KHATAV CIRCLE: CROP COMBINATION (2012-13)

Sr. No.	Crop Combination	Crops in Combination	Area in Hectares	Area in %
1	Monoculture	Jw	3667.62	22.77
2	Two	Jw, Gm	2593.99	16.11
3	Three	Jw, Gm, Sc	2119.34	13.16
4	Four	Jw, Gm, Sc, Bj	1836.76	11.40
5	Five	Jw, Gm, Sc, Bj, Sb	1649.48	10.24
6	Six	Jw, Gm, Sc, Bj, Sb, Mz	1512.08	9.39
7	Seven	Jw, Gm, Sc, Bj, Sb, Mz,Wt	1405.85	8.73
8	Eight	Jw, Gm, Sc, Bj, Sb, Mz,Wt, Ud	1320.98	8.20

Crops - (Jw = Jowar, Gm = Grams, Sc = Sugarcane, Bj = Bajara, Sb = Soyabean, Mz = Maize, Wt = Wheat, Ud = Udid,) Source: Compiled by Researcher.

Mayani Circle

Mayani circle is occupied southern part of tahsil. This circle involves 382.11 lakh rupees expenditure in different WDP schemes, which has 2,248 hectares area irrigated. Jowar is the monoculture crop having 22.75 percent area (Table 4.10 (F) and fig. 4.5). Two crop combinations have about 16.08 percent of especially Jowar and Gram crops. Also the three-crop combination has seen 13.15 percent area of Jowar, Gram and Bajara crops. Whereas, the other crop combination have included less than 11 percent area.

Table 4.10 (F)
MAYANI CIRCLE: CROP COMBINATION (2012-13)

Sr. No.	Crop Combination	Crops in Combination	Area in Hectares	Area in %
1	Monoculture	Jw	3794.5	22.75
2	Two	Jw, Gm	2683.11	16.08
3	Three	Jw, Gm, Bj	2192.99	13.15
4	Four	Jw, Gm, Bj, Sc	1901.5	11.40
5	Five	Jw, Gm, Bj, Sc, Wt	1709.33	10.25
6	Six	Jw, Gm, Bj, Sc, Wt, Mz	1568.24	9.40
7	Seven	Jw, Gm, Bj, Sc, Wt, Mz,Ud	1459.54	8.75
8	Eight	Jw, Gm, Bj, Sc, Wt, Mz,Ud, Tr	1372.49	8.23

Crops - (Jw = Jowar, Gm = Grams, Bj = Bajara, Sc = Sugarcane, Wt = Wheat, Mz = Maize, Ud = Udid, Tr = Tur) Source: Compiled by Researcher.

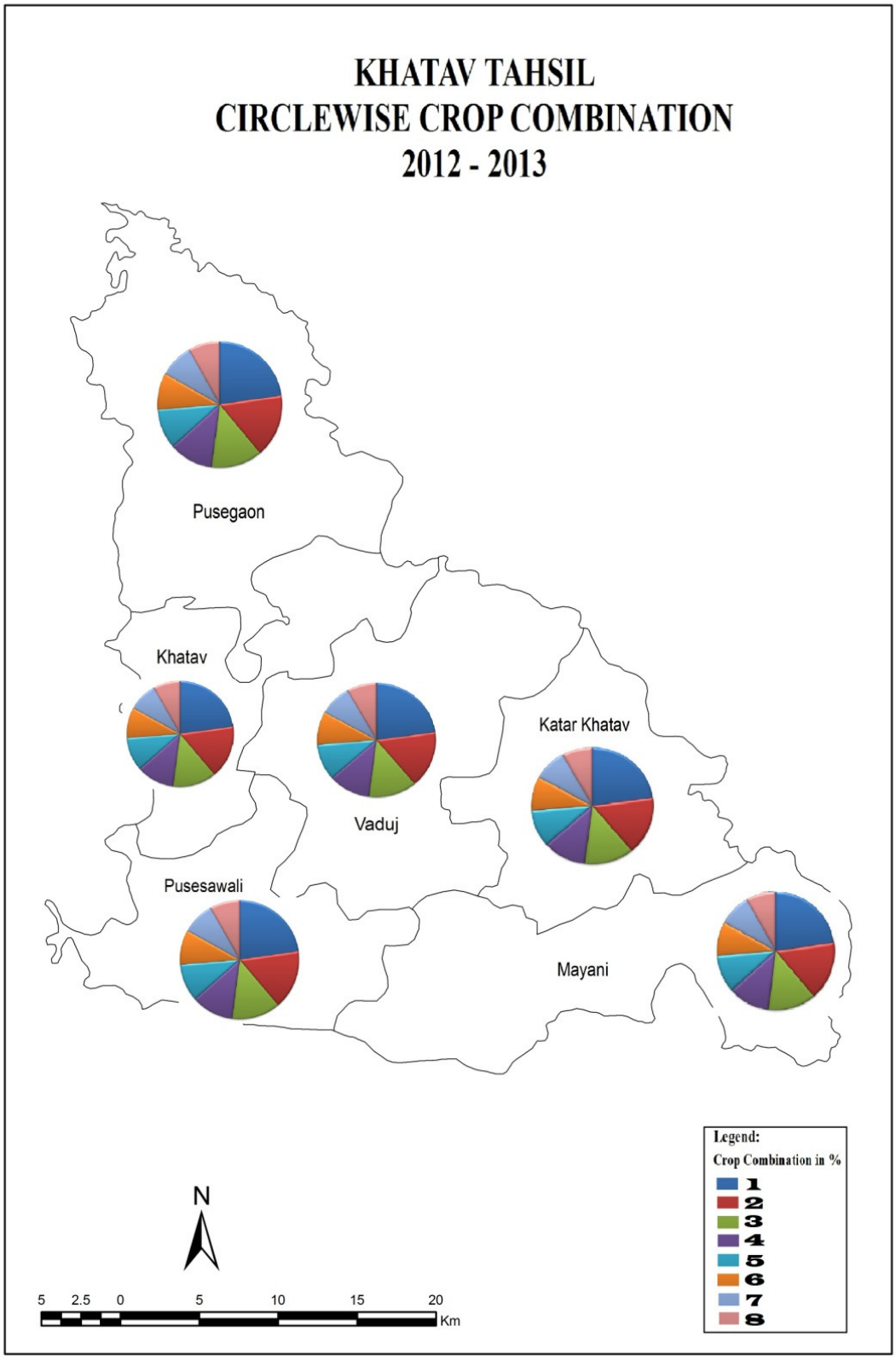
KHATAV TAHSIL
CIRCLEWISE CROP COMBINATION
2012 - 2013
Pusegaon
Khatav
Vaduj
Katar Khatav
Pusesawali
Mayani
N
5 2.5 0 5 10 15 20
Km
Legend:
Crop Combination in %
1
2
3
4
5
6
7
8

Fig. 4.5

4.3.4 CROP DIVERSIFICATION REGIONS

First method was formulated by Jasbir Singh in 1984. It suggests the formula:-

Index of Crop Diversification = (Percentage of total cropped area under 'n' crop ÷ Number of 'n' crops). Where ' n' denotes those crops which individually occupied at least 5 % or more of total cropped area in the Tahsil. For the measurement of diversification of crops, Bhatia (1965) also developed a formula based on the gross cropped area. The formula has been expressed as:

Index of crop diversification = (Percent of sown area under x crops ÷ number of x crops)

There are some limitations to adopt this formula since, in this purpose, the quantitative techniques proposed by Gibbs and Martin to measure crop diversification provide a useful index for measuring the degree of diversification in the cropping pattern of an area (Singh and Dhillon, 1984). The formula developed for calculating the Crop Diversification Index (CDI) is as follows:

Crop Diversification Index (CDI) = 1- {$\Sigma X^2 / (\Sigma X)^2$}

Where, X is the percentage of the total cropped area occupied by each crop or hectare under individual crop. If the total cultivated area in a region is devoted wholly to one crop (i.e., specialization) the index value will be zero (0), and if it is evenly distributed among all crops (i.e., maximum diversification), the index value approaches one (1).

This direct and calculation- precise method has taken into consideration both the evenness factor (relative strength of crops) and number of factors (number of crops) perfectly to form the basis of proper measurement of diversity. On the other hand, the figures can be adjusted into hundreds, thousands, millions etc., which will not alter the results. Therefore, keeping all these advantages in mind, this method of crop diversification has been adopted in this purpose.

Table 4.11
KHATAV TAHSIL: CROPS AREA (2012-13)

Ranking No.	Crops	Area in Hectares	Area in %
1	Jowar	23700	65.87
2	Grams	3218	8.94
3	Sugarcane	2017	5.6
4	Bajara	1830	5.08
5	Maize	937	2.6
6	Wheat	840	2.39
7	Soyabean	830	2.3
8	Cotton	793	2.2
9	Udid	650	1.8
10	Mung	630	1.75
11	Groundnut	284	0.79
12	Niger	184	0.51
13	Tur	62	0.17
14	Seasum	--	--
15	Sunflower	--	--
16	Paddy	--	--
Total		**35975**	**100**

Source: Agricultural Department of Khatav, Tahsil (2012-13).

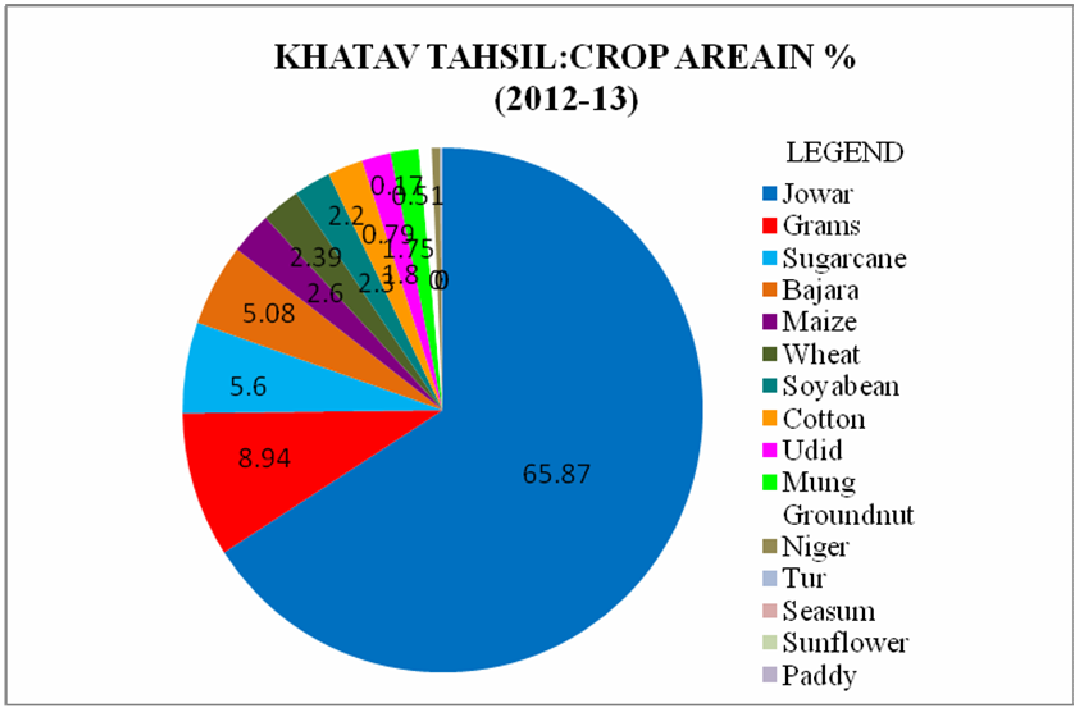

Fig. 4.6

Crop Diversification Index (CDI) = 1- {$\Sigma X^2 / (\Sigma X)^2$}

= 1- 166.88 / 10000

= 1-0.016688

= 0.98

= 1

Crop Diversification Index (CDI) = 1

The total cultivated area in Khatav tahsil is devoted to one index value i.e. maximum area having high diversification is appeared in the tahsil (Table 4.11 (A) and fig. 4.6). Jowar, Grams, Bajara, Maize, Wheat, Soyabean, Cotton, Udid etc. crops have played main role in crop diversification.

4.3.5 TEMPORAL VARIATIONS IN CROPPING PATTERN

Khatav tahsil has a droughtic area, so cereals crops are the predominant crop and cash crops are the lowest sown area crop. This tahsil has 73.55 percent cereals crop area. Pulses crops are the second dominant crop, which has 5,714 hectares area in tahsil. Cash crops are the very lowest area, which has 2,810 hectares area in tahsil. And last Oilseed crops are important but very lowest area, which has 1,298 hectares area in tahsil. Cereal crops include paddy, Jowar, Bajara, Ragi, Wheat, Maize etc. Pulse crops include Tur, Mung, Grams, and Udid etc. Oilseed crops include Groundnut, Seasum, Niger, Sunflower, Soyabean etc. Cotton as well as Sugarcane crop involves in Cash crops.

For the study, temporal variation of cropping pattern, 2001, 2006 and 2011 years are given. Table 4.9 display temporal variations of crops in the year 2001, 2006 and 2011 in Khatav tahsil. In these three years, Cereal crops are the predominant crop, which has 1,83,797 hectares area in tahsil (Table 4.12)

Table 4.12
KHATAV TAHSIL: CROPS AREA (2001, 2006 and 2011)

Sr. No.	Circle	2001 (in hect.)	2006 (in hect.)	2011 (in hect.)	Total (in hect.)	Ranking
1	Cereals	54243	69485	60069	183797	1
2	Pulses	6525	18035	13472	38032	2
3	Oilseeds	3180	5245	4498	12923	3
4	Cash Crops	1130	2070	2905	6105	4
	Total	**65078**	**94835**	**80944**	**240857**	

Source: Compiled by Researcher.

Pulse crops are the second dominant crop, which has 38,032 hectares area in tahsil (Table 4.12). Oilseed crops are the third dominant crop, which has 12,923 hectares area in tahsil. Cash Crops are the last but significant crop, which has 6,105 hectares area in tahsil.

4.3.6 CROP SEASON AND CROP AREA

Table 4.13(A) displays temporal season-wise variations of crops in the year 2001, 2006 and 2011 in Khatav tahsil. Cereal crops are the dominant sown crop, which has above 60 percent sown area yearly in tahsil. The aerial extent of Cereal crops has recorded decrease about 10.83 percent sown area in 2006 and increase about 0.94 percent sown area in 2011 in the tahsil. Kharif and Rabbi Season has above 60 percent sown area, so these both seasons are favorable for Cereal crops. In the above all years, the summer season has sown nearly 20 percent Cereal crops. A Cereal crop includes Jowar, Bajara, Maize, Wheat etc.

Table 4.13(A)
KHATAV TAHSIL: ALL CROPS AREA
(2001, 2006 and 2011)

Sr. No.	Year	Crops	Cropping Season						Total		Change
			Kharif		Rabbi		Summer				
			Area in Hect.	%	Area in Hect.	%	Area in Hect.	%	Area in Hect.	%	%
1	2001	Cereals	31385	82	22738	85.36	120	16.44	54243	83.35	---
		Pulses	3700	9.81	2825	0.6	22	2.93	6547	10.05	---
		Oilseeds	1820	4.83	1075	4.04	285	39.04	3180	4.88	---
		Cash	805	2.14	42	0.16	325	44.52	1172	1.74	---
		Total	37710	100	26680	100	752	100	65142	100	---
2	2006	Cereals	42345	68.57	27005	83.28	135	20.45	69485	73.27	-10.83
		Pulses	13820	22.57	4215	12.99	38	4.54	18073	19.02	8.99
		Oilseeds	3680	5.96	1205	3.73	360	54.56	5245	5.53	0.65
		Cash	1905	3.09	69	0.21	304	24.99	2278	2.18	0.44
		Total	61750	100	32494	100	837	100	95081	100	45.96
3	2011	Cereals	34564	67.85	25395	85.84	110	26.38	60069	74.21	0.94
		Pulses	10263	0.15	3209	10.85	55	6.46	13527	16.64	-2.38
		Oilseeds	3212	6.3	979	3.31	307	73.62	4498	5.56	0.03
		Cash	2905	5.7	114	0.38	379	44.54	3398	3.59	1.41
		Total	50944	100	29697	100	851	100	81492	100	16.68

Source: Agricultural Department of Khatav tahsil, (2001, 2006 and 2011).

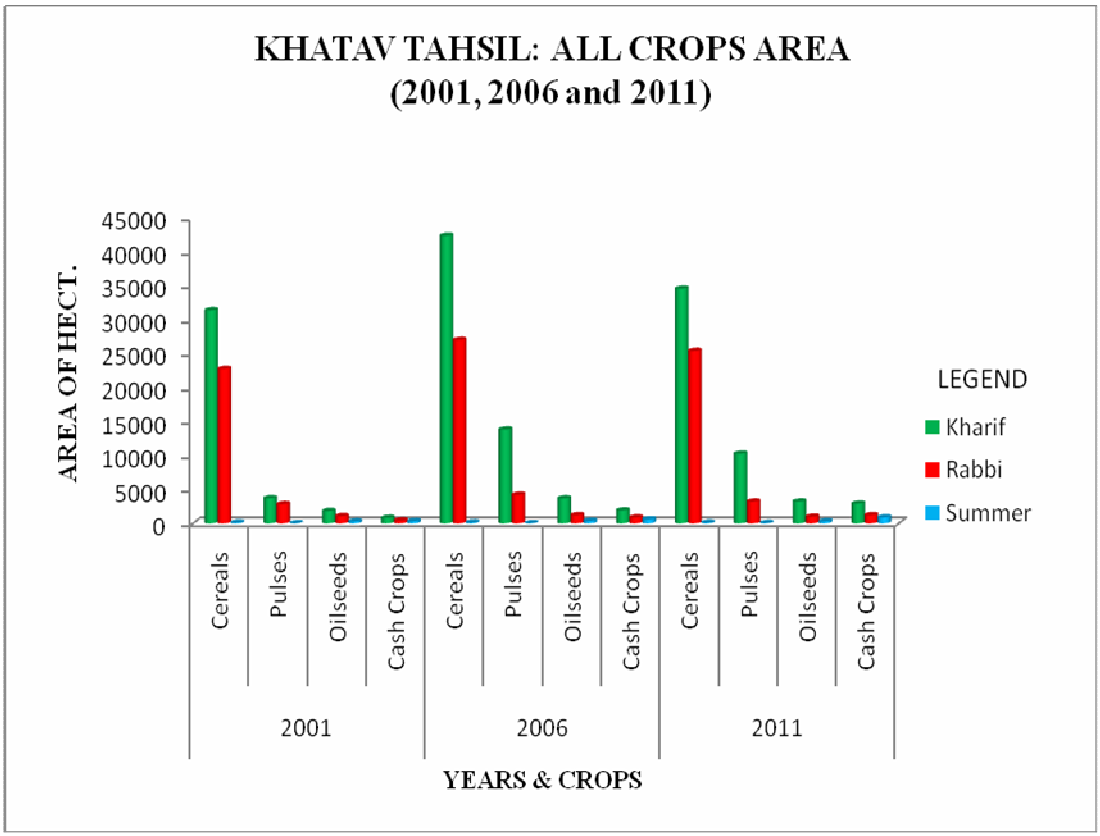

Fig. 4.7 (A)

Table 4.13 (B)
KHATAV TAHSIL: ALL CROPS AREA
(2001, 2006 and 2011)

Ranking No.	Crop	2001		2006		2011	
		Area in Hectare	Area in %	Area in Hectare	Area in %	Area in Hectare	Area in %
1	Jowar	28475	44.08	33875	39.65	26800	36.38
2	Bajara	23520	36.41	29245	34.23	26655	36.2
3	Wheat	3185	4.93	4815	5.64	4510	6.12
4	Maize	1875	2.9	4595	5.38	3744	5.08
5	Tur	1548	2.4	2340	2.74	2363	3.2
6	Mung	1390	2.15	1935	2.27	1900	2.58
7	Udid	1115	1.73	1765	2.06	1814	2.46
8	Groundnut	1070	1.66	1630	1.91	1378	1.87
9	Seasum	580	0.9	1130	1.32	1117	1.52
10	Niger	555	0.86	1005	1.18	1090	1.48
11	Sunflower	550	0.85	940	1.1	1020	1.38
12	Soyabean	485	0.75	805	0.94	589	0.8
13	Cotton	170	0.26	735	0.86	477	0.65
14	Sugarcane	65	0.1	310	0.36	204	0.28
15	Paddy	15	0.02	305	0.36	--	--
	Total	**64598**	**100**	**85430**	**100**	**73661**	**100**

Source: Agricultural Department of Khatav tahsil, (2001-2011).

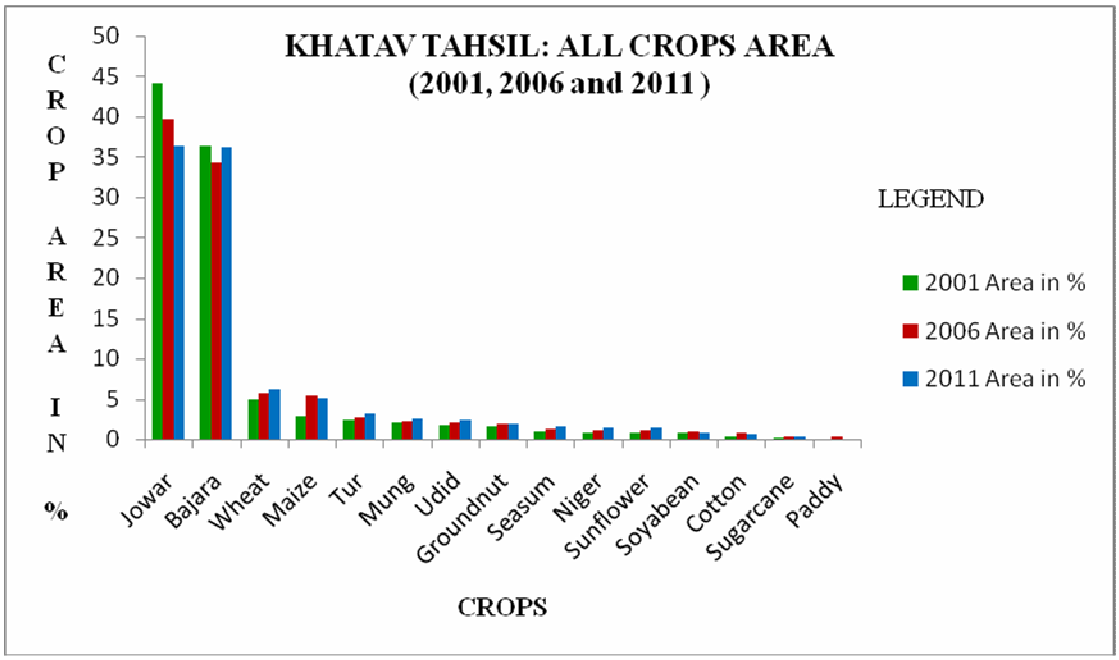

Fig. 4.7 (B)

Table 4.14

KHATAV TAHSIL: RANKING OF CROPS

Sr. No.	Year	First Rank Crops	Second Rank Crops	Third Rank Crops
1	2001	Cereals (83.35 %)	Pulses (10.*03* %)	Oilseeds (4.88 %)
2	2006	Cereals (73.27 %)	Pulses (19.02 %)	Oilseeds (5.53 %)
3	2011	Cereals (74.21%)	Pulses (16.64 %)	Oilseeds (5.56 %)

Source: Compiled by Researcher.

Pulse crops are the second dominant crop, which has nearly 10 percent sown area yearly in tahsil (Table 4.13-A and B and fig. 4.7). The aerial extent of pulse crop has recorded increase (8.99 percent) in 2006 and decrease (2.38 percent) in 2011 in the tahsil. Kharif and Rabbi Season has near 10 percent pulse crop sown area in 2001, 2006and 2011, so this season is good time for pulse crops. In the above all years, the summer season has not sown pulse crops. A pulse crop includes Tur, Mung and Udid etc.

Oilseed crops are the third dominant crop in the tahsil, which has above 5 percent sown area yearly in tahsil. The aerial extent of oilseed crop has noted very low increase sown area (i.e. 0.65 percent) in 2006 and (0.3 percent) in 2011. Summer season has above 50 percent oilseed crops sown area in 2006 and 2011. So, this

season is ideal time for oilseed crops. Oilseed crops include Groundnut, Seasum, Niger, Sunflower, Soyabean etc.

Cash Crops are the last but most dominant and important crops in the tahsil, which has above 2 percent sown area yearly. The aerial extent of cash crop has noted very low increase sown area about 0.44 percent in 2006 and nearly 1.41 in 2011. Kharif season has averagely 3 percent sown area in the above all years. The rabbi season has below 2 percent sown area. Whereas, summer season has about 1 percent cash crops sown area in the above all years. It seen that, The Watershed Development work have really effect on cash crop sown area and production.

CEREAL CROPS

Cereals crops are the predominant crop, which has 1,83,797 hectares area in tahsil (Table 4.15 and fig.4.8).

Table 4.15
KHATAV TAHSIL: CEREAL CROPS

Sr.	Year	Crops	Cropping Season						Total		Volume Change
			Kharif		Rabbi		Summer				
			Area in Hect.	%	Area in Hect.	%	Area in Hect.	%	Area in Hect.	%	%
		Paddy	45	0.14	--	--	--	--	45	0.08	---
		Jowar	2670	8.51	20850	91.7	--	--	23520	43.36	---
		Bajara	28575	91.05	--	--	--	--	28575	52.68	---
		Wheat	--	--	1548	6.81	--	--	1548	2.85	---
		Maize	95	0.3	340	1.49	120	100	555	1.03	---
1	2001	**Total**	**31385**	**100**	**22738**	**100**	**120**	**100**	**54243**	**100**	**---**
		Paddy	305	0.73	--	--	--	--	305	0.44	0.41
		Jowar	7530	17.78	21815	80.78	--	--	29345	42.23	-1.27
		Bajara	33975	80.23	--	--	--	--	33975	48.90	-3.75
		Wheat	--	--	4815	17.83	--	--	4815	6.93	4.08
		Maize	535	1.26	375	1.39	135	100	1045	1.50	0.43
2	2006	**Total**	**42345**	**100**	**27005**	**100**	**135**	**100**	**69485**	**100**	**28.1**
		Paddy	204	0.59	--	--	--	--	204	0.34	-0.1
		Jowar	6080	17.59	20575	81.02	--	--	26655	44.38	2.29
		Bajara	26800	77.54	--	--	--	--	26800	44.62	-4.13
		Wheat	--	--	4510	17.76	--	--	4510	7.5	0.57
		Maize	1480	4.28	310	1.22	110	100	1900	3.16	1.71
3	2011	**Total**	**34564**	**100**	**25395**	**100**	**110**	**100**	**60069**	**100**	**15.68**

Source: Agricultural Department of Khatav, Tahsil (2001, 2006 and 2011).

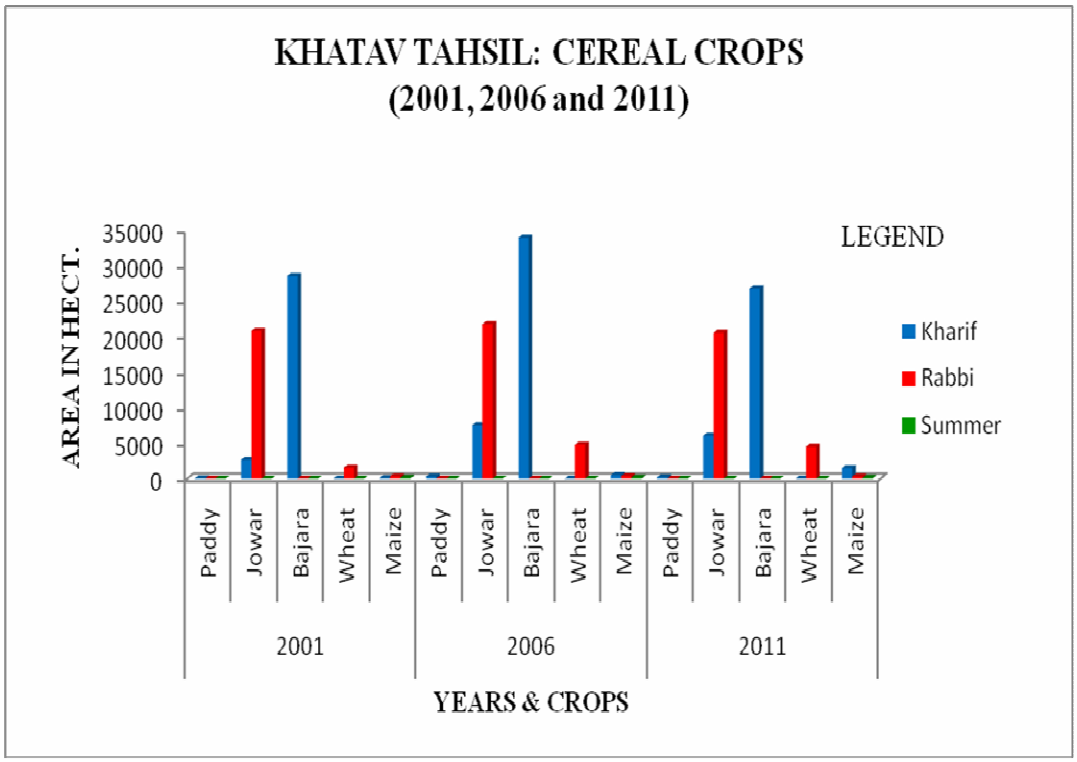

Fig. 4.8

Table 4.16

KHATAV TAHSIL: RANKING OF CEREAL CROPS

Sr. No.	Year	First Rank Crops	Second Rank Crops	Third Rank Crops
1	2001	Bajara (52.50%)	Jowar (43.36%)	Wheat (2.85%)
2	2006	Bajara (48.75%)	Jowar (42.09%)	Wheat (6.93%)
3	2011	Bajara (44.62%)	Jowar (44.38%)	Wheat (7.50%)

Source: Compiled by Researcher.

Table 4.15, 4.16 and fig.4.8 displays temporal variations of cereal crops in the year 2001, 2006 and 2011 in Khatav tahsil. Bajara is the pre-dominant cereals crop, which has above 45 percent cereals crop area yearly in tahsil. The aerial extent of Bajara crop has noted above 2 percent temporal variation, it decreases 3.75 percent from 2001 to 2006 and 4.13 percent decrease from 2006 to 2011. Kharif season has noted a Bajara crop area 90.74 percent in 2001, 79.99 percent in 2006 and 77.14 percent in 2011 in this tahsil. So, this season is ideal time for Bajara crop. In the above all years, rabbi and summer season has not sown Bajara.

Jowar

Jowar is the second dominant cereals crop, which has above 40 percent cereals crop area yearly in tahsil. The aerial extent of Jowar crop has recorded average equal to 2 percent temporal variation; it decreases 1.27 percent from 2001 to 2006, after this year increase 2.29 percent. Kharif season has noted a Jowar crop area 8.50 percent in 2001, 17.78 percent in 2006 and 17.59 percent in 2011 in this tahsil. Rabbi season has above 80 percent Jowar crop area in 2001, 2006 and 2011. So, this season is ideal time for Jowar crops. In the above all years, summer season has not sown Jowar. (Table 4.15, 4.16 and fig.4.8)

Wheat

Wheat is the third dominant cereals crop, which has above 5 percent cereals crop area yearly in tahsil. The aerial extent of Wheat crop has recorded average equal to 2 percent temporal variation, it increases 4.08 percent from 2001 to 2006 and 0.57 percent increase, 2.29 percent from 2006 to 2011. Rabbi season has noted a wheat crop area 6.81 percent in 2001, 17.83 percent in 2006 and 17.76 percent in 2011 in this tahsil. So, this season is ideal time for wheat crops. In the above all years, Kharif and summer season has not sown wheat. (Table 4.15, 4.16 and fig.4.8)

Maize

Maize is the also dominant important cereals crop, which has above 2 percent cereals crop area yearly in tahsil. The aerial extent of maize crop has recorded very low increase temporal variation; it increases 0.43 percent from 2001 to 2006, and 1.71 percent from 2006 to 2011 in the tahsil. This crop is one of the crop which noted area in all seasons of year. Kharif season has noted maize crop area 0.30 percent in 2001, 1.24 percent in 2006 and 4.28 percent in 2011 year in the Khatav tahsil. Rabbi season has noted a maize crop area 1.49 percent in 2001, 1.28 percent in 2006 and 1.22 percent in 2011. And summer season has noted a maize crop area 100 percent cereal cropped area in 2001, 2006 and 2011, because this crop has sown only in summer in the Khatav tahsil, so this crop is called the “Summer Fodder”. (Table 4.15, 4.16 and fig.4.8)

Paddy

Paddy is the last but important dominant cereals crop in Khatav tahsil because it has pivotal role in food of people in drought-prone region in drought climatic condition. The aerial extent of Paddy crop has recorded low temporal variation, it increases 0.41 percent from 2000-01 to 2005-2006, after this year decrease just 0.10 percent. Kharif season has noted a paddy crop area 0.05 percent in 2001, 0.73 percent in 2006 and 0.59 percent in 2011 in this tahsil. So, this season is ideal time for paddy crop. In the above all years, the rabbi and summer season has not sown paddy crop. (Table 4.15, 4.16 and fig.4.8)

Other Cereals

Barley, Ragi and other cereals also important but has very low area. This crop sowing in rainy or Kharif season, mix in small percent in other crops according to farmers need. So this crop has not special record. (Table 4.15, 4.16 and fig.4.8)

PULSE CROPS

Pulse crops are the second dominant crop, which has 38,032 hectares area in tahsil. (Table 4.17, 4.18 and fig. 4.9)

Table 4.17
KHATAV TAHSIL: PULSE CROPS
(2001, 2006 and 2011)

Sr.	Year	Crops	Cropping Season						Total		Volume Change
			Kharif		Rabbi		Summer				
			Area in Hectares	%	Area in Hectares	%	Area in Hectares	%	Area in	%	%
		Tur	1122	30.32	--	--	--	--	1122	17.14	---
		Mung	715	19.32	--	--	--	--	715	10.92	---
		Udid	485	13.11	2700	95.58	--	--	3185	48.65	---
		Other	1378	37.24	125	4.42	22	100	1525	23.29	---
1	2001	**Total**	**3700**	**100**	**2825**	**100**	**22**	**100**	**6547**	**100**	**---**
		Tur	2340	16.93	--	--	--	--	2340	12.95	3.69
		Mung	1935	14.01	--	--	--	--	1935	10.71	0.83
		Udid	975	7.05	3620	85.88	--	--	4595	25.42	-2.82
		Other	8570	62.01	595	14.12	38	100	9203	50.92	5.68
2	2006	**Total**	**13820**	**100**	**4215**	**100**	**38**	**100**	**18073**	**100**	**176.05**
		Tur	1020	9.94	--	--	--	--	1020	7.54	-5.4
		Mung	1378	46.11	--	--	--	--	1378	10.19	-0.5
		Udid	740	24.77	3004	93.61	--	--	3744	27.68	2.31
		Other	7125	2.38	205	6.39	55	100	7385	54.59	3.59
3	2011	**Total**	**10263**	**100**	**3209**	**100**	**55**	**100**	**13527**	**100**	**25.15**

Source: Agricultural Department of Khatav, Tahsil (2001-2011).

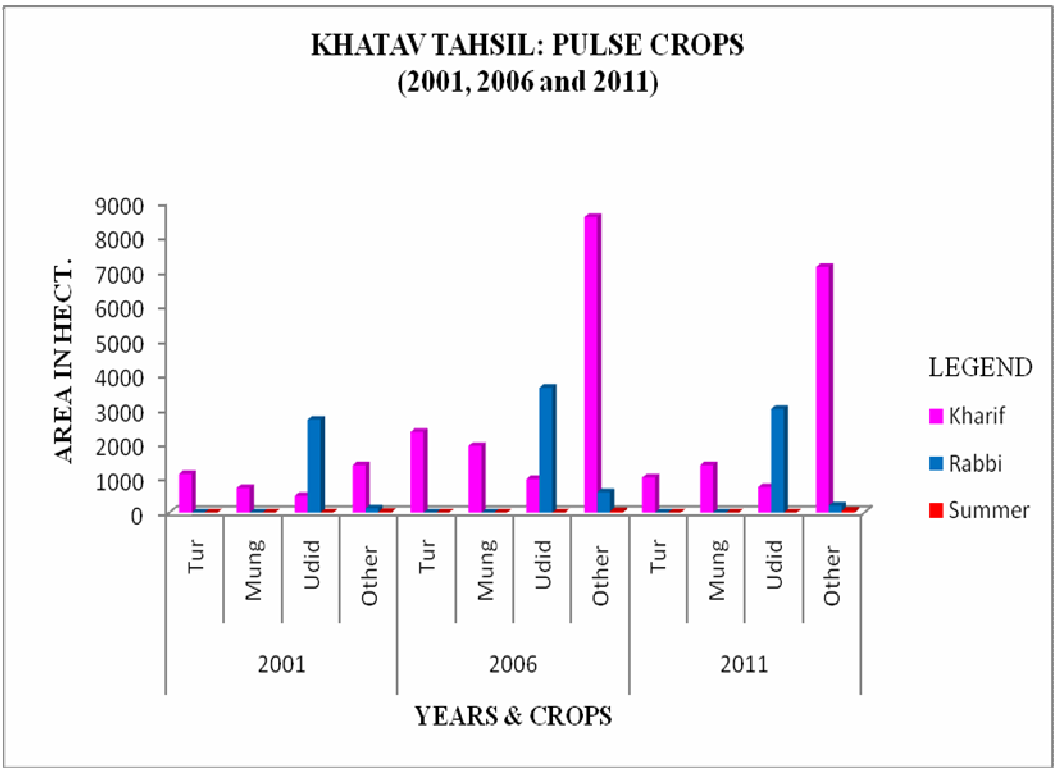

Fig. 4.9

Table 4.18

KHATAV TAHSIL: RANKING OF PULSE CROPS

Sr. No.	Year	First Rank Crop	Second Rank Crops	Third Rank Crops
1	2001	Udid (28.30%)	Tur (16.66%)	Mung (9.90%)
2	2006	Udid (25.48%)	Tur (12.97%)	Mung (10.73%)
3	2011	Udid (27.79%)	Mung (10.23%)	Tur (7.57%)

Source: Compiled by Researcher.

Udid

Table 4.17, 4.18 and fig.4.9 displays temporal variations of pulse crop in the year 2001, 2006 and 2011 in Khatav tahsil. Udid is the pre-dominant pulse crop, which has above 25 percent pulse crop area yearly in tahsil. The aerial extent of Udid crop has noted above 2 percent temporal variation, it decreases 2.82 percent from 2001 to 2006 and 2.31 percent increases from 2006 to 2011 year. Rabbi season has noted an Udid crop area 95.58 percent in 2001, 85.88 percent in 2006 and 93.61 percent in 2011 in this tahsil. So, this season is ideal time for Udid crop. Also this

crop has 5.75 percent in 2001, 7.05 percent in 2006, and 24.77 percent in 2011 in the Kharif season. In the above all years, Udid has not sown in summer season.

Tur

Tur is the second dominant pulse crop, which has above 12 percent pulse crop area yearly in tahsil. The aerial extent of Tur crop has recorded average equal to 2 percent temporal variation, it increases 3.69 percent from 2001 to 2006 after this year decrease 5.4 percent in 2011 year. Kharif season has noted a Tur crop area 22.24 percent in 2001, 16.93 percent in 2006 and 9.94 percent in 2011 in this tahsil. So, this season is ideal time for Tur crop. In the above all years, Tur has not shown in rabbi and summer season. (Table 4.17, 4.18 and fig.4.9)

Mung

Mung is the third dominant pulse crop, which has above 5 percent pulse crop area yearly in tahsil. The aerial extent of Mung crop has recorded average equal to 2 percent temporal variation; it increases 0.83 percent in 2006 and 0.5 percent decrease in 2011 in tahsil. Kharif season has noted a Mung crop area 03.23 percent in 2001, 14.01 percent in 2006 and 46.11 percent in 2011 in this tahsil. So, this season is ideal time for Mung crop. In the above all years, Mung has not sown rabbi and summer season. (Table 4.17, 4.18 and fig.4.9)

Other Pulses:

Other pulses are also important but have very low area. This crop sowing in rainy or Kharif season, mix in small percent in other crops according to farmer's need. So this crop has not special record.

OILSEED CROPS

Oilseed crops are the third dominant crop, which has 12,923 hectares area in tahsil. (Table 4.19, 4.20 and fig.4.10)

Table 4.19
KHATAV TAHSIL: OILSEED CROPS
(2001, 2006 and 2011)

Sr. No.	Year	Crops	Cropping Season						Total		Volume of Change
			Kharif		Rabbi		Summer				
			Area in Hect.	%	Area in Hect.	%	Area in Hect.	%	Area in Hect.	%	%
1	2001	**Groundnut**	785	43.13	--	--	285	100	1070	33.65	---
		Seasum	65	3.57	--	--	--	--	65	2.04	---
		Niger	350	19.23	1040	96.74	--	--	1390	43.71	---
		Sunflower	135	7.42	35	3.26	--	--	170	5.35	---
		Soyabean	485	26.65	--	--	--	--	485	15.25	
		Total	**1820**	**100**	**1075**	**100**	**285**	**100**	**3180**	**100**	**---**
2	2006	**Groundnut**	1405	38.18	--	--	360	100	--	33.65	0.00
		Seasum	310	8.42	--	--	--	--	310	5.91	+3.87
		Niger	130	3.53	675	56.02	--	--	805	15.35	-28.36
		Sunflower	410	11.14	325	26.97	--	--	735	14.01	+8.66
		Soyabean	1425	38.72	205	17.01	--	--	1630	31.08	+15.83
		Total	**3680**	**100**	**1205**	**100**	**360**	**100**	**5245**	**100**	**64.95**
3	2011	**Groundnut**	810	25.22	--	--	307	100	1117	24.83	-8.82
		Seasum	--	--	--	--	--	--	--	--	-5.91
		Niger	285	8.87	805	82.23	--	--	1090	24.24	+8.89
		Sunflower	367	11.43	110	11.24	--	--	477	10.60	-3.41
		Soyabean	1750	54.48	64	6.53	--	--	1814	40.33	+9.25
		Total	**3212**	**100**	**979**	**100**	**307**	**100**	**4498**	**100**	**14.21**

Source: Agricultural Department of Khatav, Tahsil (2001-2011).

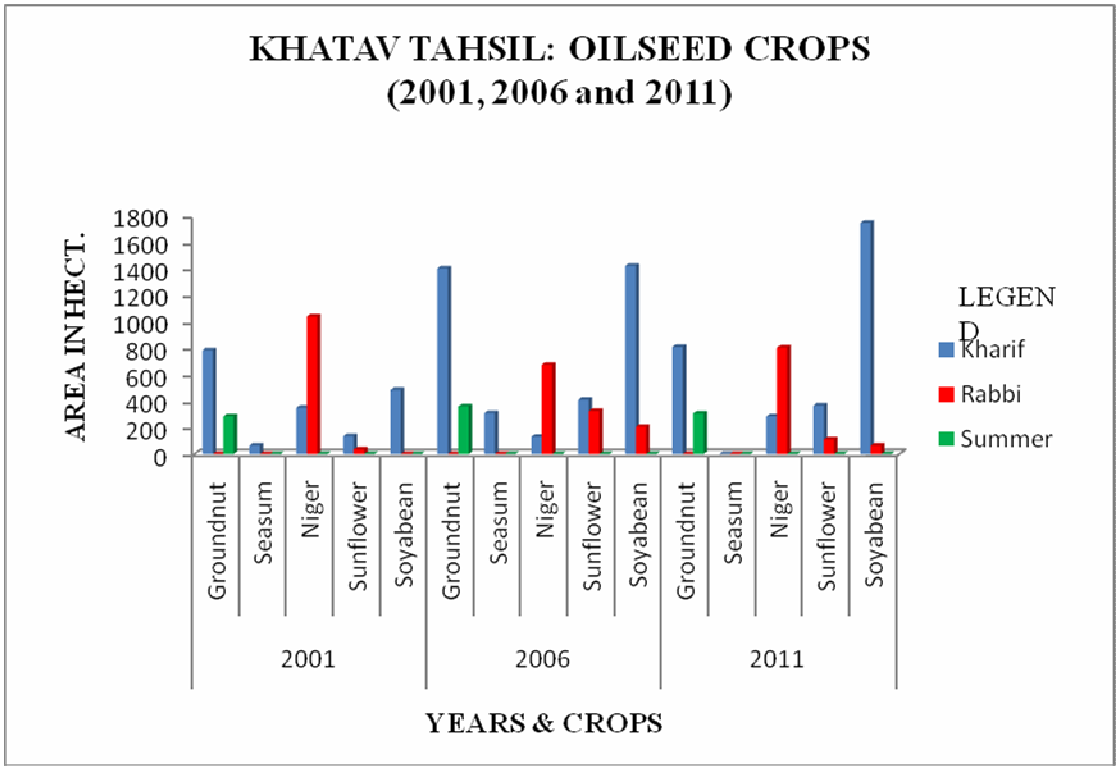

Fig. 4.10

Table 4.20
KHATAV TAHSIL: RANKING OF OILSEED CROPS

Sr. No.	Year	First Rank Crop	Second Rank Crops	Third Rank Crops
1	2001	**Niger** (43.71%)	**Groundnut** (33.65%)	**Soyabean** (15.25%)
2	2006	**Soyabean** (31.08%)	**Niger** (15.35%)	**Sunflower** (14.01%)
3	2011	**Soyabean** (40.33%)	**Groundnut** (24.83%)	**Niger** (24.24%)

Source: Compiled by Researcher.

Soyabean

Table 4.19, 4.20 and fig.4.10 displays temporal variations of Oilseed crops in the year 2001, 2006 and 2011 in Khatav tahsil. Soyabean is the pre-dominant oilseed crop, which has above 30 percent oilseed crop area yearly in tahsil. The aerial extent of Soyabean crop has noted near 10 percent temporal variation, it increases 15.83 percent from 2001 to 2006 and 9.25 percent increase from 2006 to 2011. Kharif season has noted a Soyabean crop area 26.65 percent in 2001, 38.72 percent in 2006, 54.48 percent in 2011 in the Kharif season. So, this season is ideal time for Soyabean crop. Also this crop has 17.01percent in 2006 and 6.53 percent in 2011 in rabbi season. In the above all years, Soyabean has not sown in summer season.

Groundnut

Groundnut is the second dominant oilseed crop, which has above 20 percent oilseed crop area yearly in tahsil. The aerial extent of Groundnut crop has recorded decrease temporal variation; it has 0.00 percent change from 2001 to 2006, after this year decreases 8.82 percent in 2011. Kharif season has noted a Groundnut crop area 43.13 percent in 2001, 38.18 percent in 2006 and 25.22 percent in 2011 in this tahsil. Also this crop has area 285 hectares in 2001 and 360 hectares in 2006 and 307 hectares in 2011 in summer season. But, this crop has more crop production in Kharif season so, this season is ideal time for Groundnut crop. In the above all years, Groundnut has not sown in rabbi season. (Table 4.19, 4.20 and fig.4.10)

Niger

Niger is the third dominant oilseed crop, which has above 15 percent oilseed crop area yearly in tahsil. The aerial extent of Niger crop has recorded steady temporal variation; it decreases 28.36 percent in 2006 and 8.89 percent increase in 2011, in tahsil. Rabbi season has noted a Niger crop area 96.74 percent in 2001, 56.02 percent in 2006 and 82.23 percent in 2011 in this tahsil. So, this season is ideal time for Niger crop. Also this crop has area 19.23 percent in 2001 and 3.53 percent in 2006 and 8.87 percent in 2011 in Kharif season. In the above all years, Niger has not sown in summer season. (Table 4.19, 4.20 and fig.4.10)

Sunflower

Sunflower is also dominant important oilseed crop which has above 7 percent oilseed crop area yearly in tahsil. The aerial extent of Sunflower crop has recorded very low increase temporal variation; it increases 8.66 percent from 2001 to 2006, and decreases 3.41 percent from 2006 to 2011 in the tahsil. Kharif season has noted a Sunflower crops area 26.65 percent in 2001, 11.14 percent in 2006 and 11.43 percent in 2011 in this tahsil. Also this crop has area 3.26 percent in 2001 and 26.97 percent in 2006, 11.24 percent in 2011 and 8.87 percent in 2011year in rabbi season. In the above all years, Sunflower has not sown in summer season. (Table 4.19, 4.20 and fig.4.10)

Seasum

Seasum is also significant dominant oilseed crop. The aerial extent of Seasum crop has recorded average equal to 2 percent temporal variation; it increases 3.87 percent in 2006 and 5.91 percent decrease in 2011 in tahsil. Kharif season has noted a Seasum crop area 3.57 percent in 2001 and 8.42 percent in 2006 in this tahsil. So, this season is ideal time for Seasum crop. In the above all years, Seasum has not sown in rabbi and summer season. (Table 4.19, 4.20 and fig.4.10)

CASH CROPS

Cash Crops are the last but significant crop, which have 6,105 hectares area in tahsil. (Table 4.21, 4.22 and fig.4.11)

Table 4.21
KHATAV TAHSIL: CASH CROPS
(2001, 2006 and 2011)

Sr. No.	Year	Crops	Cropping Season						Total		Volume of Change
			Kharif		Rabbi		Summer				
			Area in Hectare	%	Area in Hectare	%	Area in Hectare	%	Area in Hectare	%	%
1	2001	**Cotton**	255	31.68	--	--	325	100	580	51.33	---
		Sugarcane	550	68.32	42	100	--	--	592	48.67	---
		Total	**805**	**100**	**42**	**100**	**325**	**100**	**1172**	**100**	**---**
2	2006	**Cotton**	965	50.65	--	--	165	100	1130	54.59	3.26
		Sugarcane	940	49.34	208	100	--	--	1148	45.41	-3.26
		Total	**1905**	**100**	**208**	**100**	**165**	**100**	**2278**	**100**	**---**
3	2011	**Cotton**	542	18.65	--	--	47	100	589	19.95	-34.64
		Sugarcane	2363	81.35	446	100	--	--	2809	80.04	-3.26
		Total	**2905**	**100**	**446**	**100**	**47**	**100**	**3398**	**100**	**---**

Source: Agricultural Department of Khatav, Tahsil (2001-2011).

KHATAV TAHSIL: CASH CROPS

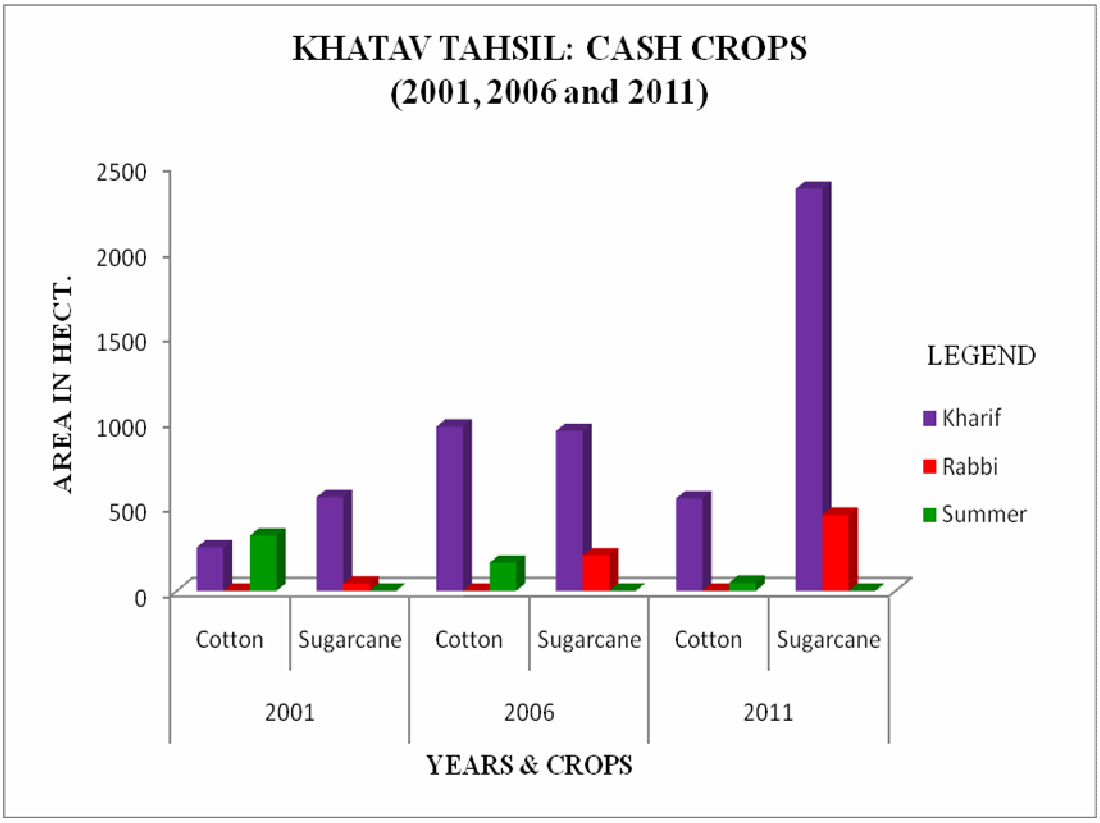

Fig. 4.11

Table 4.22

KHATAV TAHSIL: RANKING OF CASH CROPS

Sr. No.	Year	First Rank Crops	Second Rank Crops	Third Rank Crops
1	2001	**Cotton** (51.33%)	**Sugarcane** (48.67%)	---
2	2006	**Cotton** (54.59%)	**Sugarcane** (45.41%)	---
3	2011	**Sugarcane** (80.04%)	**Cotton** (19.95%)	---

Source: Compiled by Researcher.

Cotton

Table 4.21, 4.22 and fig. 4.11 displays temporal variations of Cash crop in the year 2001, 2006 and 2011 in Khatav tahsil. Cotton is the pre-dominant cash crop, which has above 70 percent cash crop area yearly in tahsil. The aerial extent of Cotton crop has noted normal percent decreases temporal variation, it increases 3.26 percent from 2001 to 2006 and but, it largely decrease i.e. 34.64 percent from 2006 to 2011. Kharif season has noted a Cotton crop area 31.68 percent in 2001, 50.65 percent in 2006, 18.65 percent in 2011 in the Kharif season. So, this season is well time for

Cotton crop in the tahsil. Also this crop has 320 hectares in 2001, 165 hectares in 2006 and 47 hectares in 2011 in summer season. In the above all years, Cotton has not sown in rabbi season.

Sugarcane

Sugarcane is the second and recorded dominant cash crop, which has above 20 percent cash crop area yearly in tahsil. The aerial extent of Sugarcane crop has noted near 3 percent decrease in temporal variation, it decreases 3.26 percent from 2001 to 2006 and 3.26 percent from 2006 to 2011. Kharif season has noted a Sugarcane crop area 68.32 percent in 2001, 49.34 percent in 2006, 81.35 percent in 2011 in the Kharif season. So, this season is ideal time for Sugarcane crop in the tahsil. In the above all years, sugarcane has not sown in rabbi and summer season. (Table 4.21, 4.22 and fig.4.11)

4.4 CONCLUSION

The cropping patterns are the important parameters of economic development of rural sectors. They include the production of area under various crops at a point of time. Khatav tahsil belongs to eastern part of Satara district where rainfall varies between 450 to 500 millimeters. The study region has varied topography and climate. Land in river valleys is fertile which resulted to cultivate sugarcane maize, cotton and groundnut, besides Jowar and Bajra. After every 3-4 years drought condition is occurring mainly in summer season in tahsil. So, summer season has crop sown area in the WDP work circle village area. Because WDP work increases the level of groundwater and availability of water.

Pusegaon, Pusesawali and Vaduj circle has highest cash crop sown area and lowest cereals crop sown area. Because all these circle have well water situation because of WDP work. Rajapur, Katalgewadi and Nidhal are the villages which belong to high WDP work. Cash crop has high water requirements and high profit as compared to cereals crops.

Mayani, Katar Khatav and Khatav have most cereals crop sown area and lowest cash crop sown area. Because these entire circle have low availability of water because of less WDP work. Cereals crop has low water requirements and low profit as compared to cash crops.

Eastern part of tahsil has high fallow or low crop sown area as compared to Central or Western part of tahsil. So, agriculture department and farmers in Khatav tahsil are making efforts to improve agricultural practice to cultivate maximum area under crop. New planning strategies are applied to enhance the knowledge of farmers and to increase the yield from the land. River basin areas in study region are very rich in terms of the agriculture but it is very essential to supplement this activity by horticulture and dairy farming. Such typical characteristics of this region create a background for immense development of agriculture sector.

Such study has much potential to attract experts from various fields like planning, agriculture, economics, and administration for further study and to prepare plan for overall development of agriculture for Khatav tahsil.

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* * *

CHAPTER V

CASE STUDY-FARMERS OF SELECTED VILLAGES

5.1 Introduction

Watershed Development Programme (WDP) consists of conservation, regeneration and judicious use of all the resources, natural resources within the watershed area. It involves favorable change in land, water, plants, animals and human. Out of all this, human is significant factor having vital role in WDP.

Human have society, which gives priority to food, shelter, clothing, health and education for entire population. All these basic needs complete through the environment. But, when the economic and natural conditions of the society deteriorate, the community tends to over exploit and degrades the natural resources, which in turn further aggravate poverty. WDP completes needs through less use of environmental factors. So, WDP is really helpful to better development of human.

The WDP has most beneficial to the farmers or cultivators. Hence, to understand the impact of WDP on socio-economic status of population, farmers, socio-economic situation changes selected for case study. There are 326 farmers in the selected sample of 8 villages (Kaledhon, Mhasurne, Katar Khatav, Satewadi, Ganeshwadi, Varud, Nidhal, Katalgewadi etc.). For the purpose of sample selection, these farmers are classified according to the size of their land holding- (i) small farmer (below 2 hectares), (ii) medium farmer (2 to 4 hectares), (iii) large farmer (above 4 hectares). Out of these three categories, small farmers are 176, medium farmers are 124 and large farmers are 26 i.e. a total of 326 farmers, are identified as sample-respondents.

5.2 WDP works in Sample Villages

The methodology of the study mainly consists of the research design, nature and scope of the study, selection of sample villages and sample farmers for the purpose of an empirical study. We have chosen Khatav tahsil one of the 11 tahsil of Satara district. The tahsil is located in the eastern part of Satara district. There are 143 villages in Khatav tahsil. The selection of Khatav tahsil is purposive, for the researcher belongs to the same region and more importantly, he has been working in Khatav tahsil. To study the performance of Watershed Development Programmes,

which are implemented in selected 8 villages which we have selected purposeful and for judging the impact of Watershed Development Programmes. The selection of the villages is based on the maximum work done in these villages. Finally, the individual sample respondents were identified as shown in table 5.1.

The selected 8 villages were chosen on the following basis.

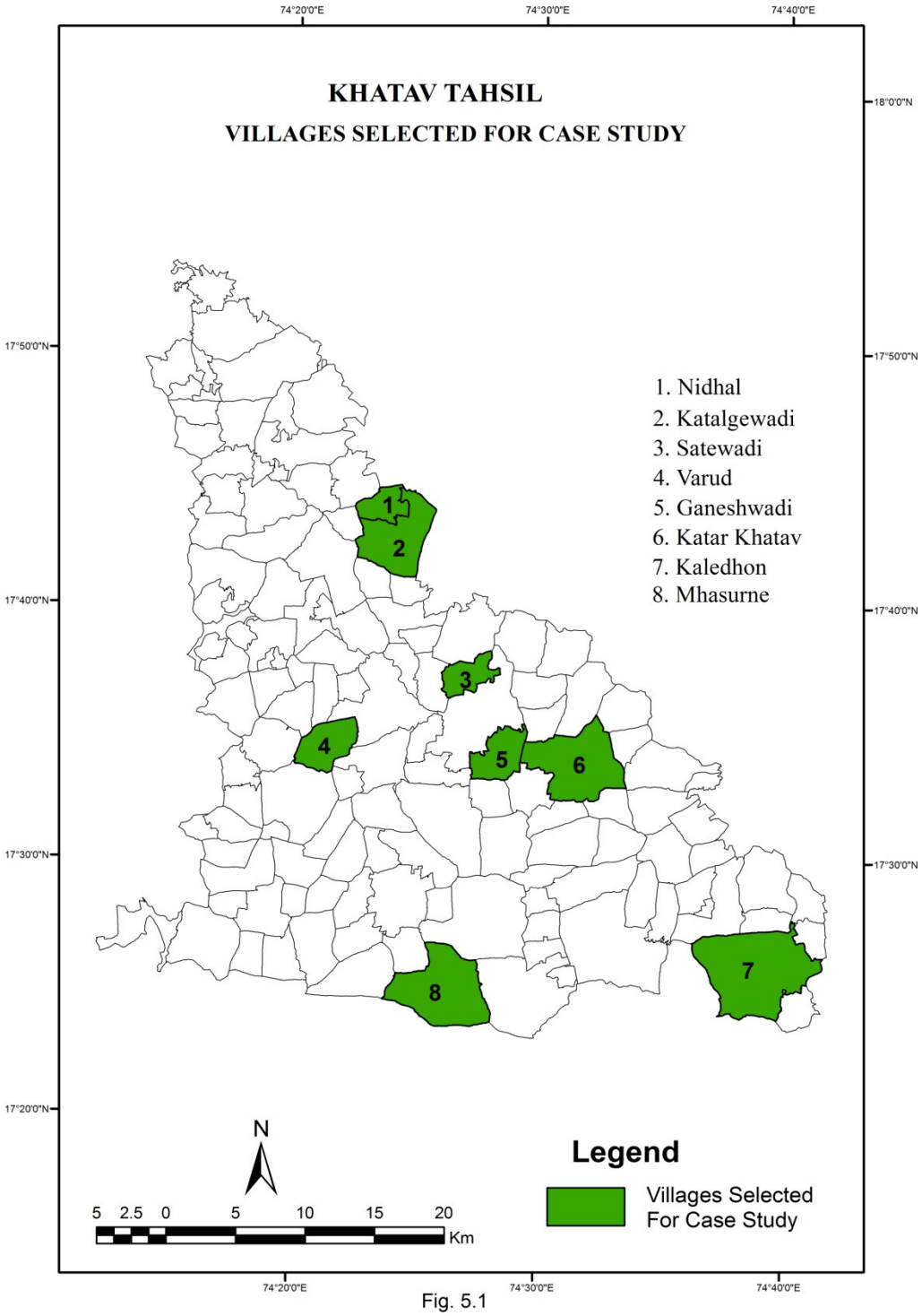

Fig. 5.1

Table 5.1

Maximum Watershed Development Programmes done in some selected villages.

Sr. No.	Name of Villages	Structures of Watershed Development									
		P.T.	C.N.B.	E.N.B.	F.P.	L.B	K.T.W.	Div. B	C.C.T. Hectare	Vanrai Bandhar	Gabion Structure
1	Nidhal	06	42	62	07	70	00	03	50	08	16
2	Katalgewadi	01	07	26	08	35	01	00	100	07	12
3	Satewadi	02	06	14	08	00	01	02	25	03	15
4	Varud	03	13	82	04	12	01	01	32	00	08
5	Ganeshwadi	01	06	17	06	00	02	02	18	00	07
6	Katar Khatav	04	09	25	08	14	06	04	20	07	10
7	Kaledhon	05	12	32	21	16	04	03	60	03	18
8	Mhasurne	05	09	13	17	23	05	02	40	05	11

Sources: Khatav tahsil Tahsildar Office, Vaduj (2012-13).

(P.T.= Percolation Tanks, C.N.B.= Cement Nala Bandhara, E.N.B.= Earthen Nala Bundings, F.P.= Farm Ponds, L.B.= Loose Boulder, K.T.W.=Kolhapur Type Weirs, Div. B.= Diversion Bunds, C.C.T.= Continuous Counter Trenches).

First of all, we selected 8 villages of Khatav tahsil by taking into consideration the above table 5.1. In the next phase, we enlisted the total number of land holders in these villages. This list was prepared by taking the needed data from the office of the Khatav tahsil tahsildar. There were found to be 6456 land holders in these 8 villages. Out of these, we have taken 5 percent farmers (total farmers = 326) for the case study. Table 5.2 gives the data in this respect.

Table 5.2

Total Number of Land Holders

Sr. No.	Name of Villages	Total Land Holders	5% of selected Land-holders
1	Nidhal	890	45
2	Katalgewadi	253	13
3	Satewadi	518	26
4	Varud	776	39
5	Ganeshwadi	520	28
6	Katar Khatav	1062	53
7	Kaledhon	929	47
8	Mhasurne	1508	75
	Total	6456	326

Source: District Census Handbook Satara district, 2011.

By taking the data of the landholders, we have classified the land holders according to their landholdings. The classification is as shown in table 5.3.

Table 5.3

Holding-wise Classification of Land-holders in Selected Villages.

Sr.	Name of	Total	small farmer	medium	large farmer
1	Nidhal	45	23	19	03
2	Katalgewadi	13	10	01	02
3	Satewadi	26	14	08	04
4	Varud	39	21	15	03
5	Ganeshwadi	26	19	5	02
6	Katar Khatav	55	28	23	04
7	Kaledhon	47	23	21	03
8	Mhasurne	75	38	32	05
	Total	**326**	**176**	**124**	**26**

Source: Based on Table 5.2 and Field Survey by Researcher, 2013.

(i) small farmer (below 2 hectares), (ii) medium farmer (2 to 4 hectares), (iii) large farmer (above 4 hectares). Out of these three categories, small farmers are 176, medium farmers are 124 and large farmers are 26 i.e. a total of 326 farmers, are identified as sample-respondents.

5.2.1 The Sample Farmers

The sample selected for the study is 5.04 % , i.e. 326 landholders out of 6456. Here, we have used the random sampling method as well as cluster sampling method. Table 5.4 gives the information in this behalf.

Table 5.4

Selection of the Sample

Sr.No.	Village	Population Sample	small farmer (below 2 hectares)	medium farmer (2 to 4 hectares)	large farmer (above 4 hectares)	Total	%
1	Nidhal	Population	455	376	59	890	
		Sample	23	19	3	45	5.05
2	Katalgewadi	Population	195	19	39	253	
		Sample	10	01	02	13	5.13
3	Satewadi	Population	279	159	80	518	
		Sample	14	8	4	26	5.01
4	Varud	Population	418	298	60	776	
		Sample	21	15	3	39	5.02
5	Ganeshwadi	Population	380	100	40	520	
		Sample	19	5	02	26	5.00
6	Katar Khatav	Population	541	444	77	1062	
		Sample	28	23	04	55	5.17
7	Kaledhon	Population	455	415	59	929	
		Sample	23	21	03	47	5.05
8	Mhasurne	Population	764	643	101	1508	
		Sample	38	32	05	75	4.97
	Total	Population	3485	2456	515	6456	
		Sample	176	124	26	326	5.04

Source: Based on Table 5.2 and Researcher Field Survey, 2013.

Let us go into the details of the methodology of the study related to the different villages being studied.

1. Nidhal

In village Nidhal, there are 890 landholders. Out of these, there are 455 landholders upto below 2 hectares, out of which, we selected 23. There are 376 landholders in the range of above 2 to 4 hectares, out of which, we selected 19. Lastly, above 4 hectares, there are 59 landholders, out of which, we selected 3. The sample selected in village Nidhal is 45 out of 890, the percentage of which is 5.05 %. (Table 5.4)

2. Katalgewadi

In village Katalgewadi, there are 253 landholders. Out of these, there are 195 landholders upto below 2 hectares, out of which, we selected 10. There are 19 landholders in the range of above 2 to 4 hectares, out of which, we selected 01. Lastly, above 4 hectares, there are 39 landholders, out of which, we selected 02. The sample selected in village Katalgewadi is 13 out of 253, the percentage of which is 5.13 %. (Table 5.4)

3. Satewadi

In village Satewadi, there are 518 landholders. Out of these, there are 279 landholders upto below 2 hectares, out of which, we selected 14. There are 159 landholders in the range of above 2 to 4 hectares, out of which, we selected 08. Lastly, above 4 hectares, there are 80 landholders, out of which, we selected 04. The sample selected in village Satewadi is 26 out of 518, the percentage of which is 5.01 %. (Table 5.4)

4. Varud

In village Varud, there are 776 landholders. Out of these, there are 418 landholders upto below 2 hectares, out of which, we selected 21. There are 298 landholders in the range of above 2 to 4 hectares, out of which, we selected 15. Lastly, above 4 hectares, there are 60 landholders, out of which, we selected 03. The sample selected in village Varud is 39 out of 776, the percentage of which is 5.02 %. (Table 5.4)

5. Ganeshwadi

In village Ganeshwadi, there are 520 landholders. Out of these, there are 380 landholders upto below 2 hectares, out of which, we selected 19. There are 100

landholders in the range of above 2 to 4 hectares, out of which, we selected 05. Lastly, above 4 hectares, there are 40 landholders, out of which, we selected 02. The sample selected in village Ganeshwadi is 26 out of 520, the percentage of which is 5.00 %. (Table 5.4)

6. Katar Khatav

In village Katar Khatav, there are 1062 landholders. Out of these, there are 541 landholders upto below 2 hectares, out of which, we selected 28. There are 444 landholders in the range of above 2 to 4 hectares, out of which, we selected 23. Lastly, above 4 hectares, there are 77 landholders, out of which, we selected 04. The sample selected in village Katar Khatav is 55 out of 1062, the percentage of which is 5.17 %. (Table 5.4)

7. **Kaledhon**

In village Kaledhon, there are 929 landholders. Out of these, there are 455 landholders upto below 2 hectares, out of which, we selected 23. There are 415 landholders in the range of above 2 to 4 hectares, out of which, we selected 21. Lastly, above 4 hectares, there are 59 landholders, out of which, we selected 03. The sample selected in village Kaledhon is 47 out of 929, the percentage of which is 5.05 %. (Table 5.4)

8. Mhasurne

In village Mhasurne, there are 1508 landholders. Out of these, there are 764 landholders upto below 2 hectares, out of which, we selected 38. There are 643 landholders in the range of above 2 to 4 hectares, out of which, we selected 32. Lastly, above 4 hectares, there are 101 landholders, out of which, we selected 05. The sample selected in village Mhasurne is 75 out of 1508, the percentage of which is 4.97 %. (Table 5.4)

5.3 GENERAL INFORMATION

The general information of the sample farmer's is associated to the type of family, age group, size of family, gender, status of education. These 326 sample farmers are studied with a well structured questionnaire for collecting the information or data, which is presented in tables 5.1 to 5.5, respectively.

5.3.1 Type of Family

Family plays important role in farming activities. All family members are associated to the agriculture, so this family is called as agricultural family. Agriculture

development and growth leads to the family development and growth. The agriculture has development and growth through the WDP. Generally, Family system is classified into two types- joint family system and nuclear family system. The population growth rate is depending on the types of families. Several studies indicate that the population growth rate is higher in the joint family system, rather than in the nuclear family system. Table 5.5 shows the classification of the sample families according to the family type.

Table 5.5
Type of Family

Sr. No.	Type of family	Farmers Category			Total
		Small	Medium	Large	
1	Nuclear	67	33	7	107
	%	36.41	30.84	20.00	32.82
2	Joint	117	74	28	219
	%	63.59	69.16	80.00	67.18
3	Total	184	107	35	326
	%	100.00	100.00	100.00	100.00

Note: Figures in brackets indicate the percentages to the column total.

Source: Field Survey by Researcher, 2013.

Type of Family

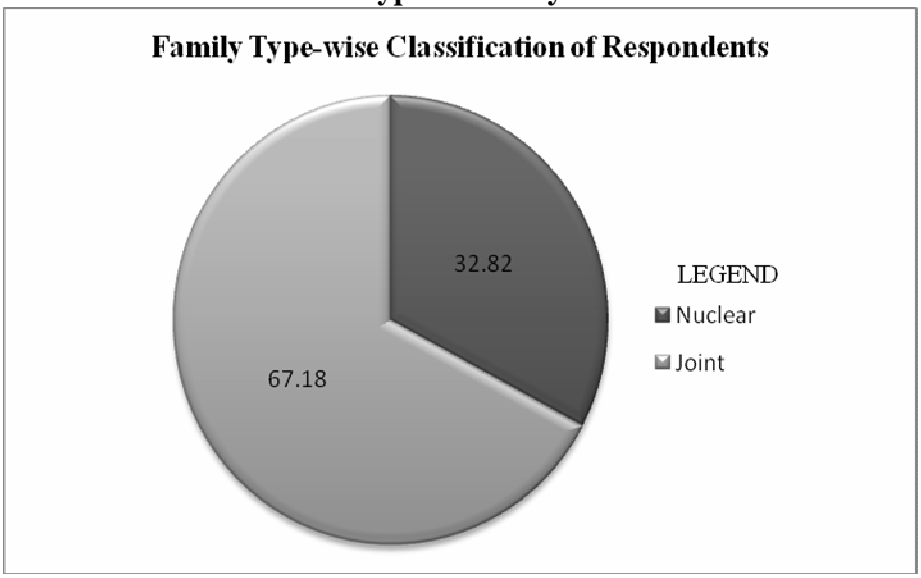

Fig. 5.2

Note; Figures indicate the percentages.

The above table 5.1 and fig. 2 shows that out of the sample of 326 families, 107 (32.82 %) families belong to the nuclear type, while the remaining 219 (67.18 %)

families belong to the joint type. Among the 184(100 %) small farmers' families, 67 (36.41 %) families are of nuclear-type, while the remaining 117 (63.59 %) families are of joint-type. Out of 107 (100 %) medium farmers' families, 33 (30.84 %) families are the nuclear-type and 74 (69.16 %) families are of joint-type. Lastly, out of the 35 (100 %) large farmers' families, 7 (20.00 %) families are of nuclear-type, the remaining 28 (80.00 %) families are of joint-type. (table 5.1 and fig. 2)

In the final tally, in a descending order, 80.00 % large farmer's families are of joint-type, followed, in the same category, by 69.16 % medium farmers' families, 63.59 % small farmers' families. Whereas, in a descending order, 36.41 % small farmers are of nuclear-type, followed, in the same category, by 30.84 % medium farmers' families, 20.00 large farmers' families. Overall, the joint agrarian family type has emerged as the dominant demographic feature in the study area.

5.3.2 Age Group

Age group is also significant for study of the farmers. Because, different age group members of farmers family plays vital role in farming activities. The active age group requires nearly 50 years or below 50 ages which doing dominantly various works in farm, this age group is referred as "agricultural respondent group". The age of the head of the family is presented in the following table 5.6.

Table 5.6
Age-groups

Sr. No.	Age-groups	Farmers Category			Total
		Small	Medium	Large	
1	21-40 Years	56	47	9	112
	%	30.44	43.92	25.71	34.36
2	41-60 Years	102	43	19	164
	%	55.43	40.19	54.29	50.30
3	Above 60 Years	26	17	7	50
	%	14.13	15.89	20	15.34
Total		184	107	35	326
Total %		100.00	100.00	100.00	100.00

Note: Figures indicate the percentages.

Source: Field Survey by Researcher, 2013.

Farmers Age-group

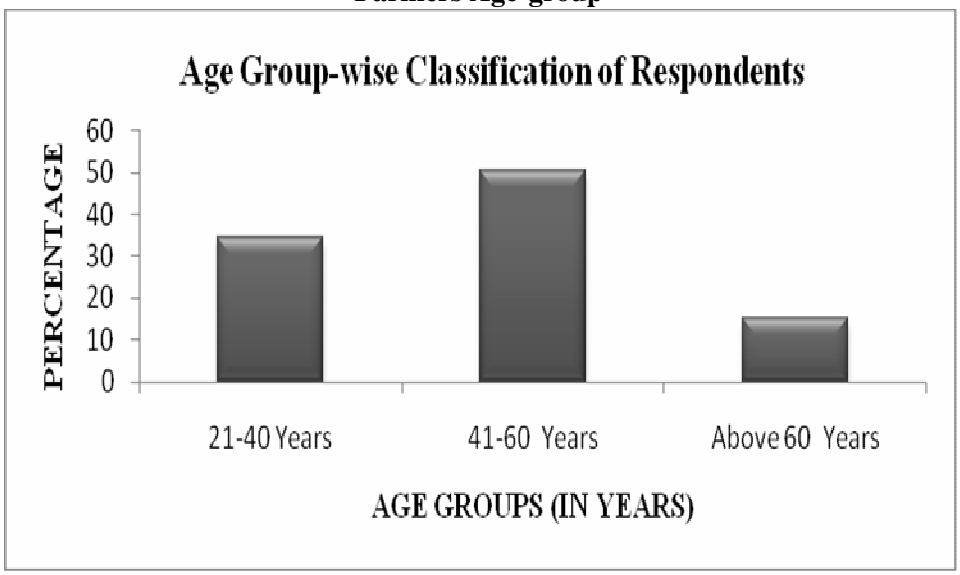

Fig. 5.3

The above table 5.6 and fig 5.3 shows that out of the sample of 326 respondents, the largest group of 164 (50.30 %) farmers belongs to the age-group of 41- 60 years, followed by 112 (34.36 %) farmers in the age-group of 21- 40 years and 50 (15.34 %) farmers in the age-group of above 60 years. Among the 184 (100%) small farmers, the largest group of 102 (55.43 %) farmers belong to the age-group of 41- 60 years, followed by 56 (30.44 %) farmers belong to the age-group of 21- 40 years and 26 (14.13 %) farmers belonging to the age-group of above 60 years. Among the 107 (100 %) medium farmers, the largest group of 47 (43.92 %) farmers belong to the age-group of 21-40 years, followed by 43 (40.19 %) farmers belong to the age-group of 41-60 years and 17 (15.89 %) farmers belonging to the age-group of above 60 years. Lastly, out of 35 (100 %) large farmers, the largest group of 19 (54.29 %) farmers belongs to the age-group of 41-60 years. Followed by 9 (25.71 %) farmers belonging to the age-group of 21- 40 years and just 7 (20.00 %) farmers belonging to the age-group of above 60 years. Interestingly, it is found that youngest respondent is only 22 years of age, while the oldest one is 85 years of age and still active (table 5.6 and fig 5.3).

Overall, it is seen that slightly more than half the respondent farmers belong to the economically-working age-group of 41-60 years. On the other hand, about one-fifth farmers also continue to be economically- active beyond the age of 60 years.

5.3.3 The Size of the Family

The size of family is involved a group of different ages family members. Generally, Small family gives less human force in farming activities, whereas, big

family gives most human force in agriculture work. The information regarding the size of sample families is shown in table 5.7

Table 5.7
Size of Family

Sr. No.	Family Size	No. of Families	Percentage
1	Upto 3 Members	17	5.21
2	4 to 5 Members	123	37.73
3	6 to 8 Members	167	51.23
4	9 and above Members	19	5.83
	Total	326	100.00

Source: Field Survey by Researcher, 2013.

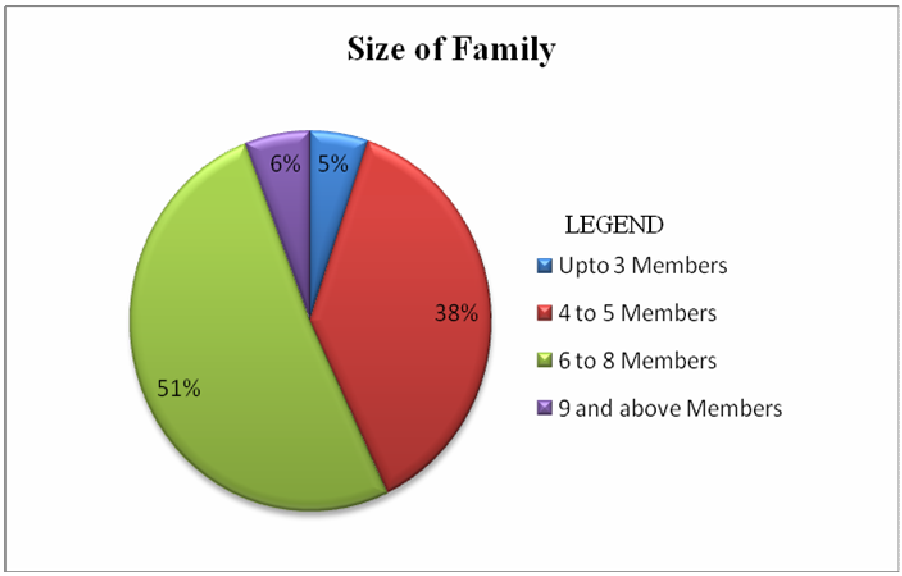

Fig. 5.4

The above table 5.7 and fig 5.4 shows that out of the 326 (100 %) respondents, the largest group of 167 (51.23 %) farmers have 6 to 8 members (including children) in their families, followed by 123 (37.73%) farmers having 4 to 5 members in the family, 19 (5.83 %) farmers having more than 9 members in the family (table 5.7 and fig 5.4). Lastly, there are only 17 (5.21 %) farmers with only upto 3 members in the family. Evidently, agriculture continues to be a labour intensive activity and every pair of unpaid hands in the family has to contribute to the family labour pool. It is also found that one respondent-family comprises of just two members - husband and wife - while another household contains 15 members.

5.3.4 Gender Distribution

Sex-ratio is the basic tool for the analysis of the composition of population. Apart from it's directly influences married persons in a population and birth rate, it also

determines the socio-economic and political structure of the population. It shows the number of females per 1000 males. It influences the marriage rate and the number of children. Further, an unfavorable ratio (i.e. when the proportion of females is less) leads to the emergence of many moral and social evils. As per Census 2011, there are 1012 females for every thousand males in Khatav tahsil which contains more female than male. (Table 5.8 and fig 5.5)

Table 5.8

Gender Distribution

Sr. No.	Gender	No. of families	Percentage
1	Male	966	49.58
2	Female	982	50.41
3	Total	1948	100.00

Source: Field Survey by Researcher, 2013.

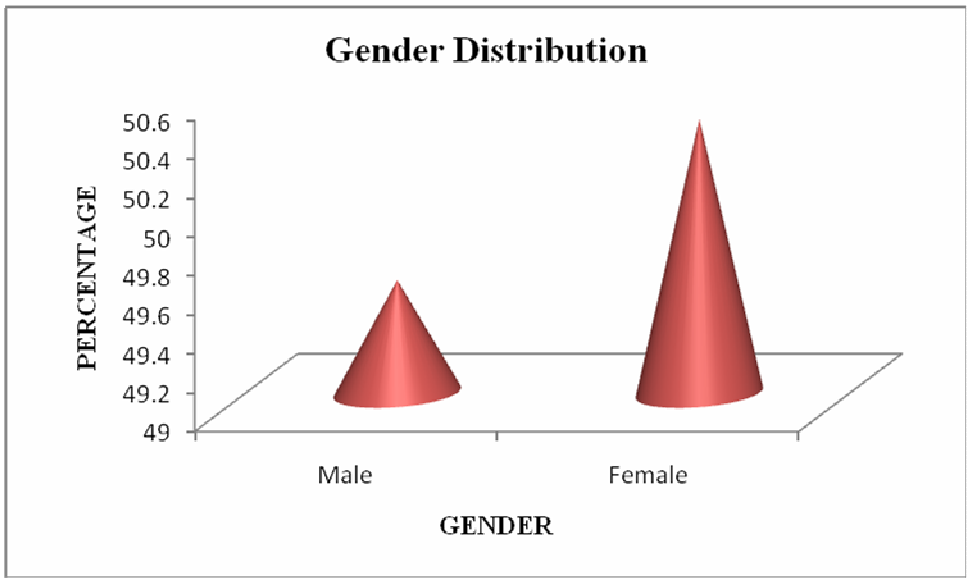

Fig. 5.5

The above Table 5.8 and fig. 5.5 shows that out the 1948 (100 %) respondents, the female population is more, i.e. 982 (50.42 %) and the male population is less, i.e. 966 (49.58 %). Thus, the sex ratio among the sample respondents is 1016 females per 1000 males. There is the most female population engaged in agriculture work as compared to male.

5.3.4 Educational Status

Even today education is the most intrisinsic instrument for changing the socio-economic status of an individual and society as a whole. The development of a human being basically depends upon the education. The literacy rate of a region depends upon the distribution of educational facilities. The literates' as well as well educated population are a significant resource for the nation. The science and technology are

the products of education. The educational level or literacy rate of the farmers is an important factor that plays a vital role in the development of agriculture. It is shown in (table 5.9 and fig. 5.6)

From the above (table 5.9 and fig. 5.6) below, it, is seen that among the 881(100%) small farmers., the largest group of 310 (65.13 %) farmers has completed only secondary education; they are followed, in a descending order, by 231 (46.2 %) farmers completing higher secondary education, 222 (50.57 %) farmers completing primary education, 100 (43.86%) farmers completing graduation education and 18 (28.57 %) each completing post graduation; but there are 122 (50.41 %) farmers in this group who are illiterate.

Table 5.9
Educational Status

Sr. No.	Educational Status	Farmer Category			Total
		Small	Medium	Large	
1	Primary School	222	180	37	439
	%	50.57	41.00	8.43	100
2	Secondary School	310	134	32	476
	%	65.13	28.15	6.72	100
3	Higher Secondary	231	228	41	500
	%	46.2	45.6	8.2	100
4	Graduation	100	88	40	228
	%	43.86	38.60	17.54	100
5	Postgraduate	18	20	25	63
	%	28.57	31.75	39.68	100
6	**Total Literates**	881	650	175	1706
	%	51.64	38.10	10.26	100
7	**Total Illiterate**	122	90	30	242
	%	50.41	37.19	12.40	100
8	**Grand Total**	1003	740	205	1948
	%	100	100	100	100

Note: Figures indicate the percentages to the column total.

Source: Field Survey by Researcher, 2013

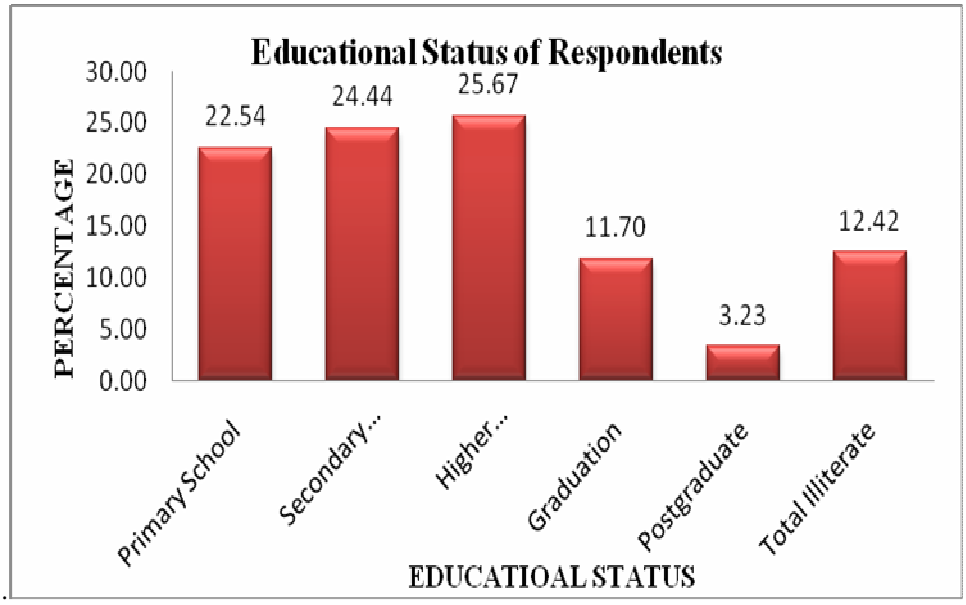

Fig. 5.6

Among the 650 (100 %) medium farmers, the largest group of 228 (45.6 %) farmers have completed higher secondary education; they are followed, in a descending order, by 180 (41 %) farmers completing primary education, 134 (28.15%) farmers completing secondary school, 88 (38.60%) farmers completing graduation; and 20 (31.75 %) farming completing post-graduation but there are 90 (37.19%) farmers in this group who are illiterate. (Table 5.9 and fig. 5.6)

In the final tally, out of the total 175(100%) large farmers, the largest group of 41 (8.2 %) farmers have completed higher secondary education; they are followed, in a descending order, by 40 (17.54 %) farmers completing graduation education, 37 (8.43 %) farmers completing primary education, 32 (6.72 %) secondary school education and 25 (39.68 %) farmers completing post-graduation; but there are 30 (12.40 %) farmers in this group who are illiterate.

Thus, it reveals that more than three-fourths of the sampled farmers are sufficiently educated, having completed their primary, secondary class education while slightly more than one-fifth of them are highly educated, having completed their graduate and post-graduate education. Still, despite widely spread educational facilities in the study area, there is a disturbing presence of 50.41 % illiterate farmers, mostly with the small farmers.

5.4 IMPACT OF WATERSHED DEVELOPMENT PROGRAMME WORK

The following different Tables present the field survey data collected by the researcher after visiting each sampled village and after meeting the sampled respondent-farmers there. Through the analysis and interpretation of this data, an

attempt is being made to assess the impact of the Watershed Development Programme work on the agricultural operations, standard of living, employment generation, etc.

5.4.1 Land Use Pattern

Land-use has land which cultivated or sown under different crops. The land use pattern for the present study means the proportion of the area under different land use before and after water conservation work periods. The land is grouped under four major types of use, namely, (i) fallow land, (ii) dry land, (iii) seasonal land, (iv) permanent land.

Khatav tahsil has come in the drought-prone area. The most land of it came under cereals crops. Jowar has sown in more than 60 percent area of tahsil. WDP has most affect on agricultural land use. It has changed cropping pattern. After WDP, Cash crops have increased sown area in tahsil. Also it increased agricultural land at the rate of 10.87 percent in the tahsil.

Table 5.10 and fig. 5.6 shows the data of the land-use pattern. The total fallow land water conservation was 114.17 hectares, which has decreased upto 38.06 hectares after the Watershed Development Programme work. The simple growth rate has shown a negative tendency (-231.11 %) of the land-use pattern. The point should be noted is that the maximum decrease in the use of fallow land is among the medium farmers category (-106.19 %). The same picture is seen in the all different categories of the farmers.

Table 5.10

Land Use Pattern (in Hectares)

Sr. No.	Landuse	Farmer Category			Total
		Small	Medium	Large	
1	**Fallow Land**				
	Pre-work Period	32.79	52.23	29.15	114.17
	%-age Share	**28.72**	**45.74**	**25.53**	**100**
	Post-work Period	3.24	17.41	17.41	38.06
	%-age Share	**8.51**	**45.74**	**45.74**	**100**
	Simple Growth Rate	-90.12	-106.19	-35.8	-232.11
2	**Dry Land**				
	Pre-work Period	33.2	46.56	13.77	93.52
	%-age Share	**35.5**	**49.78**	**14.72**	**100**
	Post-work Period	8.5	16.6	7.29	32.39
	%-age Share	**26.25**	**51.25**	**22.5**	**100**
	Simple Growth Rate	-75.33	-91.37	-19.76	-186.42

Contd….

3	**Seasonal Land**				
	Pre-work Period	74.9	90.28	28.34	193.52
	%-age Share	**38.7**	**46.65**	**14.64**	**100**
	Post-work Period	73.89	97.98	33.2	205.06
	%-age Share	**36.03**	**47.78**	**16.19**	**100**
	Simple Growth Rate	-3.08	23.48	14.82	35.19
4	**Permanant Land**				
	Pre-work Period	0	2.43	2.83	5.26
	%-age Share	**0**	**46.15**	**53.85**	**100**
	Post-work Period	54.45	64.37	19.03	137.85
	%-age Share	**39.5**	**46.7**	**13.8**	**100**
	Simple Growth Rate	166.05	188.9	49.41	404.36
5	**Total Land**				
	Pre-work Period	139.27	191.5	77.33	408.1
	%-age Share	**34.13**	**46.92**	**18.95**	**100**
	Post-work Period	140.49	193.52	77.33	411.34
	%-age Share	**34.15**	**47.05**	**18.8**	**100**
	Simple Growth Rate	3.72	6.16	0	9.88

Note: Figures in brackets indicate the percentages to the column total.

Source: Field Survey by Researcher, 2013.

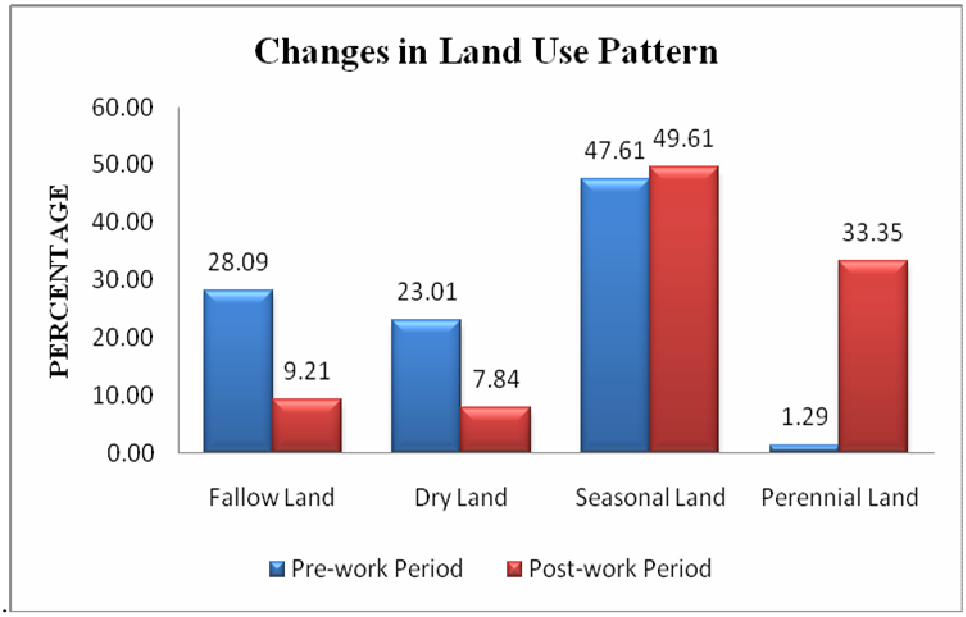

Fig. 5.7

Regarding **dryland,** the land use has reduced all the categories of the farmers. This is due to Watershed Development Programme work. The total dry land before Watershed Development work was 93.52 hectares, which has reduced upto 32.39 hectares after Watershed Development work (table 5.10 and fig. 5.7). The simple growth rate has shown a negative tendency (-186.42%) in the land-use pattern. The main thing should be noted is that the maximum reduction in the use of dryland is

in the marginal farmers' category (-75.33 %). The same picture is seen regarding the different categories of the farmers.

As regards to **Permanent land**, the land-use has increased among all the categories of the farmers. It is due to Watershed Development work. The total permanent land before Watershed Development work was 5.26 hectares, which has increased to 137.85 hectares after Watershed Development work. The simple growth rate has shown a positive tendency (404.36 %). The surprising thing to be noted is that the maximum increase in the permanent land is among the medium categories of the sample farmers.

The total land use of all the categories of the sample farmers has increased. It is due to Watershed Development work. The total land before Watershed Development work period was 408.1 hectares, which has increased to 411.34 hectares after Watershed Development work. The simple growth rate has shown a positive tendency (9.88 %). The main thing to be noted is that the maximum increase in the use of total land is among the marginal farmers category. The same picture is seen regarding all the categories of the sample farmers.

Overall, it may be observed that in the study area, in the post-Watershed Development work period, the area of fallow and dry land has shown a decreasing trend and there has been a considerable increase in the seasonal and permanent land area. It is the basic benefit of the Watershed Development work.

5.4.2 Cropping Pattern

The cropping pattern means the proportion of area under different crops at a point in time, changes in its distribution over a period of time and the factors determining these changes in the distribution. The cropping pattern in the study area is determined mainly by the natural factors like rainfall, climate and soil conditions. However, technological factors have also played an important part in the cropping pattern changes. Jowar, Bajara, Wheat, Maize, Tur, Mung, Udid, Gram, Seasum, Niger, Sunflower, Soyabean, Paddy etc. are the main food crops and Sugarcane, Cotton, Groundnut, Pomegranate are the main cash crops of the study villages.

Table 5.11
CROPPING PATTERN

Sr. No.	Crops	Farmers Category			Total
		Small	Medium	Large	
1	**Cereals**				
	Pre-work Period	**172.27**	**208.5**	**64.37**	**445.14**
	%-age Share	38.7	46.84	14.46	**100**
	Post-work Period	**247.57**	**260.32**	**100.4**	**608.3**
	%-age Share	40.7	42.8	16.51	**100**
	Simple Growth Rate	43.71	30.08	20.92	94.71
2	**Pulses**				
	Pre-work Period	**98.79**	**107.57**	**33.4**	**239.76**
	%-age Share	41.2	44.87	13.93	**100**
	Post-work Period	**56.48**	**60.53**	**25.51**	**142.51**
	%-age Share	39.63	42.47	17.9	**100**
	Simple Growth Rate	-24.55	-27.31	-4.58	-56.45
3	**Cash Crops**				
	Pre-work Period	**21.66**	**26.11**	**10.53**	**58.3**
	%-age Share	37.15	44.79	18.06	**100**
	Post-work Period	**68.62**	**110.53**	**30.77**	**209.92**
	%-age Share	32.69	52.65	14.66	**100**
	Simple Growth Rate	27.26	49	11.75	88.01
4	**Oilseeds**				
	Pre-work Period	**23.08**	**36.23**	**12.55**	**71.86**
	%-age Share	32.11	50.42	17.46	**100**
	Post-work Period	**55.06**	**54.05**	**13.56**	**122.67**
	%-age Share	44.88	44.06	11.06	**100**
	Simple Growth Rate	18.57	10.34	0.59	29.49
5	**Fruits**				
	Pre-work Period	**1.62**	**4.45**	**2.63**	**8.7**
	%-age Share	18.6	51.16	30.23	**100**
	Post-work Period	**14.57**	**29.55**	**14.98**	**59.11**
	%-age Share	24.66	50.00	25.34	**100**
	Simple Growth Rate	7.52	-0.27	4.43	29.26
6	**Vegetables**				
	Pre-work Period	**10.93**	**9.31**	**8.7**	**28.95**
	%-age Share	37.76	32.17	30.07	**100**
	Post-work Period	**60.12**	**72.87**	**16.6**	**149.6**
	%-age Share	40.19	48.71	11.1	**100**
	Simple Growth Rate	28.55	36.9	4.58	70.03
7	**Gross Cropped Area**				
	Pre-work Period	328.34	392.19	132.19	852.71
	%-age Share	**38.51**	**45.99**	**15.5**	**100**
	Post-work Period	502.43	587.85	201.82	1292.11
	%-age Share	**38.88**	**45.5**	**15.62**	**100**
	Simple Growth Rate	**101.05**	**113.58**	**40.42**	**255.06**

Note: Figures in brackets indicate the percentages to the column total. Source: Field Survey by Researcher, 2013.

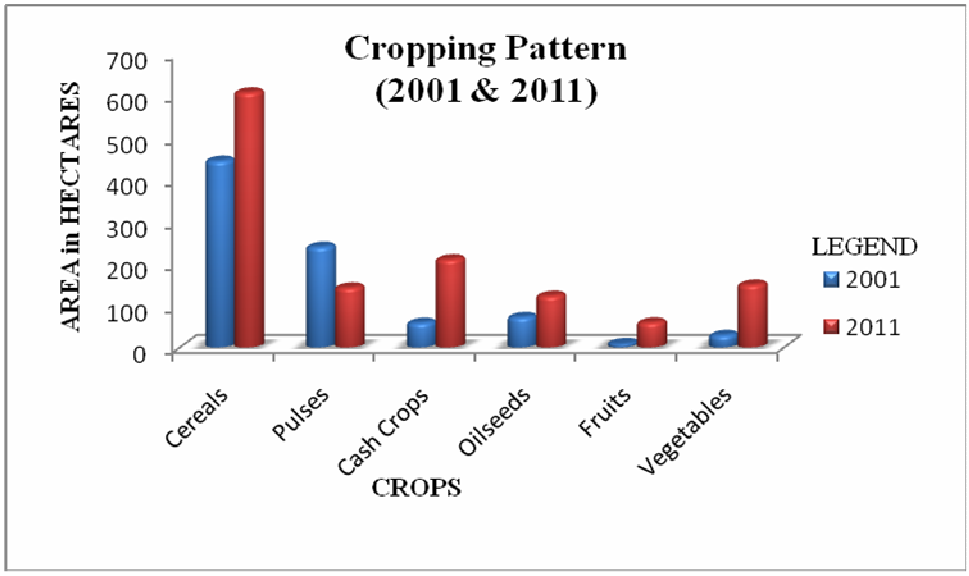

Fig. 5.8

Table 5.11 and fig. 5.8 indicates the changes in the cropping pattern of various crops in the pre and post-watershed development programme work periods among the different categories of farmers.

The total cropped area of **cereals** before Watershed Development period was 445.14 hectares, which has increased to 608.3 hectares after Watershed Development work. The simple growth rate of the cropping pattern has shown a positive tendency to increase 94.71 percent. The main thing to be noted is that the maximum increase is in the area of cereals is of small farmer's category (43.71 %). The same picture is seen regarding the other categories of the farmers also. More particularly, the areas under Jowar (12.09%) and Maize (15.37%) have increased, but the area under Bajara (09.32%) and Wheat (8.55%) has decreased (table 5.11 and fig. 5.8).

The total cropped area under the **pulses** has decreased. The total cropped area of pulses before the Watershed Development work period was 239.76 hectares, which has decreased to 142.51 hectares after Watershed Development work period. The simple growth rate has shown a negative tendency (-56.45%). The surprising thing to be noted is that the maximum decrease in the cropped area is under pulses of the medium farmers (-27.31 %). The growth rates for all the categories of farmers are negative. (Table 5.11 and fig. 5.8)

The total cropped area of the sample farmers under the **cash crops** has increased. The total cropped area under cash crops before the Watershed Development work period was 58.3 hectares, which has increased upto 209.92 hectares after Watershed Development work period. The simple growth rate has shown a positive

tendency (88.01 %). The surprising thing to be noted is that the maximum growth rate under cash crops is of small farmers' category (27.26 %). The growth rates for all the categories of the farmers are positive.

The total cropped area of the sample farmers under the **oilseeds** has increased. The total cropped area under oilseeds before the Watershed Development work period was **71.86** hectares, which has increased upto 122.67 hectares, after the Watershed Development work period. The simple growth rate has shown a positive tendency. The main thing to be noted is that the highest growth rate under the oilseeds cropped area is of the small farmers' category (44.88 %). The growth rate for all the categories of farmers is positive. (Table 5.11 and fig. 5.8)

The total cropped area of the sample farmers under the **fruits and vegetables has increased.** The cropped area under the fruits and vegetables before the Watershed Development work period was 37.65 hectares which has increased upto 208.71 hectares after the Watershed Development work period. The simple growth rate has shown a positive tendency. The main thing to be noted is that the maximum growth rate under the fruits cropped area is medium farmers' category (50.00 %) and the maximum growth rate under the vegetables cropped area is of medium farmers' category (36.9 %). The same picture is seen regarding all categories of sample farmers.

On the whole, it may be observed that in the study area, the general picture emerging from the above table is decreasing trend of the area under cultivation for pulses. On the other hand, the area under cultivation in respect of crops like cereals, cash crops, oilseeds and fruits and vegetables is on the increase. The simple growth rate has consistently remained positive. All the sample farmers have abandoned cereals and turned to some other remunerative crops.

5.4.3 Crop Production

The increased availability of water has to lead to use of fertilizers and pesticides, HYV seeds, modern farming techniques together with mechanized farm equipment and apply more capital, which has ultimately led to the growth in crop production. That shown, in case of sample farmers. Table 5.8 gives the information data regarding the total production of different crops. After the Watershed Development work period, there is a tremendous change in the production of various crops. The total production of 25,482.19 tons before the Watershed Development

work period has increased to 1,09,540.49 tons after Watershed Development work period. The simple growth rate for this change is 329.87 %. (Table 5.12 and fig. 5.9)

The production of pulse crop has decreased due to a variety of reasons, for example, it is being replaced by maize crop production. The production of all other crops has increased due to the increased availability of water, adoption of HYV seeds, use of fertilizers and pesticides, adoption of modern farming techniques, etc.

Table 5.12
Total Crop Production
(in Metric tons)

Sr. No.	Crops	Farmer Category			Total
		Small	Medium	Large	
1	**Cereals**				
	Pre-work Period	**1765.74**	**2137.15**	**659.82**	**4562.7**
	%-age Share	38.7	46.84	14.46	100
	Post-work Period	**3626.91**	**3813.75**	**1470.93**	**8911.59**
	%-age Share	40.7	42.8	16.51	100
	Simple Growth Rate	105.4	94.95	45.94	246.29
2	**Pulses**				
	Pre-work Period	**804.11**	**875.63**	**271.88**	**1951.62**
	%-age Share	41.2	44.87	13.93	100
	Post-work Period	**558.56**	**598.61**	**252.26**	**1409.43**
	%-age Share	39.63	42.47	17.9	100
	Simple Growth Rate	-13.91	-15.69	-1.11	-30.71
3	**Cash Crops**				
	Pre-work Period	**5988.97**	**7220.34**	**2910.53**	**16119.84**
	%-age Share	37.15	44.79	18.06	100
	Post-work Period	**25007.09**	**40276.89**	**11212.62**	**76496.6**
	%-age Share	32.69	52.65	14.66	100
	Simple Growth Rate	1077.1	1872.1	470.18	3419.3
4	**Oilseeds**				
	Pre-work Period	**295.38**	**463.81**	**160.65**	**919.84**
	%-age Share	32.11	50.42	17.46	100
	Post-work Period	**919.51**	**902.61**	**226.5**	**2048.62**
	%-age Share	44.88	44.06	11.06	100
	Simple Growth Rate	63.93	24.85	3.73	92.51
5	**Fruits**				
	Pre-work Period	**251.01**	**690.28**	**407.89**	**1349.19**
	%-age Share	18.6	51.16	30.23	100
	Post-work Period	**3585.43**	**7270.45**	**3685.02**	**14540.89**
	%-age Share	24.66	50	25.34	100
	Simple Growth Rate	188.84	372.66	185.6	747.10

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6	**Vegetables**				
	Pre-work Period	**218.62**	**186.23**	**174.09**	**578.95**
	%-age Share	37.76	32.17	30.07	100
	Post-work Period	**2464.98**	**2987.85**	**680.57**	**6133.4**
	%-age Share	40.19	48.71	11.1	100
	Simple Growth Rate	127.22	158.67	28.68	441.79
7	**Total Crop Production**				
	Pre-work Period	9323.84	11573.44	4585.02	25482.19
	%-age Share	36.59	45.42	17.99	100
	Post-work Period	36162.35	55850.2	17527.94	109540.49
	%-age Share	33.01	50.99	16	100
	Simple Growth Rate	26838.51	44276.76	12942.92	84058.19
	Simple Growth Rate %	287.85	382.57	282.29	329.87

Note: Figures indicate the percentages to the column total.
Source: Field Survey by Researcher, 2013.

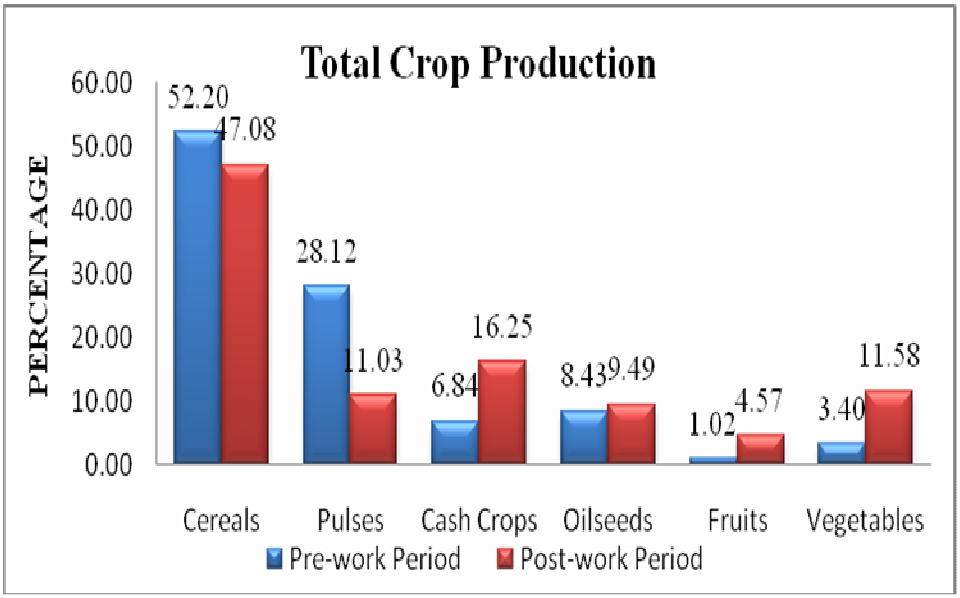

Fig. 5.9

The highest increase in the production of crops has occurred in cash crop (3419.3 %) as well as fruit crops (747.09%) (Table 5.12 and fig. 5.9). At the same time, the production of a cereal has increased at the rate of (246.29 %). The main thing to be noted is that the maximum growth rate of all crops has occurred in the medium farmers' category (382.57 %).

5.4.4 Crop Productivity

Crop productivity is the per hectares crop production in particular farm. Watershed Development Programme has given better water irrigation for crops which increase the agricultural productivity. Because Watershed Development has stress on

use of new techniques in agriculture. So, that reason, sample farmers have noted increased agricultural productivity.

Table 5.13
Crop Productivity (Yield)
(Quintals per hectares)

Sr. No.	Crops	Pre -work Period	Post -work Period	Absolute Change	Simple Growth Rate (%)
1	Vegetables	20	41	21	105
2	Jowar	9.96	18.22	8.26	82.93
3	Grapes	15	22	7	46.66
4	Groundnut	8.94	16.55	7.61	85.12
5	Maize	6.62	8.78	2.16	32.63
6	Bean (Ghavada)	9.83	14.45	4.62	46.99
7	Black Gram(Udid)	6.89	8.98	2.09	30.33
8	Gram	7.8	10.6	2.8	35.90
9	Wheat	17.5	22.5	5.00	28.57
10	Green Gram(Moog)	7.96	9.76	1.8	22.61
11	Bajara	6.9	9.1	2.20	31.88
12	Cotton	14.5	18.25	3.75	25.86
13	Sunflower	13.65	16.35	2.7	19.78
14	Soyabean	15.83	17.22	1.39	8.78
15	Sugarcane	800	1050	250	31.25
16	Pomegranate	450	710	260	57.77
17	Red Gram (Tur)	9.89	10.25	0.36	3.64
18	Other fruits	2.5	4.75	2.25	90.00

Source: Agricultural Department of Khatav, Tahsil (2012-13).

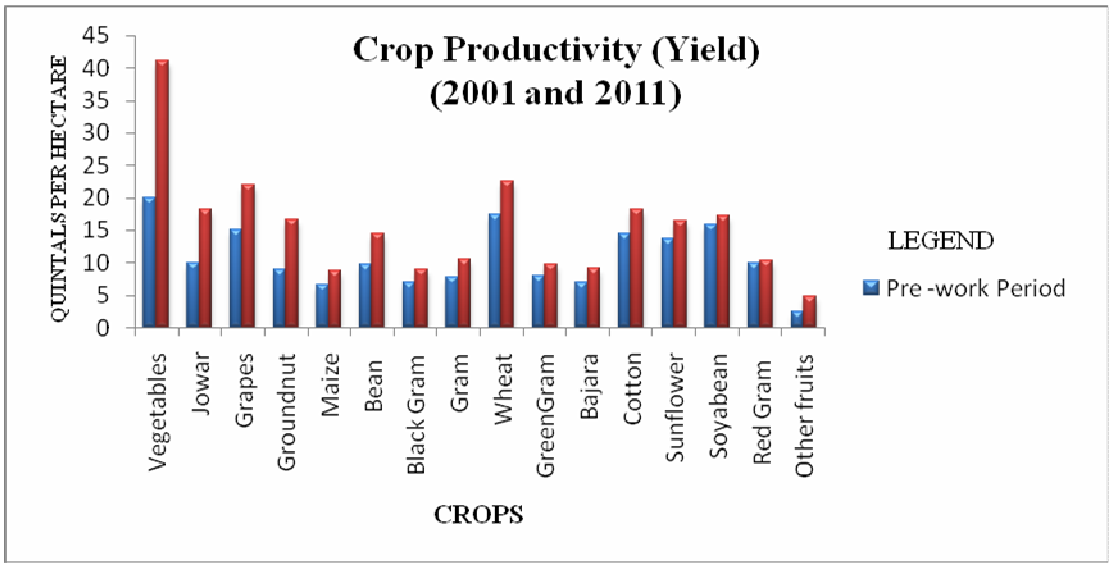

Fig. 5.10

Table 5.13 and fig. 5.10 shows the quintal per hectare yields of different varieties of crops. It reveals that all crops have recorded rise in productivity (yields) in

production in quintals per hectare. This once again confirms the fact that the availability of water has made this possible. The highest rise is in regard of vegetables (105 %) while the lowest rise is in regard of red gram (Tur) (3.64 %).

5.4.5 The Beneficial Crops

After the Watershed Development work, there is a tremendous change in the benefits of various crops. Cash crops have most increases benefits as well as production after Watershed Development work period. Table 5.14 and fig.5.11 below shows the beneficial crops to the different categories of the farmers.

Table 5.14
Beneficial Crops

Sr. No.	Farmers' Category	Cereals	Cash Crops	Oilseeds	Fruit and Vegetables	Total Sample
1	Small	**48**	**82**	**6**	**40**	176
	%	27.36	46.31	3.17	23.16	100
2	Medium	**8**	**70**	**11**	**35**	124
	%	6.26	56.23	9.38	28.13	100
3	Large	**2**	**11**	**1**	**12**	26
	%	8.33	41.67	4.85	45.15	100
	Total	58	163	18	87	326
	%	17.79	50	5.52	26.69	100

Note: Figures indicate the percentages to the column total.

Source: Field Survey by Researcher, 2013.

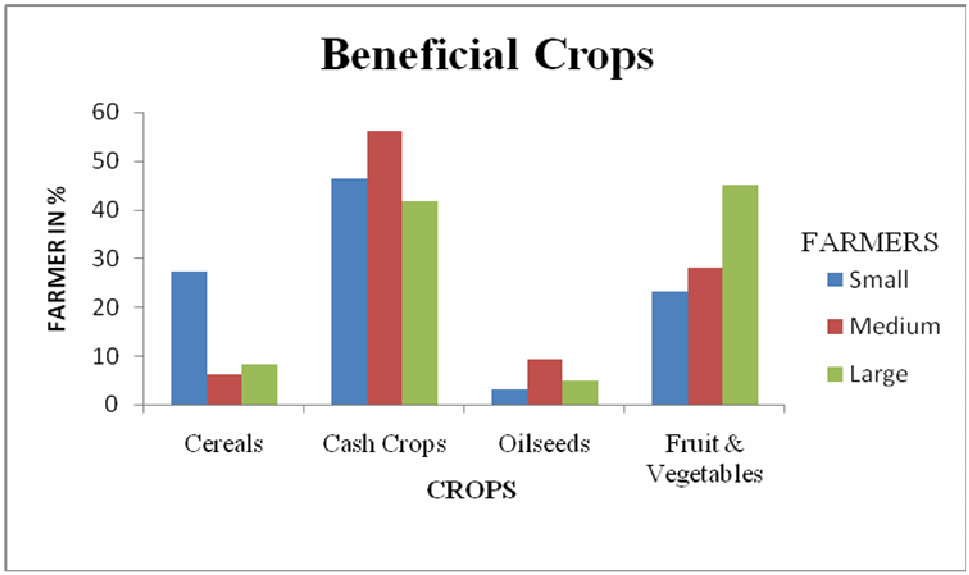

Fig. 5.11

The above table 5.14 and fig. 5.11 presents the data regarding the beneficial crops taken by the sample farmers. These crops are: cereals, cash crops, oilseeds, fruit and vegetables. Out of 326 farmers, 163 (50 %) farmers have opined that the cash

crops are more beneficial than other crops. Only 18 (5.52 %) farmers have opined that the oilseeds crops are more beneficial. The crops of fruit and vegetables 87 (26.69 %) and cereals 58 (17.79 %) are also beneficial to some extent.

5.4.6 The Agricultural Inputs

Use of agricultural inputs includes fertilizers, labours, services, pesticides and insecticides, methods of irrigation, loans, and agricultural investments etc. which are used by the sample units in the study area. The use of these inputs brings favorable results and returns to the farmers. The yield rate changes as a result of use of inputs.

5.3.7 Sources of Irrigation

The sources of irrigation are greatly impacted by the geological, physical and climatological conditions. The tahsil comes in drought-prone area, therefore, the vital sources available in the study area are; wells and tubewells.

Table 5.15
Irrigation Sources and Irrigated Land (in Hectare)

Sr. No.	Period	Farmers using Wells				Farmers using Tube Wells				Grand Total
		Small	Medium	Large	Total	Small	Medium	Large	Total	
1	Pre-work Period	158	114	26	298	6	18	14	38	336
	%-age Share	53.02	38.25	8.72	40.48	15.78	47.36	36.84	13.01	32.68
2	Post-work Period	212	168	58	438	98	114	42	254	692
	%-age Share	48.4	38.35	13.24	59.51	38.58	44.88	16.53	86.98	67.32
Simple Growth Rate		34.18	47.37	123.08	46.98	1533.33	533.33	200	568.42	105.95

Note: Figures indicate the percentages to the column total.

Source: Field Survey by Researcher, 2012-13.

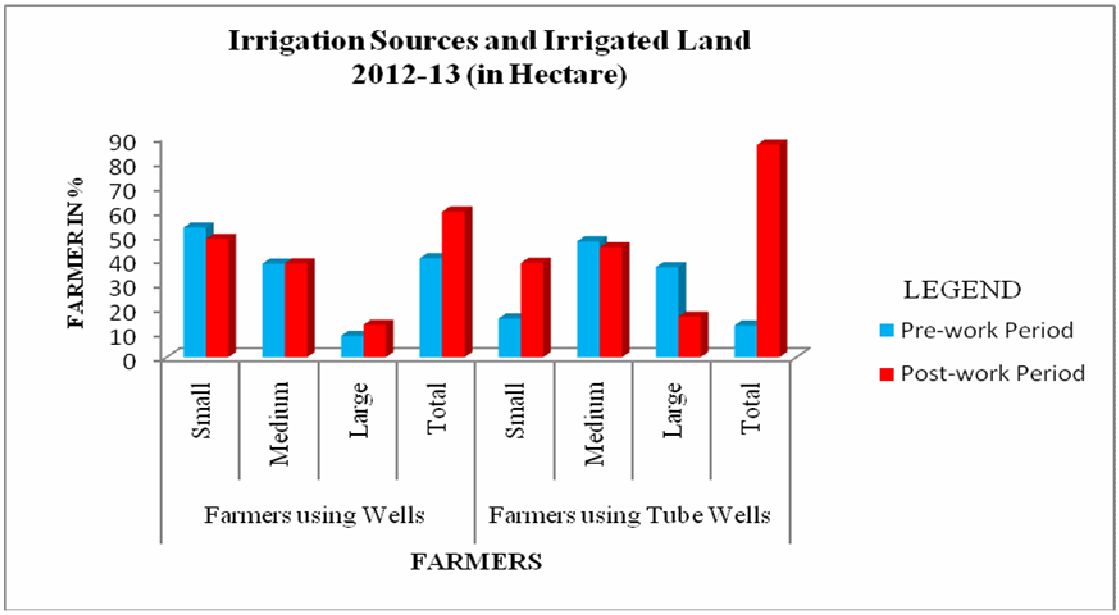

Fig. 5.12

The above table 5.15 and fig. 5.12 presents the data regarding the different sources of irrigation and the area in hectares under a particular source of irrigation. It is seen that the total area under irrigation of 336 hectares before the Watershed Development work period has increased as the 105.95 percent simple growth rate which made 692 hectares after Watershed Development work period.

Under well irrigation, in pre-period, among the 298 hectares farm, the largest farm of 158 hectares (53.02 %) farm has by small farmers, they are followed, in a descending order, by 114 hectares (38.25 %) farm of medium farmers and just 26 hectares (8.72 %) farm of large farmers, whereas, in post-period, among the 438 hectares farm, the largest farm of 212 hectares (48.4 %) farm has by small farmers; they are followed, in a descending order, by 168 hectares (38.25 %) farm of medium farmers and 58 hectares (13.24 %) farm of large farmers. There is large farmers have dominant simple growth rate of 123.08 percent and is followed by, 47.37 percent medium farmers and 34.18 percent small farmers (table 5.15 and fig. 5.12).

Under tube well irrigation, in pre-period, among the 336 hectares farm, the largest farm of 18 hectares (47.36 %) farm has by medium farmers, they are followed, in a descending order, by 14 hectares (36.84 %) farm of large farmers and just 6 hectares (15.78 %) farm of small farmers, whereas, in post-period, among the 692 hectares farm, the largest farm of 114 hectares (44.88 %) farm has by medium farmers, they are followed, in a descending order, by 98 hectares (38.58 %) farm of small farmers and 42 hectares (16.53 %) farm of large farmers. There is small farmers have dominant simple growth rate of 1533.33 percent and is followed by, 533.33 percent medium farmers and 200 percent large farmers.

5.4.8 Methods of Irrigation

The irrigation comprises two different water supplier systems or methods of agriculture. Currently flow water, drip system, sprinkler system, fogger system etc. different irrigation methods used in the agriculture. Those irrigation methods have water available from the different sources-well; tubewell, canals, farm ponds, percolation tanks, lakes etc. But, this various irrigation methods vary according to the slope of the land, the type of soil and the crop to be raised. Generally, Flow water, drip system and sprinkler system seen in the sample farms. The information in this regard is given below. (Table 5.16 and fig. 5.13)

Table 5.16

Irrigation Methods

(Area in Hectares)

Sr. No.	Particulars	Farmer Category			Total
		Small	Medium	Large	
1	**Surface Irrigation**				
	Pre-work Period	173.13	177.74	55.44	406.31
	%-age Share	42.61	43.74	13.64	100
	Post-work Period	264.88	266.41	84.64	615.93
	%-age Share	43	43.25	13.74	100
	Simple Growth Rate	52.99	51.22	16.87	121.07
2	**Drip**				
	Pre-work Period	125.36	166.48	51.17	343.01
	%-age Share	36.55	48.54	14.92	100
	Post-work Period	191.88	249.54	78.12	519.54
	%-age Share	36.93	48.03	15.04	100
	Simple Growth Rate	38.42	47.98	15.57	101.96
3	**Sprinkler**				
	Pre-work Period	29.85	47.96	25.58	103.39
	%-age Share	28.87	46.39	24.74	100
	Post-work Period	45.67	71.89	39.05	156.61
	%-age Share	29.16	45.9	24.93	100
	Simple Growth Rate	9.14	13.82	7.78	30.74
4	**Grade Total**				
	Pre-work Period	328.34	392.18	132.19	852.71
	%-age Share	38.51	45.99	15.50	100.00
	Post-work Period	502.43	587.84	201.81	1292.08
	%-age Share	38.89	45.50	15.62	100.00
	Simple Growth Rate	53.02	49.89	52.67	51.53

Note: Figures indicate the percentages to the column total.

Source: Field Survey by Researcher, 2013.

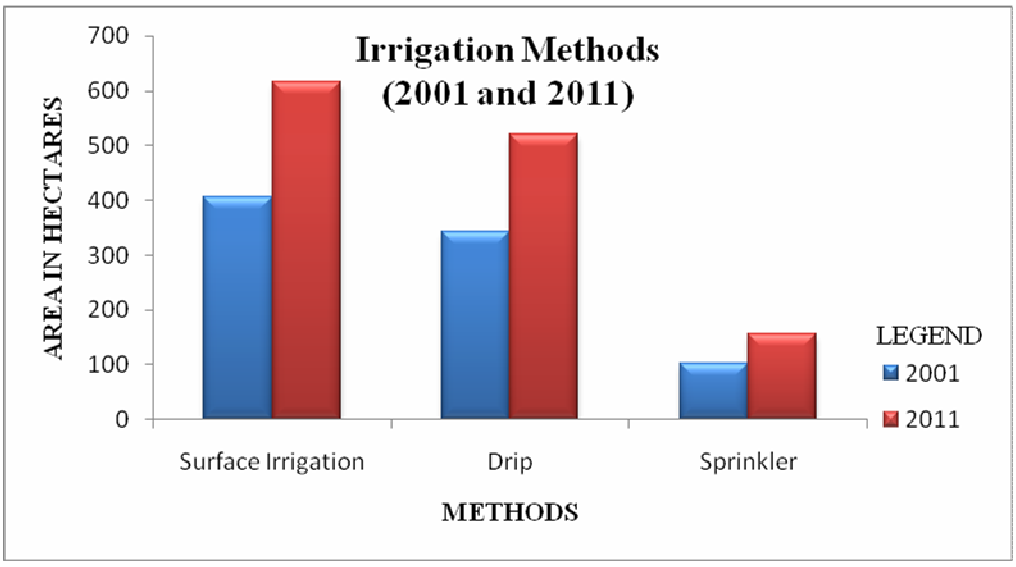

Fig. 5.13

The above table 5.16 and fig. 5.13 shows the different methods of irrigation and the area in hectares irrigated under each method. Under the surface irrigation system, the total farm of 406.31 hectares before the Watershed Development work period has increased to 615.93 hectares after Watershed Development work period at the simple growth rate of 121.07%. Under the Drip irrigation system, the total farm of 343.01 hectares before the watershed water conservation work has increased to 519.54 hectares after water conservation work at the simple growth rate of 101.96 %. Lastly, Under the Sprinkler irrigation system, the total farm of 103.39 hectares before the watershed waters conservation work has increased to 156.61 hectares after water conservation work at the minimize simple growth rate of 30.74 %. (Table 5.16 and fig. 5.13)

In pre-period, among the all methods, total 852.71 hectares (100%) farm, under irrigation, the largest farm of 392.18 hectares (45.99 %) farm has by medium farmers, they are followed, in a descending order, by 328.34 hectares (38.51 %) farm of small farmer and 132.19 hectares (15.50 %) farm of large farmers, whereas, in post period, out of total all methods 1292.08 hectares (100 %) farm, under irrigation, the largest farm of 587.84 hectares (45.50 %) farm has by medium farmers they are followed, in a descending order, by 502.43 hectares (38.89 %) farm of small farmers and 201.81 hectares (15.62 %) farm of large farmers.

The notable thing is that area under surface irrigation and sprinkler irrigation is very high. These methods affect considerable savings in the water and power needed for irrigating a specified area of crop. Their wider adoption would indeed contribute to the further development of agriculture.

5.4.9 The Use of Fertilizers

The fertilizer has played a dominant role in increasing crop production. The fertilizer increases the fertility of soils. The irrigated crops have highly use of fertilizers. Next to water, it constitutes the next most significant input for the modern agriculture. The use of fertilizers proportion seems to be always high in the case of irrigated crops. (Table 5.17 and fig. 5.14).

Table 5.17

Use of Fertilizers for Crops

(in Quintals/Hectare)

Sr. No.	Farmers' Category	Pre-work Period	Post-work Period	Absolute Change	Simple Growth Rate (%)
(A)	Chemical Fertilizers				
1	Small	2.99	4.70	1.71	57.32
	%	20.82	23.56		
2	Medium	6.99	8.21	1.22	17.42
	%	48.72	41.15		
3	Large	4.37	7.04	2.67	61.07
	%	30.46	35.29		
	Total	14.35	19.95	5.6	39.02
	%	100	100		
	Average	4.78	6.65	1.87	45.27
	%	41.82	58.18		
(B)	Compost Fertilizers				
1	Small	5.39	6.07	0.68	12.66
	%	28.65	26.85		
2	Medium	8.10	8.38	0.29	3.55
	%	43.07	37.1		
3	Large	5.32	8.15	2.83	53.24
	%	28.28	36.05		
	Total	18.8	22.6	3.8	20.21
	%	100	100		
	Average	6.27	7.53	1.27	23.15
	%	45.43	54.57		

Note: Figures in brackets indicate the percentages to the column total.

Source: Field Survey by Researcher, 2013.

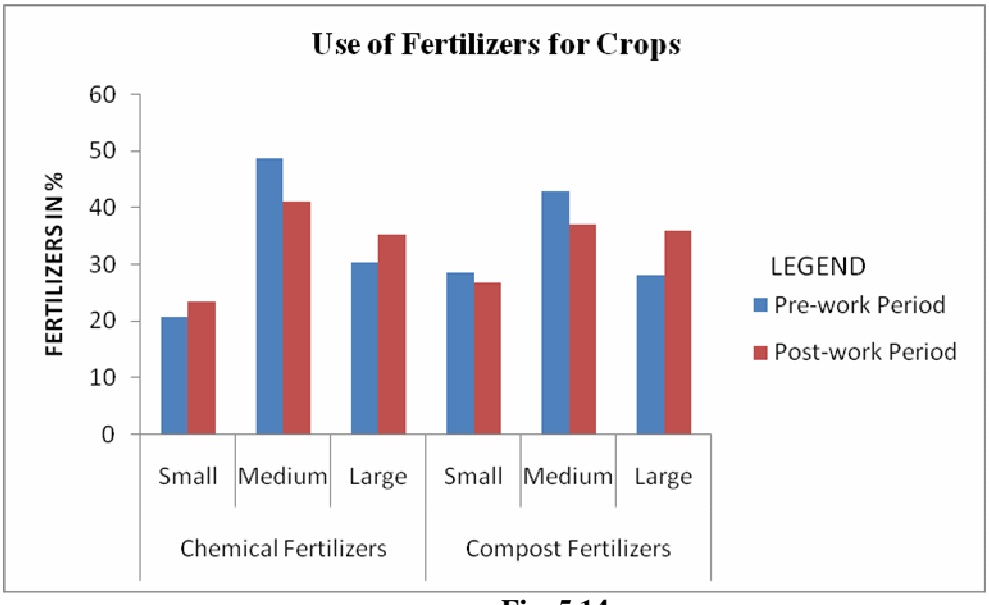

Fig. 5.14

The above table 5.17 and fig. 5.14 shows the use of chemical and compost fertilizers by the sample farmers. It is seen that in the post-watershed development work period, there have been substantial increase in the use of both chemical and compost fertilizers among all the categories of the farmers. On an average, the use of chemical fertilizers has grown from 4.78 quintals/hectare (41.82 %) to 6.65 quintals/hectare (58.18 %) at a simple growth rate of 39.02 %. There is also an increase in the average use of compost fertilizers from 6.27 quintals/hectare (45.43 %) to 7.53 quintals/hectare (54.57 %) at a simple growth rate of 20.21 %. The growth of compost fertilizers is less than that of chemical fertilizers.

5.4.10 Use of Pesticides

The pesticides play a dominant role in increasing crop production. Fertilizers, constitutes the most important input for the modern agriculture. As the improved varieties of various crops are highly susceptible to pests and diseases, a serious damage and even annihilation of crops is likely, if adequate preventive and curative measures are not taken. The use of pesticides is also an important parameter of impact of watershed water conservation work. (Table 5.18 and fig. 5.15)

Table 5.18
Use of Pesticides for Crops

(in Rupees per Hectare)

Sr. No.	Farmers' Category	Pre-work Period	Post-work Period	Absolute Change	Simple Growth Rate (%)
1	Small	1600.46	15015.02	13414.56	838.17
		11.95	24.33		
2	Medium	4214.78	17816.83	13602.05	322.72
		31.47	28.87		
3	Large	7577.76	28882.15	21304.39	281.14
		56.58	46.8		
	Total	13393	61714	48321	360.80
		100	100		
	Average	4464.33	20571.33	16107	
		17.83	82.17		

Note: Figures in brackets indicate the percentages to the column total

Source: Field Survey by Researcher, 2013.

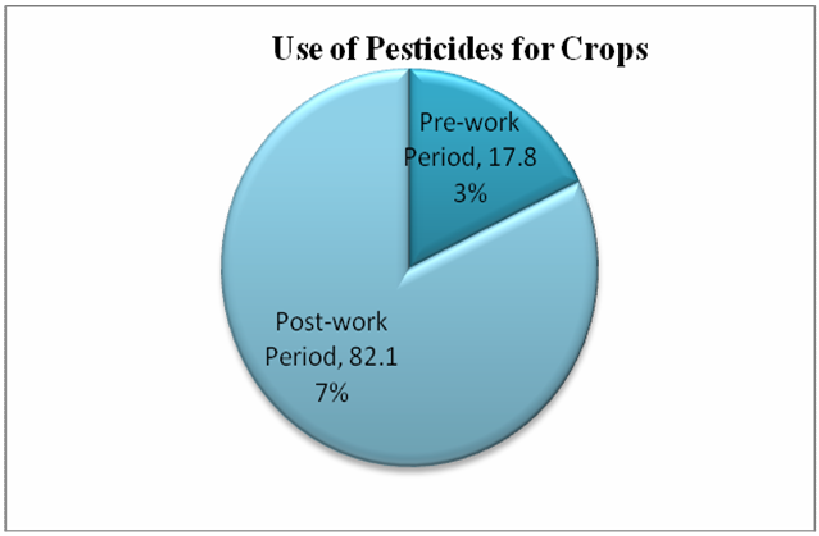

Fig. 5.15

Before the Watershed Development work period, the overall use of pesticides per hectare was Rs. 4464.33 per hectare (17.83 %), which increased after the Watershed Development work period to Rs. 20571.33 per hectare (82.17 %) (Table 5.18 and fig. 5.15). Its growth rate has been 360.80 %. The percentage increases from 17.83 % to 82.17 % in respect of the use of pesticides.

5.4.11 Employment Generation

For sustained development of agriculture, availability of agricultural labourers is essential, particularly during the peak period of the season, the shortage of agricultural labourers may adversely affect the agricultural production. The water conservation work generates more employment.

Table 5.19 shows the employment generation in pre-and post-watershed development work periods. Overall, the numbers of mandays consumed by the farmers for their agricultural work are seen to have been increased. This employment generation is the result of the availability of more water and the changes in the cropping pattern. In the pre-watershed development work period, the family labour, on an average for all the categories of the farmers, provided 50530 mandays (37.04 %), which increased upto 85863.33 mandays (62.96 % after watershed water conservation work. Its growth rate is found to be 69.93 %. The hired labour also has increased from 3197.66 mandays (17.53 %) to 15038.33 mandays (82.47 %). Its growth rate has found to be (370.27 %). The total mandays have increased from 53,727.6 (34.74 %) to 1,00,901.7 (65.26 %) at a growth rate of 87.80 %. (table 5.19 and fig. 5.16)

Table 5.19
Employment Generation

Sr. No.	Farmers' Category	Pre-work Period	Post-work Period	Absolute Change	Simple Growth Rate (%)
A	**Family Labour**				
1	Small	65,563	1,07,183	41,620	63.48
	%	43.25	41.61		
2	Medium	40,702	66,046	25,344	62.27
	%	26.85	25.64		
3	Large	45,325	84,361	39,036	86.12
	%	29.9	32.75		
	Total	1,51,590	2,57,590	1,06,000	69.93
	%	100	100		
	Average	50,530	85,863.33	35,333.3	70.62
	%	37.04	62.95		
B	**Hired Labour**				
1	Small	2,571	11,288	8,717	339.05
	%	26.8	25.02		
2	Medium	2,921	17,514	14,593	499.59
	%	30.45	38.82		
3	Large	4,101	16,313	12,212	297.78
	%	42.75	36.16		
	Total	9,593	45,115	35,522	370.29
	%	100	100		
	Average	3,197.66	15,038.33	11,840.7	378.8
	%	17.53	82.47		
C	**Total Labour**				
1	Small	68,134	1,18,471	1,86,605	73.88
	%	42.27	39.14		
2	Medium	43,623	83,560	1,27,183	91.55
	%	27.06	27.60		
3	Large	49,426	1,00,674	1,50,100	103.69
	%	30.66	33.26		
	Total	1,61,183	3,02,705	4,63,888	87.80
	%	100	100		
	Average	53,727.6	1,00,901.7	1,54,629.3	89.7

Note: Figures in brackets indicate the percentages to the column total.

Source: Field Survey by Researcher, 2013.

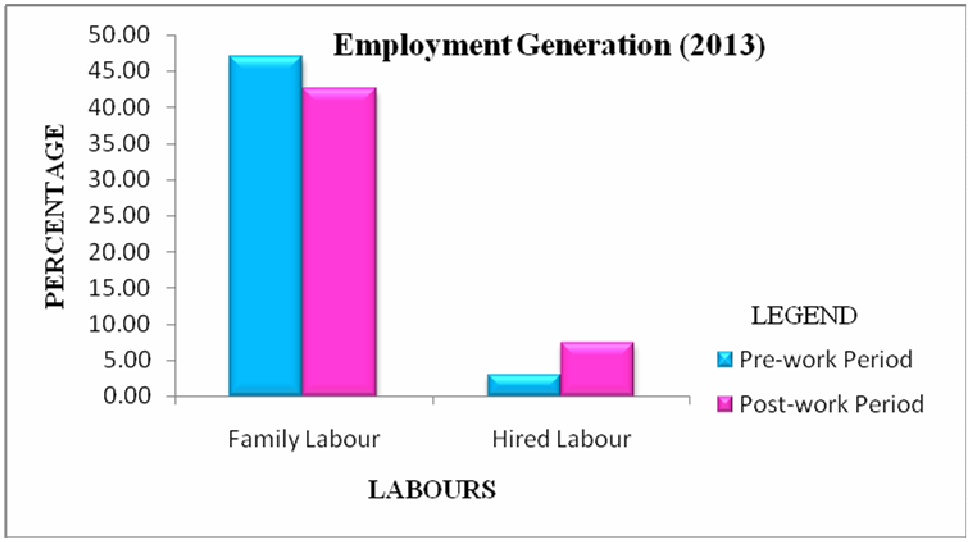

Fig. 5.16

5.4.12 Agricultural Implements

Agricultural Implements are really important in different agricultural activities. For taking agricultural production, implements like iron ploughs, bullock carts, tractors, threshers, cutters, sprayers, rotors, cultivators, etc., need to be used. Modern agricultural implements help in enhancing the crop yields. The farmers in the study area own all such implements which they use on their farms. (Table 5.20 and fig. 5.17)

Table 5.20
Agricultural Implements

Sr. No.	Particulars	Farmer Category			Total
		Small	Medium	Large	
A	**Holler**				
	Pre-work Period	106	92	12	210
	%-age Share	50.48	43.81	5.71	71.19
	Post-work Period	174	120	26	320
	%-age Share	54.37	37.50	8.12	35.24
	Simple Growth Rate	64.15	30.43	116.67	52.38
B	**Tractor**				
	Pre-work Period	8	20	2	30
	%-age Share	26.67	66.67	6.67	10.17
	Post-work Period	170	122	26	318
	%-age Share	53.46	38.36	8.18	35.02
	Simple Growth Rate	2025	510	1200	960
C	**Sprayer**				
	Pre-work Period	17	13	4	34
	%-age Share	50	38.24	11.76	11.53
	Post-work Period	75	55	12	142
	%-age Share	52.82	38.73	8.45	15.64
	Simple Growth Rate	341.18	323.08	200	317.65

Contd…

D	**HTP**				
	Pre-work Period	1	3	4	8
	%-age Share	12.5	37.5	50	2.71
	Post-work Period	14	25	17	56
	%-age Share	25	44.64	30.36	6.17
	Simple Growth Rate	1300	733.33	325	600
E	**Harvester**				
	Pre-work Period	2	7	4	13
	%-age Share	15.38	53.85	30.77	4.41
	Post-work Period	29	31	12	72
	%-age Share	40.28	43.06	16.67	7.93
	Simple Growth Rate	1350	342.86	200	453.85
G	**Grand Total**				
	Pre-work Period	134	135	26	295
	%-age Share	45.42	45.76	8.81	24.52
	Post-work Period	462	353	93	908
	%-age Share	50.88	38.88	10.24	75.48
	Simple Growth Rate	244.78	161.48	257.69	207.8

Note: Figures in brackets indicate the percentages.

Source: Field Survey by Researcher, 2013.

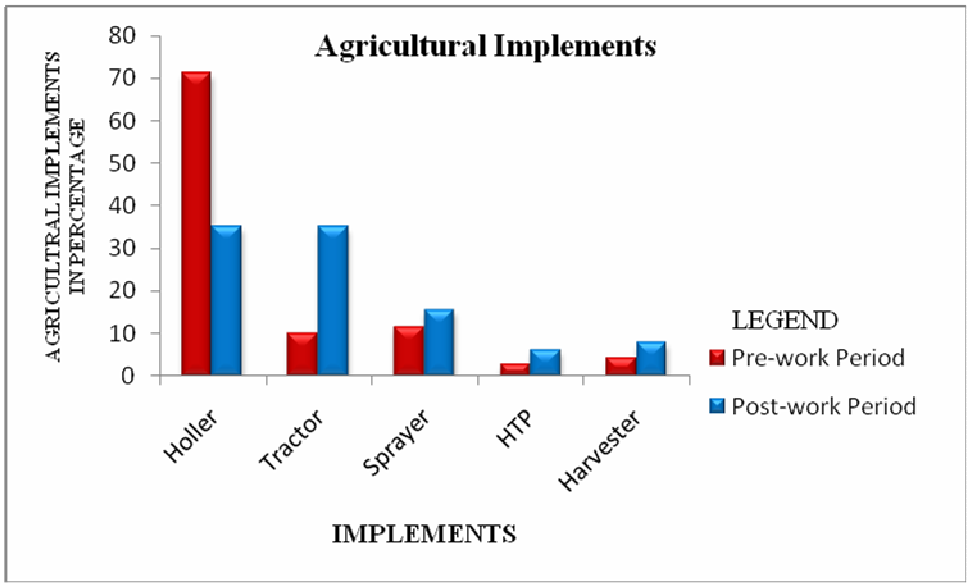

Fig. 5.17

Use of Hollers, in pre-period, among the 210 no. of hollers (100 %), the largest use of 106 no. of hollers (50.48 %) has used by small farmers, they are followed, in a descending order, by 92 no. of holler (43.81 %) of medium farmer and 12 no. of hollers (5.71 %) of large farmers, whereas, in post period, out of total 320 no. of hollers (100 %), the largest use of 174 no. of hollers (54.37 %) used by small farmers, they are followed, in a descending order, by 120 no. of hollers (37.50 %) by medium farmers and 26 no. of hollers (8.12 %) by large farmers. Its growth rate is found to be 52.38 %. (Table 5.20 and fig. 5.17)

Use of Tractors, in pre-period, among the 30 no. of tractors (100 %), the largest use of 20 no. of tractors (66.67 %) by medium farmers, they are followed, in a descending order, by 8 no. of tractors (26.67 %) by small farmers and 2 no. of tractors (6.67 %) by large farmers. Whereas, in post period, out of total 318 no. of tractors (100%), the largest use of 170 no. of tractors (53.46 %) used by small farmers, they are followed, in a descending order, by 122 no. of tractors (38.36 %) by medium farmers and 26 no. of tractors (8.18 %) of large farmers. Its growth rate is found to be 960%. (Table 5.20 and fig. 5.17)

Use of Sprayers and HTP for spray of different pesticides on various crops, in pre-period, the 42 no. of sprayers and HTP (100 %), the largest use of 18 no. of sprayers and HTP (42.86 %) used by small farmers, they are followed, in a descending order, by 16 no. of sprayers and HTP (38.10 %) by medium farmers and 8 no. of sprayers and HTP (19.05 %) by large farmers, whereas, in post period, out of total 198 no. of sprayers and HTP (100 %), the largest use of 89 no. of sprayers and HTP (44.95 %) by small farmers, they are followed, in a descending order, by 80 no. of sprayers and HTP (40.40 %) by medium farmers and 29 no. of sprayers and HTP (14.65 %) by large farmers. Its growth rate is found to be 371.43 %.

Use of Harvesters for spray of different pesticides on various crops, in pre-period, among the 13 no. of harvesters (100 %), the largest use of 7 no. of harvester (53.85 %) used by medium farmers they are followed, in a descending order, by 4 no. of harvesters (30.77 %) by small farmers and 2 no. of harvesters (15.38 %) by large farmers. Whereas, in post period, out of total 72 no. of harvesters (100 %), the largest use of 31 no. of harvesters (43.06 %) used by medium farmers they are followed, in a descending order, by 29 no. of harvesters (40.28 %) by small farmers and 12 no. of harvesters (16.67 %) by large farmers. Its growth rate is found to be 453.85 %. (Table 5.20 and fig. 5.17)

Before the Watershed Development work, the overall use of different number of agricultural implements was 295 (24.52 %), which increased after the watershed conservation work to 908 (75.48 %). Its growth rate has been 207.80 %. The percentage increases is from 24.52 % to 75.48 % in respect of the use of different agricultural implements.

In the post-watershed water conservation work, many farmers have taken to horticulture and hence, the largest numbers of farmers own sprayers (for spraying insecticides and weedicides). Harvester saves huge labour on large pieces of land. Nearly, one-fifth farmers own a tractor, which in turn has reduced the number of farmers owning a bullock cart. In recent times, as the area under sugarcane crop has

increased, so has the use of rotor and slightly more than one-fourth farmers own it. Evidently, large farmers own a large number of implements, while the small and marginal farmers own less number of implements.

5.4.13 Agricultural Income

The increased availability of water has to lead crop production which has ultimately led to the total agricultural income. This result is mostly seen in the case of small farmers. (Table 5.21 and fig. 5.18)

Table 5.21
Agricultural Income

Sr. No.	Crops	Farmer Category			Total
		Small	Medium	Large	
A	**Cereals**				
	Pre-work Period	**8.95**	**6.46**	**7.08**	22.49
	%-age Share	26.63	26.97	25.24	26.27
	Post-work Period	**20.67**	**18.49**	**18.71**	57.87
	%-age Share	22.02	23.32	21.99	22.36
	Simple Growth Rate	130.95	186.22	164.26	157.31
B	**Cash Crops**				
	Pre-work Period	**8.46**	**5.83**	**6.59**	20.88
	%-age Share	25.17	24.34	23.49	24.39
	Post-work Period	**25.09**	**19.22**	**19.11**	63.42
	%-age Share	26.72	24.24	22.46	24.51
	Simple Growth Rate	196.57	229.67	189.98	203.74
C	**Oilseeds**				
	Pre-work Period	**6.6**	**4.68**	**4.2**	15.48
	%-age Share	19.64	19.54	14.97	18.08
	Post-work Period	**17.41**	**16.08**	**16.24**	49.73
	%-age Share	18.54	20.28	19.09	19.22
	Simple Growth Rate	163.79	243.59	286.67	221.25
D	**Fruits and Vegetables**				
	Pre-work Period	**9.6**	**6.98**	**10.18**	26.76
	%-age Share	28.56	29.14	36.29	31.26
	Post-work Period	**30.72**	**25.5**	**31.03**	87.25
	%-age Share	32.72	32.16	36.47	33.91
	Simple Growth Rate	220	265.33	204.81	226.05
E	**Total Income**				
	Pre-work Period	**33.61**	**23.95**	**28.05**	85.61
	%-age Share	100	100	100	100
	Post-work Period	**93.89**	**79.29**	**85.09**	258.27
	%-age Share	100	100	100	100
	Simple Growth Rate	179.35	231.06	203.35	201.68

Note: Figures in brackets indicate the percentages to the column total.

Source: Field Survey by Researcher, 2013.

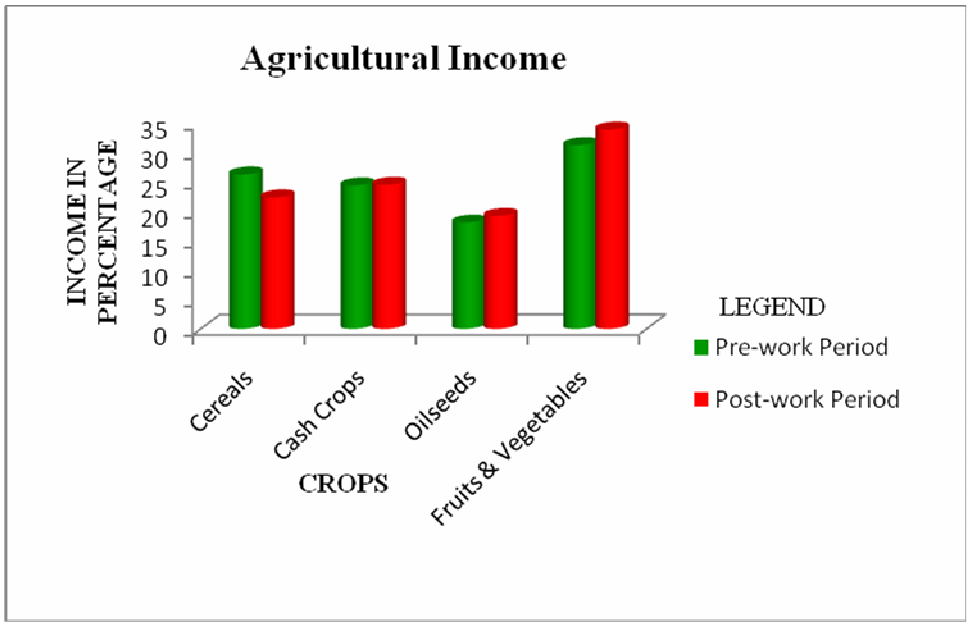

Fig. 5.18

Table 5.21 and fig. 5.18presents a picture of the total agricultural income as well as income from different crops. The total income of the respondents has increased from Rs. 85.61 lakh (24.90 %) to Rs. 258.27 lakh (75.10 %), after the watershed water conservation work. The same picture emerges from the crop-wise analysis. The income for cereals has increased from Rs. 22.49 lakh (27.99 %) to Rs. 57.87 lakh (72.01 %) and from cash crops from Rs. 20.88 lakh (24.77 %) to Rs. 63.42 lakh (75.23 %). The same pattern is seen in regards of oilseeds, fruits and vegetables also. The notable thing is that the agricultural income has increased on a large scale in regards of fruit and vegetables, i.e. from Rs. 26.76 lakh to Rs. 87.25 lakh, recording a highest growth rate in the agricultural income. Its total income growth rate is found to be 201.68 %.

5.4.14 Gross Income

Gross income means the income of the respondents mainly from agriculture as well as dairy, poultry, goat and sheep breeding etc. The increased crop production has to lead other agro-substitutes activities growth which has ultimately led to the total gross income. This result is mostly seen in the case small farmers.

Table 5.22 and fig.5.19 indicates the gross income of the sample farmers. The gross income before watershed water conservation work of the respondents was Rs. 137.17 lakh (24.67%), which has increased to Rs. 418.6 lakh (75.33 %) after the water conservation work. If we look at the average of the gross income, it has also increased

from Rs. 45.72 lakh (24.68 %) per respondent to Rs. 139.53 lakh (75.31 %) per respondent. Its simple growth rate is 205.17 %.

Table 5.22
Gross Income

(Rs. in Lakh)

Sr. No.	Sources	Farmer Category			Total
		Small	Medium	Large	
A	**Agricultural Income**				
	Pre-work Period	25.21	32.2	30.00	87.41
	%-age Share	53.57	72.19	65.93	63.72
	Post-work Period	86.16	93.18	86.28	265.62
	%-age Share	58.48	70.2	62.28	63.45
	Simple Growth Rate	241.79	189.4	187.54	203.87
B	**Dairy**				
	Pre-work Period	20.42	11.71	14.64	46.77
	%-age Share	43.4	26.25	32.17	34.10
	Post-work Period	55.86	36.3	46.89	139.05
	%-age Share	37.91	27.35	33.85	33.22
	Simple Growth Rate	173.48	210.07	220.29	197.29
C	**Poultry**				
	Pre-work Period	0.09	0.11	0.38	0.57
	%-age Share	0.19	0.24	0.83	0.42
	Post-work Period	0.68	1.41	4.03	6.12
	%-age Share	0.46	1.06	2.91	1.46
	Simple Growth Rate	658.01	1214.4	967.21	965.15
D	**Sheep and Goat Rearing**				
	Pre-work Period	1.34	0.59	0.49	2.41
	%-age Share	2.84	1.32	1.07	1.76
	Post-work Period	4.64	1.84	1.33	7.82
	%-age Share	3.15	1.39	0.96	1.87
	Simple Growth Rate	247.26	213.38	173.1	224.02
E	**Total**				
	Pre-work Period	47.06	44.6	45.51	137.17
	%-age Share	100	100	100	100
	Post-work Period	147.34	132.73	138.53	418.6
	%-age Share	100	100	100	100
	Simple Growth Rate	213.09	197.6	204.39	205.17

Note: Figures in brackets indicate the percentages.

Source: Field Survey by Researcher, 2013.

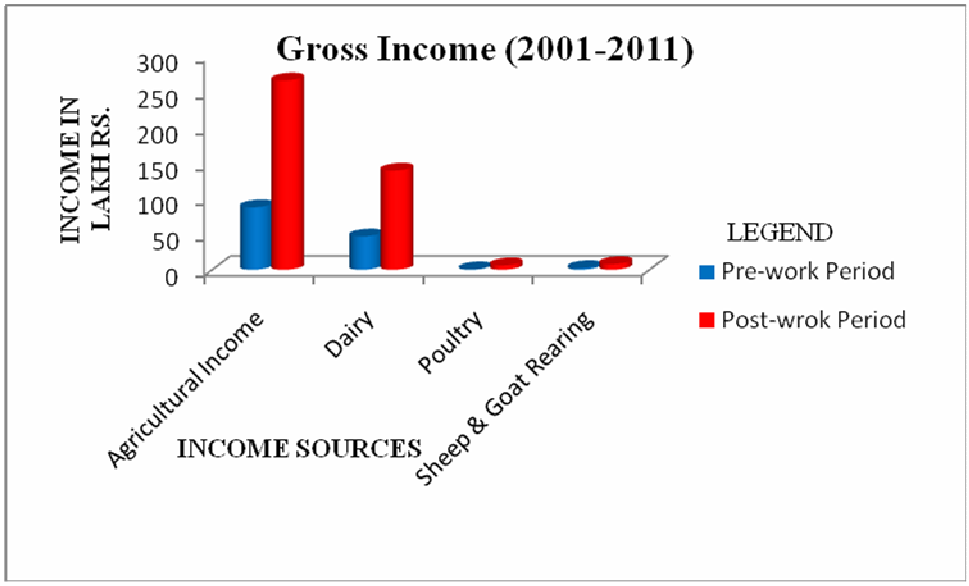

Fig. 5.19

5.4.15 Income Ranges

Income ranges also have positive change after the Watershed Development Programme followed in the tahsil. The increased availability of water has to lead crop production and also agro related activities which have ultimately led to the total income range. (Table 5.23 and fig. 5.20)

Table 5.23
Income Ranges

Sr. No.	Income Range	Pre-work Period	Post-work Period	Absolute Change	Simple Growth Rate (%)
1	Upto Rs. 20,000	139	44	-95.09	-68.30
	%	42.71	13.54		
2	Rs. 20,001 to 50,000	143	109	-33.97	-23.82
	%	43.75	33.33		
3	Rs. 50,001 to 1.00 lakh	24	80	56.04	235.80
	%	7.29	24.48		
4	Above Rs. 1.0 to 2.0 lakh	8	44	35.66	420.77
	%	2.6	13.54		
5	Above Rs. 2.0 lakh to 5.0 lakh	8	39	30.58	360.77
	%	2.6	11.98		
6	Above 5.0 lakh	3	10	6.78	198.10
	%	1.05	3.13		
	Total	326	326		

Note: Figures in brackets indicate the percentages to the column total.

Source: Field Survey by Researcher, 2013.

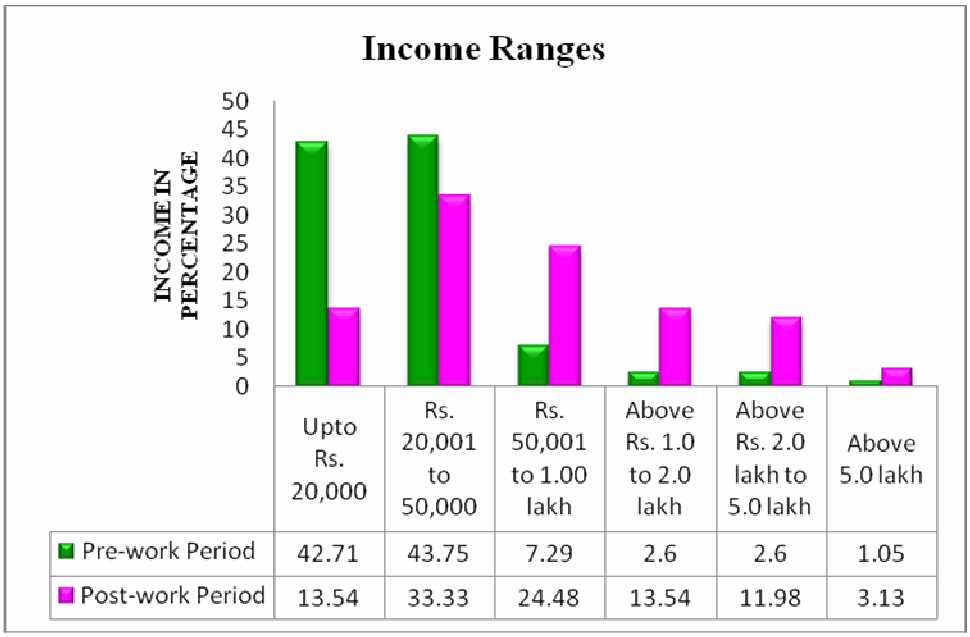

Fig. 5.20

Table 5.23 and fig. 5.20 shows the different income ranges of the respondents before the Watershed Development work and after the Watershed Development work. The notable thing is that after the water conservation, the number of respondents below the range of Rs. 50,000 has decreased. It means that the respondents from this range have shifted towards the higher income range. There were 139 (42.71 %) respondents below the range of Rs. 20,000 before the Watershed Development work; their number has decreased to 44 (13.54 %) after the Watershed Development work. In the same manner, in the range of Rs. 20,000 to 50,000/-, the number of respondents has decreased from 143 (43.75 %) to 109 (33.33 %). If we consider the range of Rs. 50,001 to 1.00 lakh, the number of respondents has increased from 24 (7.29 %) to 80 (42.48 %). In the range of above Rs. 1.00 lakh to 2.00 lakh, the number of respondents has increased from 24 (7.29 %) to 80 (24.48 %). Similarly, in the range above Rs. 2.00 lakh to 5.00 lakh, the number has increased from 8 (2.60 %) to 39 (11.98 %). Lastly, in the range of above Rs. 5 lakh, the number of respondents has increased from 3 (1.05 %) to 10 (3.13 %).

5.4.16 Savings

Savings has increased after the Watershed Development Programme followed in the tahsil. The increased availability of water has to lead crop production and also agro related an activity which has ultimately led to the total savings and its growth.

Table 5.24

Savings (in Rs. per Respondent)

Sr. No.	Particulars	Farmers Category			Total	Average
		Small	Medium	Large		
1	Pre-work Period	3402.73	7447.68	8909.94	19760.35	6586.78
	%	17.22	37.69	45.09	100	18.49
2	Post-work Period	23643	29314.2	34157.8	87115.01	29038.3
	%	27.14	33.65	39.21	100	81.51
3	Absolute Change	20240.27	21866.52	25247.86	67354.66	22451.6
4	Simple Growth Rate (%)	594.8245	293.6018	283.3673	340.8576	390.6

Note: Figures in brackets indicate the percentages to the column totals.

Source: Field Survey by Researcher, 2013.

Fig. 5.21

The above Table 5.24 and fig. 5.21 presents the data regarding the savings of the sample farmers. The impact of watershed water conservation work is also seen in the income generation of the people. If we apply this to the average savings of the respondents, we get the following result. Before the Watershed Development work, the average savings of the respondents was Rs. 6586.78 (18.49%), which has increased after the Watershed Development work to Rs. 29038.3 (81.51 %). It means that the impact of Watershed Development work is seen on the savings of respondents. Its simple growth rate is 390.6 %.

5.4.17 Household Appliances and Goods (Standard of Living)

People have better economical conditions after the Watershed Development Programme followed in the tahsil. The increased availability of water has to lead crop production and also agro related activities which have ultimately led to the total income of family. And increased family income has positive change on standard of living. Many household appliances and goods increase after Watershed Development work.

Table 5.25
Household Appliances and Goods

Sr. No	Particulars	Farmer Category				
		Small	Medium	Large	Total	Average
A	**TV**					
1	Pre-work Period	16	28	14	58	19.33
	%	7.92	14.14	16.67	11.98	
2	Post-work Period	172	126	26	324	108
	%	25.98	24.14	20.00	24.66	
	Simple Growth Rate	975	350	85.71	458.62	
B	**Telephone**					
1	Pre-work Period	6	14	10	30	10
	%	2.97	7.07	11.90	6.2	
2	Post-work Period	36	48	26	110	36.67
	%	5.44	9.2	20.00	8.37	
	Simple Growth Rate	500	242.86	160	266.67	
C	**GAS**					
1	Pre-work Period	54	50	12	116	38.67
	%	26.73	25.25	14.29	23.97	
2	Post-work Period	178	126	26	330	110
	%	26.89	24.14	20.00	25.11	
	Simple Growth Rate	229.63	152	116.67	184.48	
D	**Motor Cycle**					
1	Pre-work Period	14	18	22	54	18
	%	6.93	9.09	26.19	11.16	
2	Post-work Period	136	120	28	284	94.67
	%	20.54	22.99	21.54	21.61	
	Simple Growth Rate	871.43	566.67	27.27	425.93	
E	**Bicycle**					
1	Pre-work Period	112	88	26	226	75.33
	%	55.45	44.44	30.95	46.69	
2	Post-work Period	140	102	24	266	88.67
	%	21.15	19.54	18.46	20.24	
	Simple Growth Rate	25	15.91	-7.69	17.7	

Contd…

F	Grand Total					
1	Pre-work Period	202	198	84	484	161.33
	%	100	100	100	100	
2	Post-work Period	662	522	130	1314	438
	%	100	100	100	100	
3	Simple Growth Rate	227.72	163.64	54.76	171.49	
	Total	864	720	214	1798	599.33
	%	48.05	40.04	11.9	100	

Note: Figures in brackets indicate the percentages to the column total.

Source: Field Survey by Researcher, 2013.

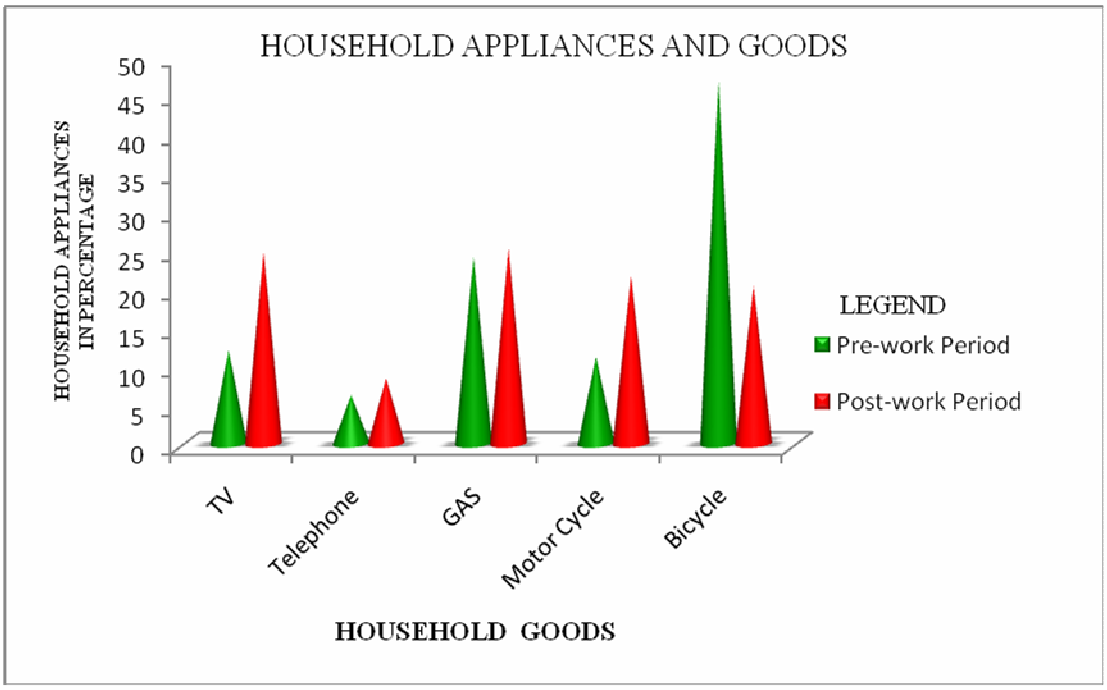

Fig. 5.22

Table 5.25 and fig. 5.22 shows the use of household appliances and goods of the sample farmers. The information collected from the respondents revealed that before the watershed water conservation work, the number of TV of the respondents was 58, which has increased after the watershed water conservation work to 324.

In pre-period, among the 202 (41.74 %) small farmers, the largest group of 112 (55.44 %) farmers has used bicycle; they are followed, in a descending order, by 54 (26.73 %) farmers using Gas, 16 (7.90 %) farmers using TV, 14 (6.93 %) farmers using Motor cycle and just 6 (2.97 %) farmer using telephone. Whereas, in post-period, out of the 662 (50.38 %) small farmers, use of TV and Gas has increased and about 50 percent use of bicycle and Motor cycle uses nearly 20 percent. The small farmers' use of growth rate is reached to 227.72 %. (Table 5.25 and fig. 5.22)

In pre-period, among the 198 (40.91 %) medium farmers, the largest group of 88 (44.44 %) farmers has used bicycle; they are followed, in a descending order, by 50 (25.25 %) farmers using Gas, 28 (14.14 %) farmers using TV and less than 10 percent farmers have used telephone and motorcycle, Whereas, in post-period, out of the 522 (39.73 %), medium farmers, use of TV , Gas and motor cycle has increased and made about 25 percent and use of bicycle and telephone uses below 20 percent. The medium farmers' growth rate of use is reached to 163.64 %. (Table 5.25 and fig. 5.22)

In pre-period, among the 84 (17.36 %) large farmers, motor cycle and bicycle use have more than 25 percent no. of farmers and other TV, telephone and gas use have below 15 percent number farmers, whereas, in post-period, out of 130 (9.89 %) large farmers, all the household appliances and goods comprised nearly 20 percent farmers. The large farmers' growth rate of use is reached to 54.76 %.

It may thus be inferred that the standard of living of the farmers in the study area has improved remarkably in the post water conservation period.

5.4.18 Number of Livestock

Number of Livestock has increases after the Watershed Development Programme ruled in the tahsil. The increased availability of water has to lead crop and fodder production which has ultimately led to the livestock population.

Table 5.26
Number of Livestock

Sr. No.	Livestock	Farmer Category			Total
		Small	Medium	Large	
A	**Buffaloes**				
	Pre-work Period	154	120	32	306
	%-age Share	17.19	14.63	13.79	15.71
	Post-work Period	426	264	82	772
	%-age Share	19.28	12.90	13.90	15.93
	Simple Growth Rate	176.62	120	156.25	152.288
B	**Cows**				
	Pre-work Period	106	116	24	246
	%-age Share	11.83	14.15	10.34	12.63
	Post-work Period	266	244	56	566
	%-age Share	12.04	11.93	9.49	11.68
	Simple Growth Rate	150.94	110.35	133.33	130.08

Contd….

C	**Bullock**				
	Pre-work Period	60	40	12	112
	%-age Share	6.70	4.88	5.17	5.75
	Post-work Period	120	92	24	236
	%-age Share	5.43	4.50	4.07	4.87
	Simple Growth Rate	100	130	100	110.7
D	**Goat and Sheep**				
	Pre-work Period	68	118	32	218
	%-age Share	7.59	14.39	13.79	11.19
	Post-work Period	202	148	66	416
	%-age Share	9.14	7.23	11.19	8.58
	Simple Growth Rate	197.06	25.42	106.25	90.83
E	**Hens**				
	Pre-work Period	508	426	132	1066
	%-age Share	56.70	51.95	56.90	54.72
	Post-work Period	1196	1298	362	2856
	%-age Share	54.12	63.44	61.36	58.94
	Simple Growth Rate	135.43	204.70	174.24	167.92
G	**Grand Total**				
	Pre-work Period	896	820	232	1948
	%-age Share	100	100	100	100
	Post-work Period	2210	2046	590	4846
	%-age Share	100	100	100	100
	Simple Growth Rate	146.65	149.51	154.31	148.77

Note: Figures in brackets indicate the percentages to the column total.

Source: Field Survey by Researcher, 2013.

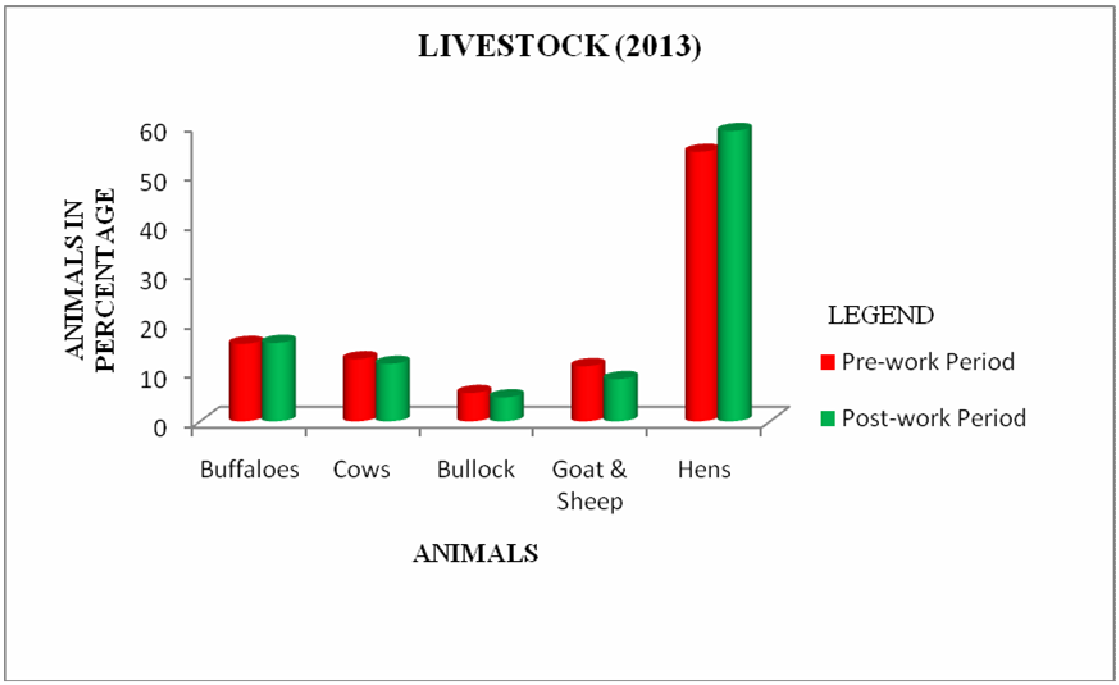

Fig. 5.23

Table 5.26 and fig. 5.23 presents the information regarding the livestock owned by the respondent-farmers in the pre-and post- Watershed Development work periods. It is seen that in the pre-watershed development work period, the respondents collectively held a total of 1948 animals; their number increased to 4846 animals in the post- watershed development work period, recording a growth rate of 148.77 %. Further, analysis reveals that the number of working Buffalo has growth of 306 (15.71 %) of the total animals to 772 (15.93 %) with simple growth rate of 152.28 percent. The number cows has increased from 246 (12.63 %) to 566 (11.68 %) with simple growth rate of 130.08 percent. The number Goats and Sheep's has increased from 218 (11.19 %) to 416 (8.58 %) with simple growth rate of 90.83 percent. And lastly the number Hens has increased from 1066 (54.72 %) to 2856 (58.94 %) with simple growth rate of 167.92 percent.

5.4.19 Ground Water Levels

Groundwater is one of the important components of agricultural development to boost up agricultural productivity. Water that's collects or flows beneath the earth's surface, filling the porous spaces in sediment, and rocks are called as groundwater. It is frequently available in various forms such as artesian wells, dug wells and borewells depending upon the geographical setting of the region and doing the water conservation work. The area under study is largely suitable for well irrigation, the development of which largely depends on the behavior of the ground water level.

Table 5.27
Well Water Levels in Pre-and Post-Watershed Development Work Periods (in Meters) in mbgl.

Sr. No	Particulars	Farmer Category			
		Small	Medium	Large	Average
A	WELL				
1	Pre-work Period	26.74	24.13	14.66	21.84
2	Post-work Period	13.72	12.49	6.97	11.06
3	Net Rise	13.02	11.64	7.69	10.78
4	Simple Growth Rate	94.91	93.23	110.40	99.51

Contd….

B	TUBE WELL				
1	Pre-work Period	297.00	220.79	310.50	276.10
2	Post-work Period	68.65	59.39	77.80	68.61
3	Net Rise	228.35	161.40	232.70	207.48
4	Simple Growth Rate	332.63	271.79	299.10	301.17

Source: Field Survey by Researcher, 2013.

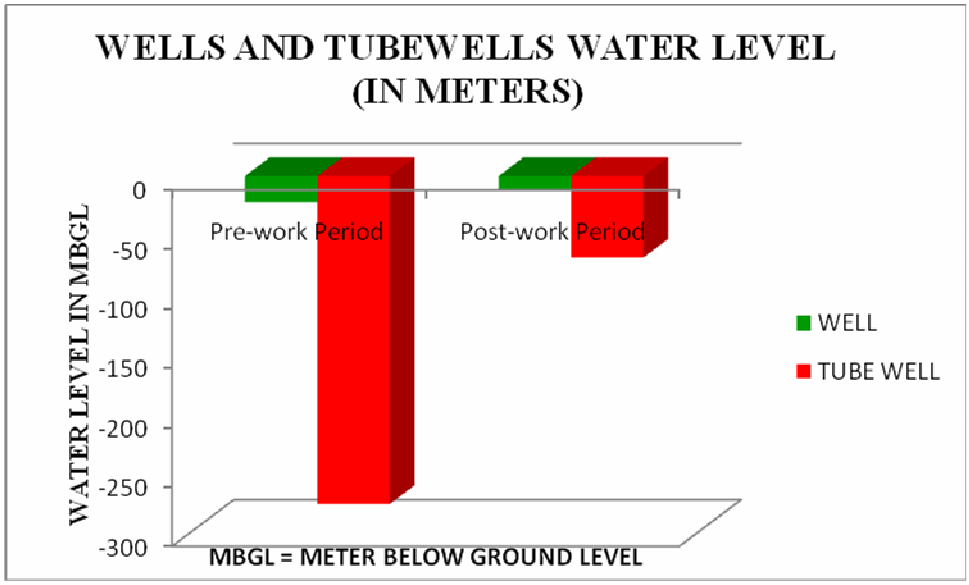

Fig. 5.24

The above table 5.27 and fig. 5.24 presents the data relating to the well and tube well water levels in the post-monsoon period (after October). Prior to the undertaking of the water conservation work, the well water was normally at a depth of 21.84 mbgl from the surface, but after the Watershed Development work, the level has risen to 11.06 mbgl from the surface. Whereas, Prior to the undertaking of the Watershed Development work, the tube well water was normally at a depth of 276.10 mbgl from the surface, but after the Watershed Development work, the level has risen to 68.61 mbgl from the surface. It is thus obvious that the Watershed Development work has recharged the underground aquifers making the water levels in the wells to rise up.

5.4.20 Milk Production

Number of Livestock has increases after the Watershed Development Programme ruled in the tahsil. The increased availability of water led to crop cultivation and fodder production which has ultimately led to the milk production. Because, of fodder availability, milk production also increases effectively.

Table 5.28
Milk Production (in liters)

Sr. No	Particulars	Farmer Category				Average
		Small	Medium	Large	Total	
1	Pre-work Period	273	248	52	573	191
	%	47.64	43.28	9.07	100	
2	Post-work Period	1150	807	225	2182	727.33
	%	52.70	36.98	10.31	100	
3	Net Rise	877	559	173	1609	536.33
4	Simple Growth Rate	321.24	225.40	332.69	280.80	293.11

Note: Figures in brackets indicate the percentages to the column total.

Source: Field Survey by Researcher, 2013.

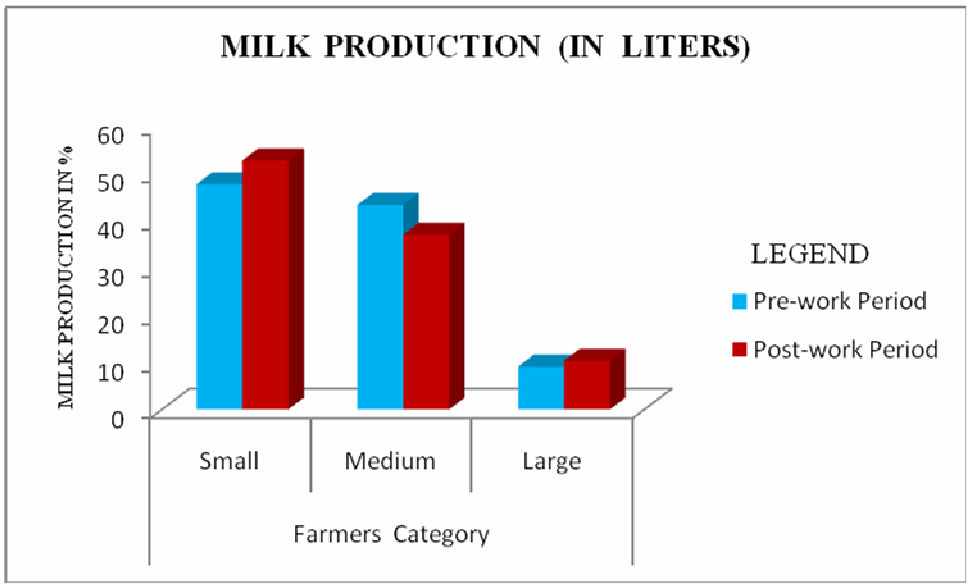

Fig. 5.25

The above table 5.28 and fig. 5.25 presents the data relating to the milk production of sample farmers. Prior to the undertaking of the Watershed Development work, the milk production was normally at 573 liters, but after the Watershed Development work, the production has risen to 2182 liters. It is thus obvious that the Watershed Development work has increased availability of green fodder crops which is suitable food to the animals.

5.4.21 People's Participation in Watershed Development Work

Table 5.29
Opinion about People's Participation in Watershed Development Work

Sr. No.	Response		Farmer Category		Total
		Small	Medium	Large	
1	Good	134	56	16	206
	%	77.01	44.44	61.54	63.19
2	Fair	14	30	4	48
	%	8.05	23.81	15.38	14.72
3	Low	26	40	6	72
	%	14.94	31.75	23.08	22.09
Total		174	126	26	326
%		53.37	38.65	7.98	100

Note: Figures in brackets indicate the percentages to the column total.

Source: Field Survey by Researcher, 2013.

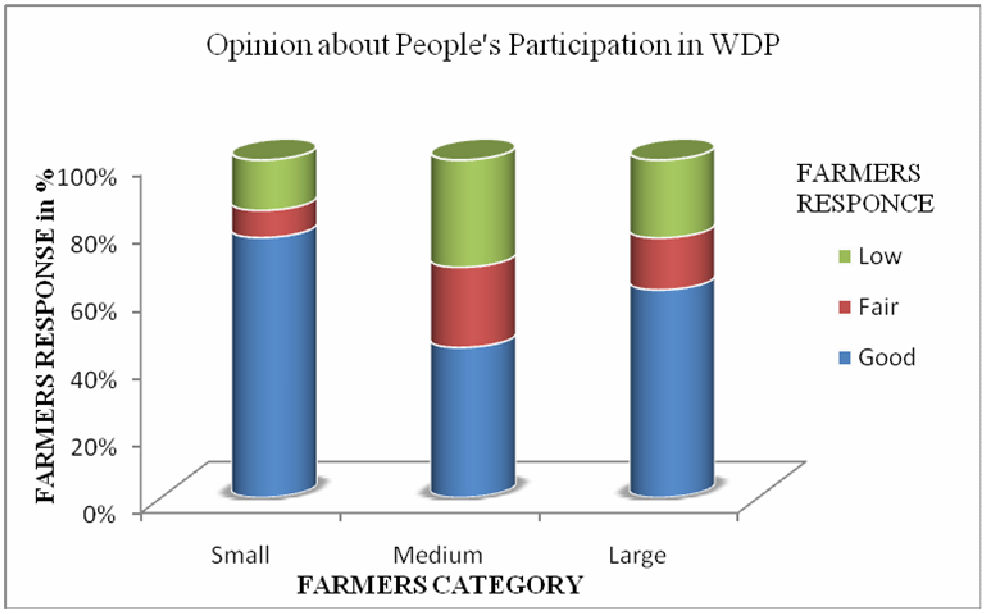

Fig. 5.26

The table 5.29 and fig. 5.26 presents opinions of the respondent-farmers about their perception of the people's participation in the Watershed Development works completed in their respective villages. In the opinion of 72 (22.09 %) respondents, the people's participation was none, another 48 (14.72 %) respondents opined that it was only fair, and lastly, 206 (63.19 %) respondents felt that it was good. On the whole, it may be inferred that the people's participation in the Watershed Development works in the study is quite reasonable.

5.5 Conclusion-

This chapter presents, analyzes and interprets the primary data collected from the sample respondent-farmers. The chapter is entirely based on the field survey work undertaken in the study area. The chapter tries to calculate the impact of the Watershed Development work in the study area and the various aspects of the benefits there of being derived by the beneficiary farmers. It presents the classification of the respondents such as age group, type and size of family, gender distribution, educational status, etc. These basic demographic features are rather important as these are directly related to the agricultural development in the rural areas.

The Chapter further deals with the data relating to changes in the land-use and cropping patterns, increase in crop production and productivity, beneficial crops, sources and methods of irrigation, use of fertilizers and pesticides, employment generation, agricultural income, gross income and income ranges, savings, investments, standard of living, adoption of modern farming techniques, livestock and income from them, ground water levels, people's participation in water conservation works, satisfaction with water conservation works.

Overall, it has been observed that the Watershed Development Programme has rendered a positive impact on the farming community in the study area in Khatav tahsil.

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CHAPTER VI

IMPACT OF WATERSHED DEVELOPMENT PROGRAMME ON SOCIO-ECONOMIC STATUS OF POPULATION IN KHATAV TAHSIL

6.1 Introduction

Food, shelter, clothing, health and education are the basic needs of every society and every Society is to give priority to those things. Nature is capable to complete every basic needs and amenities of society. Environment takes just opportunities to people for development. Everything that is essential for life is available in great abundance on the earth.

Population explosion and increasing livestock population has great pressure on environment over the years. Also the natural resources of the drought-prone areas, desert and other waste lands are under great pressure cause of population explosion. This is mainly led to depletion of green cover, increase in soil erosion and decline in ground water levels. All human development factors contribute to decrease productivity of land and loss of natural resources in these fragile areas (Mani, 2005). This situation seriously underlies the need for taking up integrated plans for water utilization and conservation for every agro-ecological area to meet the increasing demand of irrigation, water harvesting for human and livestock consumption, expanding industries, hydro-electric power generation, recreation and navigation.

To overcome the problems in related to land and water management in drought-prone areas, desert and other waste lands, our government is implementing a number of development programmes aiming at improving the standard of living of people.

The watershed approach is being increasingly used in various development programmes like soil and water conservation, erosion control, command area development, rainfed farming, ravine reclamation and waste land development. WDP has made percolation tank, village tank, Kolhapur type weirs, corner bunds, underground bunds, farm ponds, earthen bunds, cement bandhara, continues counter trenches, lift irrigation, storage irrigation scheme, bridge mixed bunds, well recharges etc. in the Khatav tahsil.

6.2 Increases in the Groundwater Level

Groundwater is one of the important components of agricultural development to boost up agricultural productivity. Water that's collects or flows beneath the earth's surface, filling the porous spaces in sediment, and rocks are called as groundwater.

As a result of WDP, the ground water level has increased in the Khatav tahsil. Also there increased the number of wells and tubewells in the tahsil. The life of wells and tubewells increased with availability of water for 10 to 11 months in the year, which increased most land, comes under the irrigation. It has increased the agricultural productivity in the tahsil. There were get 3-4 crops in the year in farm land. It has solved the problem of drinking water. There has made a green cover landscape in tahsil. (Table 6.1 and fig. 6.1)

Table 6.1

KHATAV TAHSIL: GROUNDWATER LEVEL (2001 and 2011) (in mbgl)

Sr. No.	Name of Circles	Groundwater Level (mbgl)					
		2001		2011		Change of Volumes	
		Pre-Monsoon	Post-Monsoon	Pre-Monsoon	Post-Monsoon	Pre-Monsoon	Post-Monsoon
1	Pusegaon	7.2	4.5	5.6	4.6	-1.6	0.01
2	Khatav	8.75	3.4	6.00	6.5	-2.75	3.1
3	Pusesawali	4.05	3.9	5.5	2.3	1.45	-1.6
4	Vaduj	10.4	9.7	4.8	6.5	-5.6	-3.2
5	K. Khatav	8.7	0.4	3.1	0.6	-5.6	0.2
6	Mayani	11.1	9.84	11.15	11.1	0.04	1.26
7	Average of	8.36	5.29	6.03	5.27	-2.33	-0.02

m bgl = meter below groundwater level.

Source: GSDA, Department Satara.

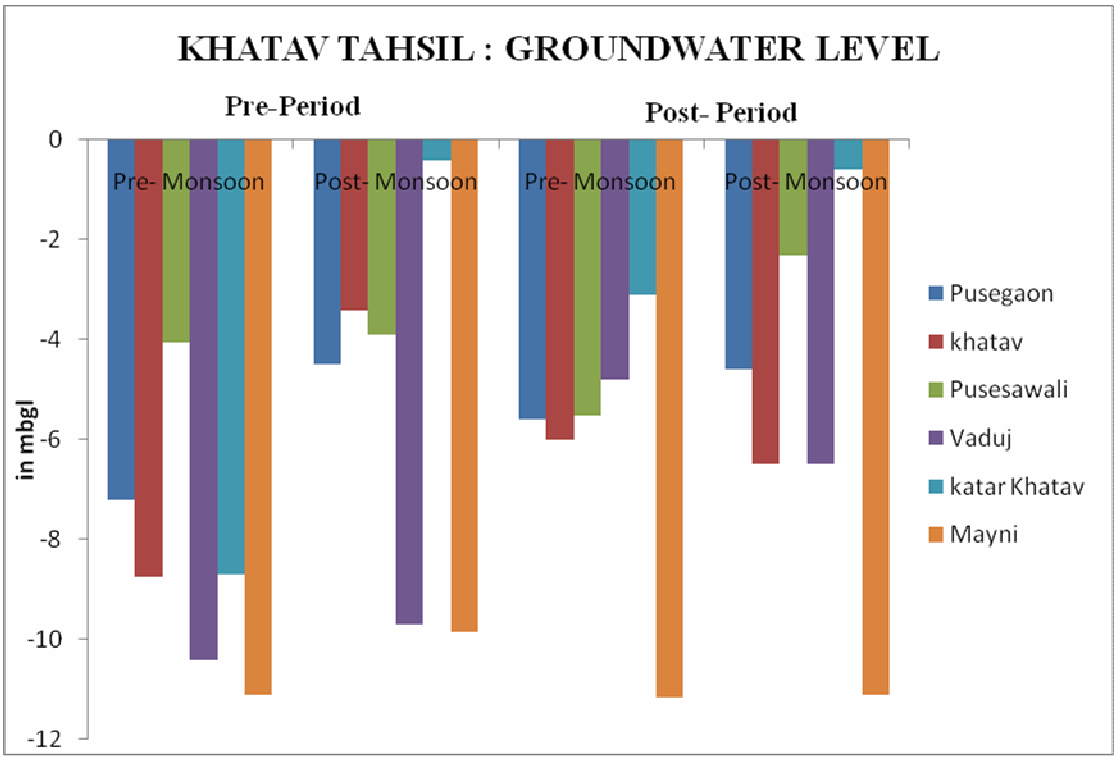

Fig. 6.1

Table 6.1 and fig. 6.1 shows the groundwater level of Khatav tahsil in 2001 and 2011. Data has taken from GSDA observation wells report in May month (pre-monsoon) and October month (post-monsoon). Vaduj circle has the highest change of volumes, has 5.6 m bgl in pre-monsoon and 3.2 m bgl post monsoon decreased the groundwater level depth means increase the groundwater level (table 6.1 and fig. 6.1). Because this circle has the location of tahsil town and also highest work of WDP. Katar Khatav has second dominant change of volume, has 5.6 m bgl decrease ground water level depth in pre-monsoon means increase the groundwater level and 0.2 m bgl increase the groundwater level depth in post-monsoon means decrease the groundwater level. Besides, other circle villages are less change of volume in groundwater level. On an average the water level of the dug well is increased by -2.33 m bgl in pre-monsoon and -0.02 m bgl in post-monsoon.

6.3 Growth in Number of Wells

Wells has important source of irrigation and traditional source for storage of water. As a result of WDP, the ground water level increase in the watershed areas. Before the WDP, the water had the shortage for farm land irrigation and had highly combined wells in Khatav tahsil but, after WDP, the water has the endless supply to

farm land and all farmers have to dig separate well in area of WDP work in the tahsil. The small farmer as well as large farmers prefers to dig wells in farm land for agricultural irrigation purpose in the tahsil. It is also reveals that Watershed Development is led to significant increase wells in use of water for irrigation. (Table 6.2 and fig. 6.2)

Table 6.2

KHATAV TAHSIL: CIRCLE VILLAGE-WISE WELLS

Sr. No.	Name of Circle	Area in Hectares	No. of Villages	Net Sown Area (in hectares)	No. of Wells (2001)	No. of Wells (2011)	Change of volume (in %)
1	Pusegaon	30746.24	34	1814	823	990	20.29
2	Khatav	17195.26	27	1711	441	554	25.62
3	Pusesawali	17582.35	21	1780	439	566	28.92
4	Vaduj	26415.40	22	1745	672	851	26.63
5	Katar Khatav	19390.83	21	1569	540	624	15.55
6	Mayani	26486.42	18	1677	668	853	27.69
Total		**137816.50**	**143**	**10296**	**3583**	**4438**	**23.86**

Source: Irrigation Department, Khatav tahsil. (2011-12)

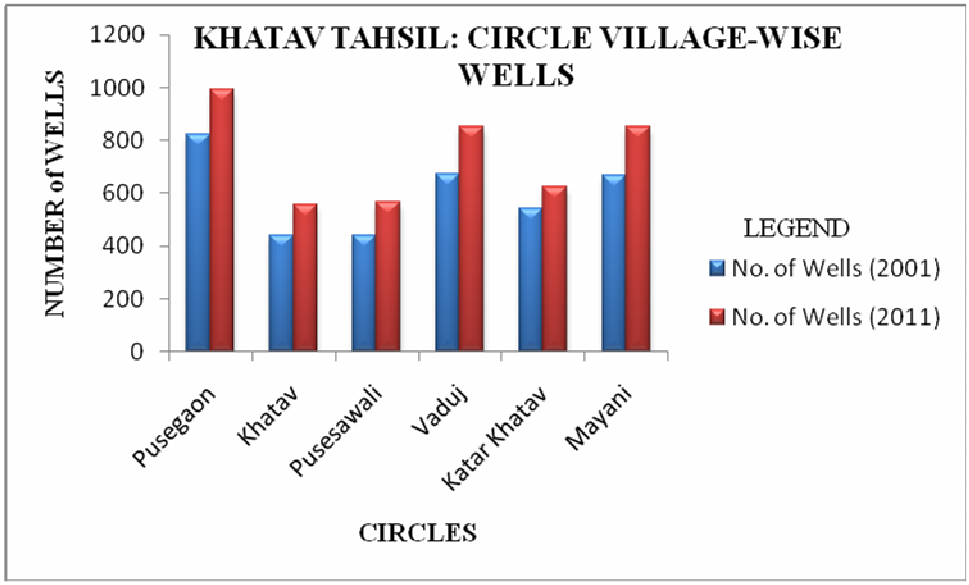

Fig. 6.2

The table 6.2 and fig. 6.2 represents the data regarding the circle village-wise wells in Khatav tahsil in year 2001 and 2011. It is seen that 3583 number of wells in 2001 and 4438 number of well in 2011 in the Khatav tahsil. Pusegaon circle village has largest number of wells in the both years. But, Pusesawali circle village has highly means 28.92 percent change of volume. The Katar Khatav circle village has lowest

means 15.55 percent change of volume. The notable feature is that around 20 percent volume change use for irrigation.

6.4 Changes in Cropping Pattern

After the Watershed Development, cropping pattern has really changed and farmer has stress on cash crops. The cropping pattern represents structure and variation of crops in farm lands. Jowar, Bajara, Wheat, Maize, Tur, Mung, Udid, Seasum, Niger, Sunflower, Soyabean, Paddy etc. are the main food crops and Sugarcane, Cotton, Groundnut, Pomegranate are the main cash crops of the tahsil. The highest area is under Jowar cultivation. The area cultivation under Jowar was 28,475 hectares in 2001 and 26,800 hectares in 2011 (Table 6.3 and fig. 6.3)

Table 6.3

KHATAV TAHSIL: CROPPING PATTERN

Ranking No.	Crop	2001		2011		Volume of Change (%)
		Area in Hectare	Area in %	Area in Hectare	Area in %	
1	Jowar	28,475	44.08	26,800	36.38	-7.7
2	Bajara	23,520	36.41	26,655	36.2	-0.21
3	Wheat	3,185	4.93	4,510	6.12	1.19
4	Maize	1,875	2.9	3,744	5.08	2.18
5	Tur	1,548	2.4	2,363	3.2	0.8
6	Mung	1,390	2.15	1,900	2.58	0.43
7	Udid	1,115	1.73	1,814	2.46	0.73
8	Groundnut	1,070	1.66	1,378	1.87	0.21
9	Seasum	580	0.9	1,117	1.52	0.62
10	Niger	555	0.86	1,090	1.48	0.62
11	Sunflower	550	0.85	1,020	1.38	0.53
12	Soyabean	485	0.75	589	0.8	0.05
13	Cotton	170	0.26	477	0.65	0.39
14	Sugarcane	65	0.1	204	0.28	0.18
15	Paddy	15	0.02	0	0	-0.02
	Total	64,598	100	73,661	100	

Source: Agricultural Department, Khatav tahsil.(2011-12)

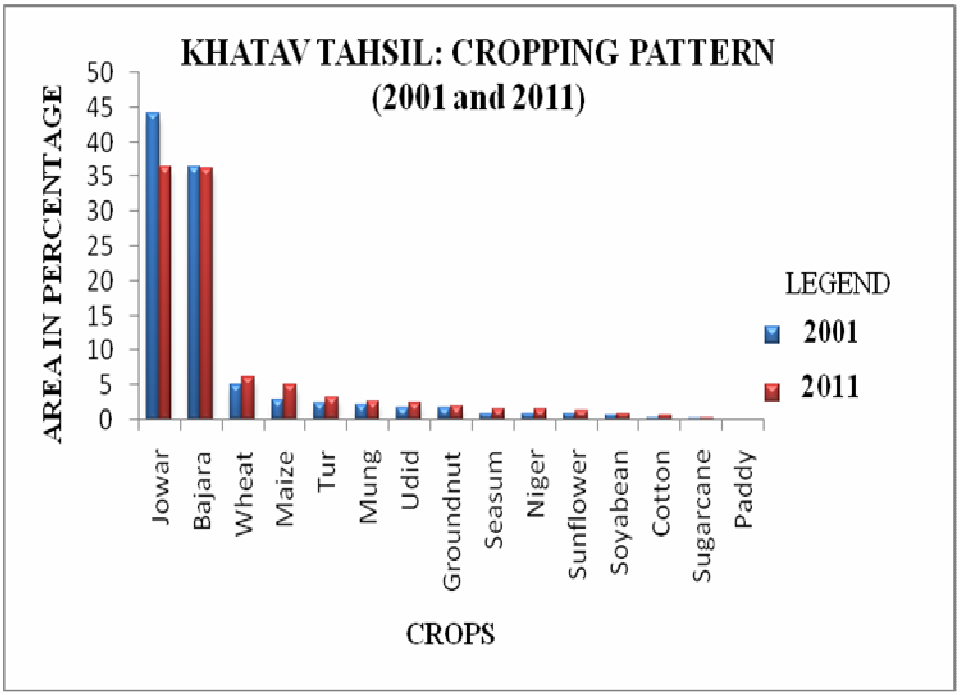

Fig. 6.3

The area cultivation under Jowar is decreased by 7.7 percent (table 6.3 and fig. 6.3). The area cultivation under Bajara was 23,520 hectares in 2001 and 26,655 hectares in 2011. The area cultivation under Bajara is decreased by 0.21 percent. The area cultivation under Wheat was 31,85 hectares in 2001 and 4510 hectares in 2011. The area cultivation under Wheat is increased by 1.19 percent. The area cultivation under Maize was 1,875 hectares in 2001 and 3,744 hectares in 2011. The area cultivation under Maize is increased by 2.18 percent. The area cultivation under Groundnut was 1,070 hectares in 2001 and 1,378 hectares in 2011. The area cultivation under Groundnut is increased by 0.21 percent. The area cultivation under Cotton was 170 hectares in 2001 and 477 hectares in 2011. The area cultivation under Cotton is increased by 0.39 percent. The area cultivation under Sugarcane was 65 hectares in 2001 and 204 hectares in 2011. The area cultivation under Sugarcane is increased by 0.18 percent. (Table 6.3 and fig. 6.3)

Wheat is rabbi crop, which requires the irrigation at the time of growth. Due to Watershed Development, the groundwater level is increased and water is available to irrigate the rabbi as well as permanent crops in study villages. The sugarcane requires large amount of water.

No use drip and Sprinkler irrigation has problems of water in agriculture in Khatav tahsil. The farmers are cultivating sugarcane without drip irrigation facilities in the tahsil, which cause the problem of water scarcity in future. So as the intensity of

Watershed Development increases the socio-economic status of the peoples improves through agricultural development.

6.5 Growth in Use of Electricity

Electricity has invaded our lives and has become vital in almost all aspects of society today. Energy is the basic needs of modern human and also basic requirement for the all sectors of economy. Electricity is the basic energy source of agricultural. Watershed Development has increase water availability, agricultural productivity and agro based industries. It has increase the use of electricity.

In Khatav tahsil, per head Electricity use is 229.95 units. The use of electricity has an average 7842 thousand kg watt hour in 2001 which became 14954 thousand kg watt hour in 2011. The simple growth of electricity use is increased by 90.49 percent in tahsil. (Table 6.4 and fig. 6.4)

Table 6.4

KHATAV TAHSIL: USE OF ELECTRICITY

Sr. No.	Category	Use of Electricity (in '000' Kg. watt /hour) 2001	Use of Electricity (in '000' kg .watt / hour) 2011	Simple Growth (in '000' kg watt hour)	Simple Growth (in %)
1	R	7,726	19,317	11,601	150.15
2	C	1,078	2,695	1,617	150.00
3	I	6,183	11,042	4,859	78.58
4	PWW	910	1,516	606	66.59
5	AG	4,3947	79,904	35,957	81.82
6	Poultry	79	142	63	79.74
7	St. Light	634	1,056	422	66.56
8	Others	2,180	3,960	1,780	81.65
	Total	62,737	1,19,632	56,905	90.70

R=Residential, C= Commercial, I= Industrial.

Source: Maharashtra State Electricity Distribution Company Ltd. Vaduj, Division. (2011-12).

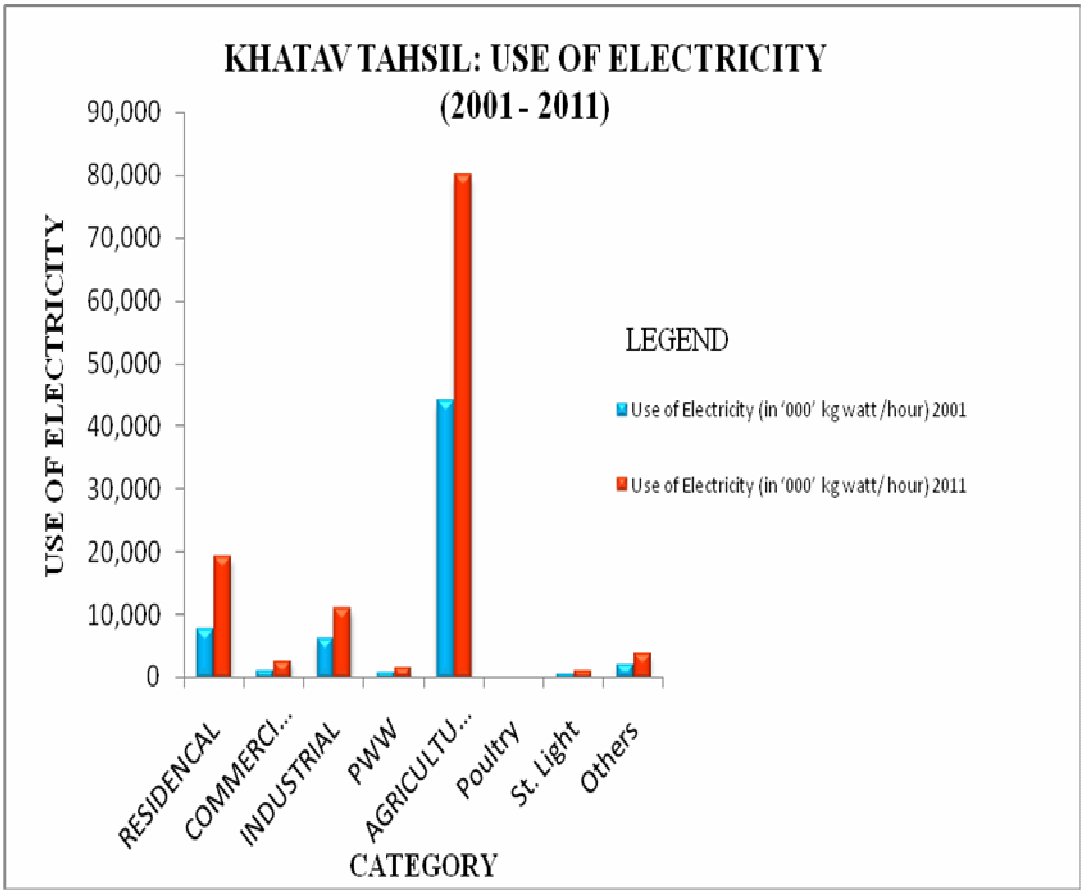

Fig. 6.4

(R= Residential, C = Commercial, I= Industrial, AG = Agricultural, St = Street Light)

Table 6.4 and fig. 6.4 reveals that, in 2001, 7726 thousand kg watt electricity use in residential purpose in Khatav tahsil; in 2011. It was increased highly by 150.15 percent and makes 19,317 thousand kg watt hour. For commercial purpose, 1078 thousand kg watt electricity use in 2001 and 2695 thousand kg watt use in 2011. The commercial use of electricity increased by 150 percent in tahsil, followed by Industrial (78.58 %), PWW (66.59 %), Agricultural (81.82 %) and others (81.65 %.) Growth rate of poultry and street light has less than 80 percent simple growth of electricity.

In general all consumers are divided into two broad groups: Commercial and Residential Customers. In 2011-12, an electricity consumer has 79,037 populations in the Khatav tahsil. (Table 6.5)

Table 6.5

KHATAV TAHSIL: ELECTRICITY CONSUMER (2011-12)

Section	Total Village	R	C	I	PWW	Street Light	Agricultural	Other	Total
Vaduj	17	8,098	750	120	29	49	1,149	3,217	13,412
Katar Khatav	19	3,471	112	43	20	33	1,975	2,028	7,682
Mayani	14	6,058	357	88	32	53	2,491	2,576	11,655
Nimsod	16	4,839	155	55	19	38	2,539	2,596	10,241
Aundh	13	3,799	185	57	24	20	938	984	6,007
Pusesawali	17	5,333	254	71	36	28	2,037	2,101	9,860
Khatav	13	4,080	133	43	31	19	365	1,424	6,095
Pusegaon	17	4,672	316	72	39	30	477	1,337	6,943
Budh	20	4,583	143	61	34	26	611	1,684	7,142
Total	146	44,933	2,405	610	264	296	12,582	17,947	79,037

(R= Residential, C = Commercial, I = Industrial).

Source: Maharashtra State Electricity Distribution Company Ltd. Vaduj, Division. (2011-12)

A residential consumer has highly population of electricity use. In tahsil, 44,933 populations have the Residential electricity consumers and 12,582 populations have the Agricultural electricity consumers (table 6.5). Vaduj section has highly electricity consumers. In Vaduj section, electricity consumers have 13,412 populations. Aundh section has low electricity consumers (6,007 Population).

6.6 Growth in Use of Agricultural Machineries and Agricultural Tools

Threshers, Tractors and power spray pumps are the main machineries used for various purposes in agriculture. The tractor usually use for ploughing, land leveling, carrying, tilling etc. work. Threshers normally use for threshing the Bajara, Wheat, Jowar, Maize, Tur, Soyabean, Grams etc. The power spray pumps use for the spraying the insecticides and pesticides on Pomegranate, Grapes, Vegetables, Cotton, Potato, Ginger, Onion, Tur, Soyabean etc. crops. WDP has increase the productivity and net benefits of all crops, hence, also increase the use of agricultural tools and machines in the agriculture.

Table 6.6
KHATAV TAHSIL: USE OF AGRICULTURAL MACHINERIES AND TOOLS

Sr. No.	Agricultural Tools	Year		Simple Growth	Simple Growth (in %)
		2001	2011		
1	Wooden Plough	1,134	645	-489	-43.12
2	Iron Plough	4,005	2,860	-1,145	-28.58
3	Bullock Cart	4,623	3,085	-1,538	-33.26
4	Sugarcane Crusher	71	110	39	54.92
5	Oil Engine Pumps	1,568	895	-683	-43.55
6	Electric Pumps	4,662	5,722	1,060	62.73
7	Petrol Pesticide Pumps	140	354	214	152.85
8	H.T.P.	23	205	182	791.30
9	Threshers	40	197	157	392.5
10	Power Tiller	32	123	91	284.37
11	Tractors	551	2,149	1,598	288.38
	Total	16,849	16345	-504	-2.90

Source: Agricultural Department Panchyat Samiti, Vaduj.(2011-12)

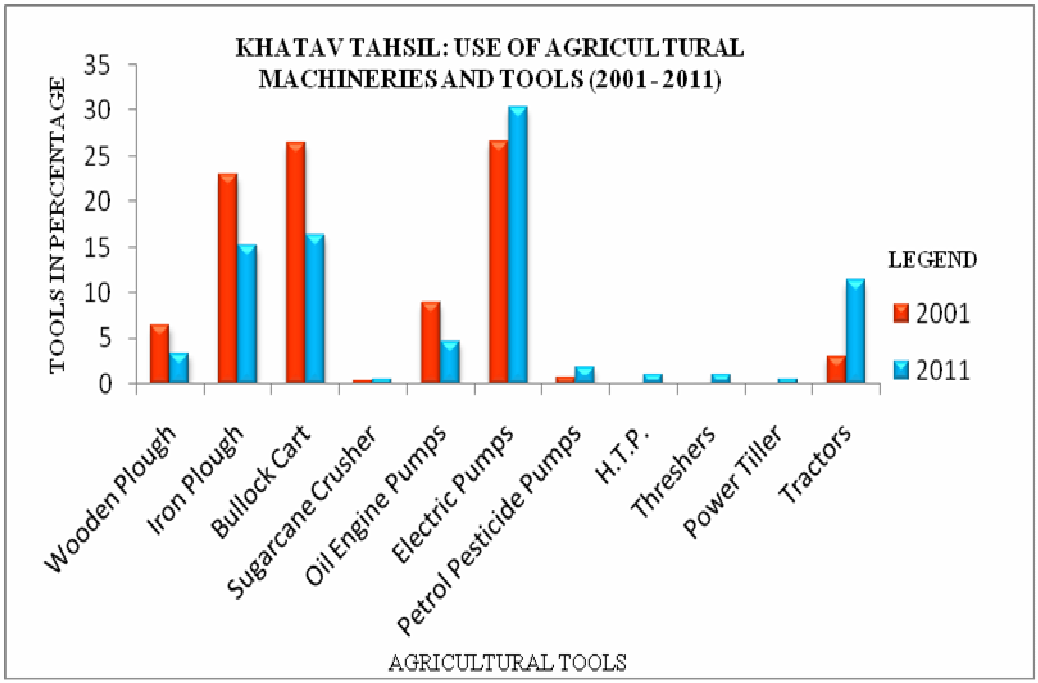

Fig. 6.5

Table 6.6 and fig. 6.5 reveals that, in 2001, 1134 in Khatav tahsil were using traditional tools -Wooden Plough; in 2011, it was decreased by 43.12 percent. The highest growth rate of agricultural tools has observed in H.T.P. (791.30 percent) followed by Threshers (392.5 %), Power Tiller (284.37 %), Petrol Pesticide Pumps (152.85 %). Growth rate of agricultural tools of the Iron Plough, Bullock Carts and Oil Engine Pumps has decreased by 28.58 %, 33.26 % and 43.55 % (Table 6.6).

6.7 Progress in Use of Fertilizers

The fertilizer has played a dominant role in increasing crop production. The fertilizer increases the fertility of soils. After the water, it constitutes the most important input for the modern agriculture. The irrigated crops has highly use of fertilizers.

Table 6.7
KHATAV TAHSIL: USE OF FERTILIZERS

Sr. No.	Season	Chemical Fertilizers (Metric tons)		Change of volume (Metric tons)	Change of volume (in %)
		2001	2011		
1	Kharif	7819	9953	2134	27.30
2	Rabbi	9668	13386	3718	38.45
3	Summer	3882	5017	1135	29.90
	Total	21369	23385	2016	9.43

Source- Agricultural Development Officer, Khatav, Tahsil (2011-12).

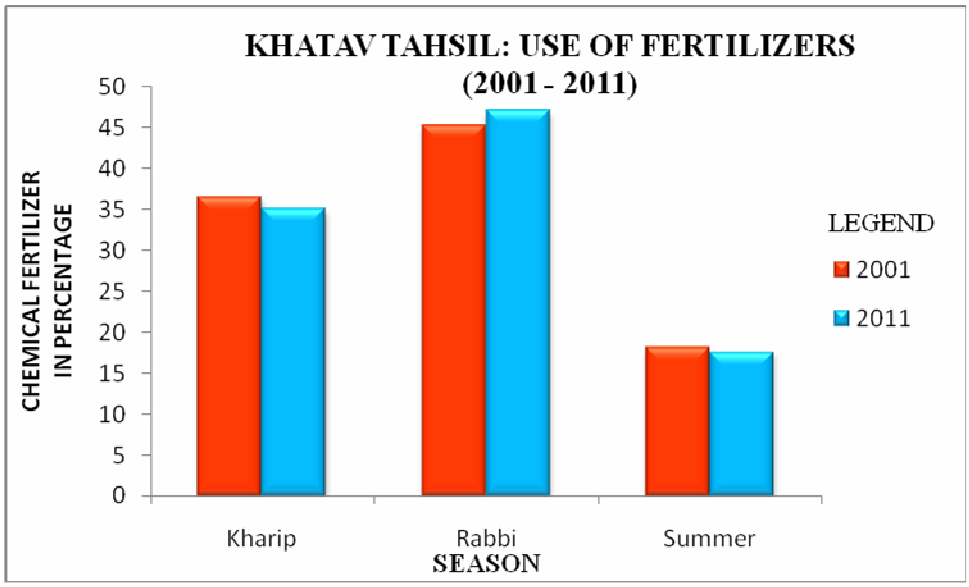

Fig. 6.6

The table 6.7 and fig. 6.6 shows the use of chemical fertilizers in Khatav tahsil in 2001 and 2011. It is seen that in 2001, 21,369 metric tons chemical fertilizers has used in tahsil which has increased about 9.43 percent and made 23,385 metric ton use of chemical fertilizers in 2011. There have been substantial increases in the use of chemical fertilizers among all the seasons of farmers. In 2001, 7819 metric tons. Chemical fertilizers has used in Kharif season in tahsil, which increases as 27.30 percent in 2011 and made 9953 metric tons. Also in 2001, 9668 metric tons. Chemical fertilizers has used in Kharif season in tahsil, which increases as 38.45 percent in

2011 and made 13386 metric tons. Besides, in summer season, change of volume is less than both seasons.

The WDP has effect on use of chemical fertilizers and increase its use. In Khatav tahsil, increase the availability of chemical fertilizers in 2011 because of WDP work in last some years. (Table 6.8 and fig. 6.7)

Table 6.8
KHATAV TAHSIL: CHEMICAL FERTILIZERS AVAILABILITY (2011)

Sr. No.	Chemical Fertilizers	Availability (Metric tons)
1	Urea	285.25
2	S.S.P.	93.65
3	12:32:16	104.55
4	M.O.P.	173.1
5	10:26:26	32.00
6	Ammonium Sulfate	2.00
7	D.A.P.	58.5
8	14:35:14	7.85
9	15:15:15	124.2
10	16:16:16	7.35
11	20:20:00	61.45
	Total	949.9

Source- Agricultural Development Officer, Khatav, Satara. (2011-12)

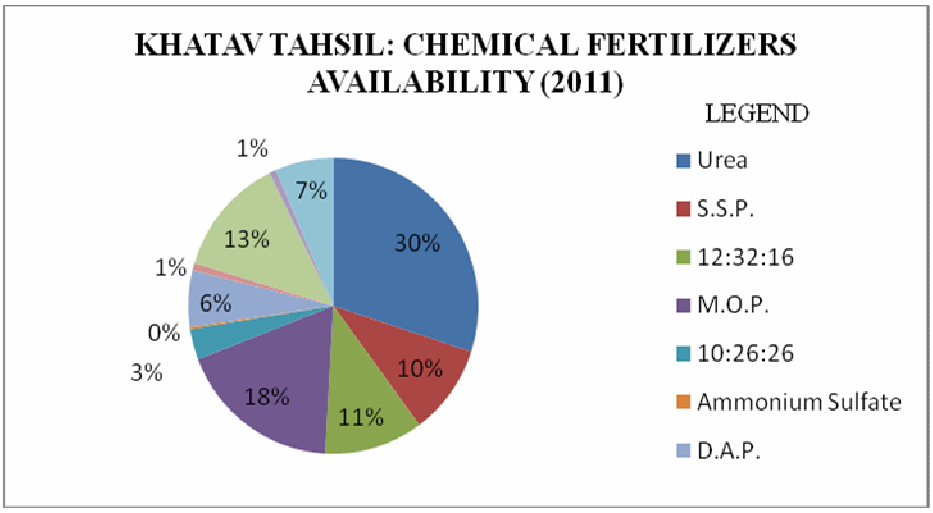

Fig. 6.7

The table 6.8 and fig. 6.7 shows the availability of chemical fertilizers in Khatav tahsil in 2011. It is seen that 949.9 metric tons chemical fertilizers has available in tahsil. Urea chemical fertilizers have largest availability has 285.25 metric tons availability. Because soil of Khatav tahsil has more demand of nitrogen and urea has nitrogen in high percentage. Also urea is well for growth of all crops.

M.O.P. chemical fertilizers has largest availability, has 173.10 metric tons availability. 15:15:15 chemical fertilizers have 124.2 metric tons availability. Besides, other chemical fertilizer has also less metric tons availability.

6.8 Fruit Farming

WDP work area has leads the fruit farming. This area has well condition water availability. Fruit farming have high capitals as well as high water. WDP work has the positive growth rate of fruit farming- Mango, Pomegranate, Jack Fruit, Custard-Apple, Guava, Lemon etc. has observed in Khatav tahsil. (Table 6.9 and fig. 6.8)

Table 6.9
KHATAV TAHSIL: FRUIT FARMING (2001 and 2011)

Trees	Area (hectares) (in 2001)	Area (hectares) (in 2011)	Change of volume (hectares)	Change of volume (in %)
Mango	36.7	71.2	34.5	94.01
Pomegranate	146.48	264.52	118.04	80.58
Jack Fruit	2.9	11.1	8.2	282.76
Custard-Apple	12.65	23.55	10.9	86.17
Guava	10.98	21.13	10.15	92.44
Lemon	1.29	2.32	1.03	79.84
Total	211	393.82	182.82	86.64

Source- Agriculture Division, Khatav. (Satara) (2011-12)

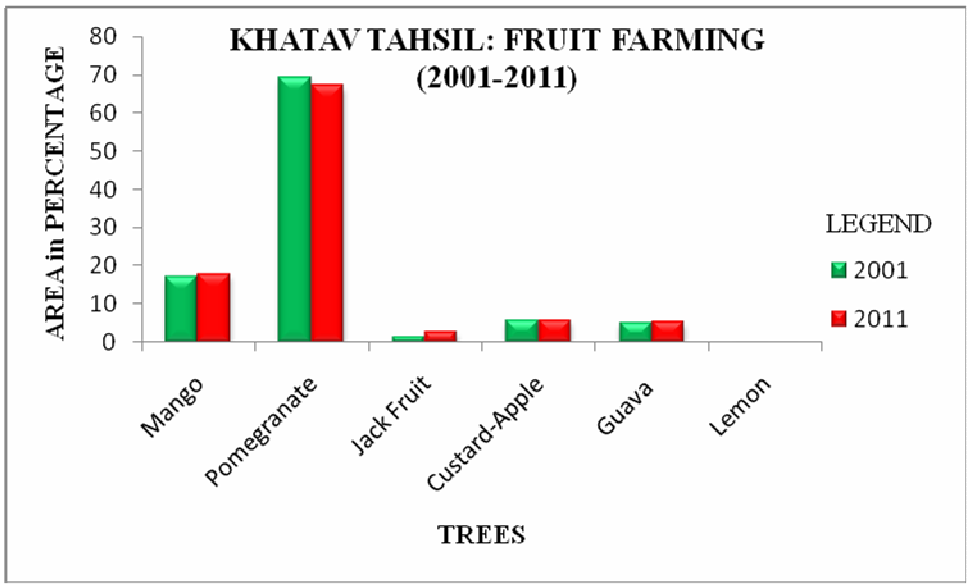

Fig. 6.8

Table 6.9 and fig. 6.8 reveals that between 2001 and 2011, the positive growth rate has observed in fruit farming in the Khatav tahsil. The total change of volume has 86.64 percent in the tahsil. Jack Fruit has dominant change of volume, has 282.76

percent growths in tahsil. Also Mango has about 94.01 percent growth. Lemon has less than 80 percent growth.

6.9 Agricultural Land Use

Agricultural land use has land which cultivated or sown under different crops. Khatav tahsil has come in the drought-prone areas. There were most land came under cereals crops. Jowar has sown in more than 60 percent area of tahsil. WDP has most affect on agricultural land use. It has changed cropping pattern. After WDP, Cash crops have increased sown area in tahsil. Also it increased agricultural land at the rate of 10.87 percent in the tahsil. In 2001, 100274.00 hectares area has under the agricultural land which has increased and made 111182.26 hectares. (Table 6.10 and fig. 6.9)

Table 6.10

KHATAV TAHSIL: AGRICULTURAL LAND USE (2001 and 2011) (in hectares)

Sr. No.	Division	Village	No. of Farmers	Geographical Area	Agricultural Land (hect.) in 2001	Agricultural Land (hect.) in 2011	Simple Growth	Simple Growth (in %)
1	Vaduj	30	21603	33589.4	24464.10	26447.62	1983.52	4.42
2	Mayani	30	23479	37071.9	29334.36	32235.51	2901.15	9.88
3	Aundh	34	19832	26612.9	21899.69	24885.89	2986.2	13.63
4	Pusegaon	43	28480	37011.7	24575.81	27613.24	3037.43	12.35
	Total	137	93394	134285.9	100274.00	111182.26	10908.26	10.87

Source- Agricultural Division, Khatav (Satara). (2011-12)

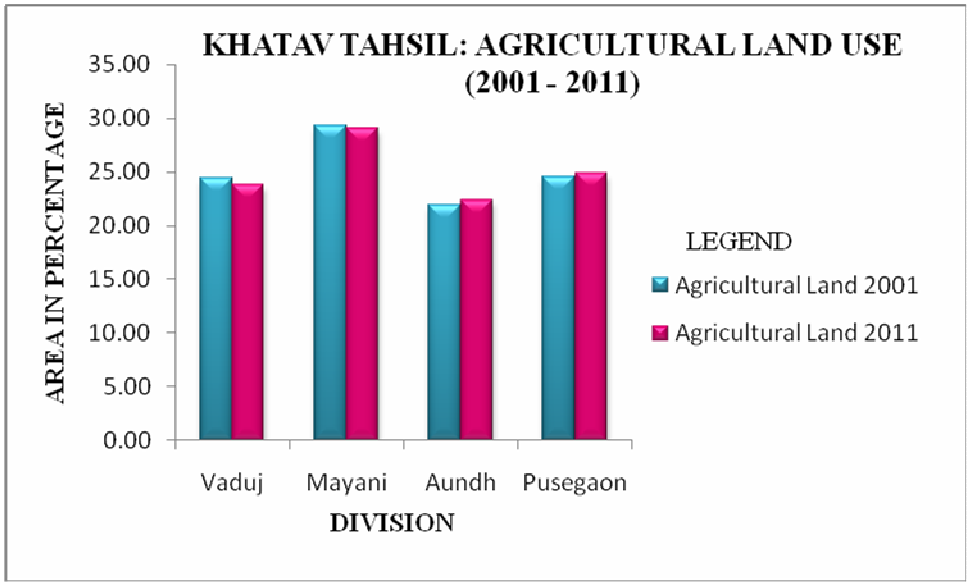

Fig. 6.9

Table 6.10 and fig. 6.9 shows the agricultural land use of Khatav tahsil in 2001 and 2011. Aundh division has largest growth rate in agricultural land use because this division has largest WDP works. In 2001 Aundh division has 21899.69 hectares area use for agricultural purpose which has 13.63 percent simple growth, made 24885.89 hectares area use for agricultural purpose in 2011. Also in 2001 year Pusegaon division has 24575.81 hectares area use for agricultural purpose which has 12.35 percent simple growth, made 27613.24 hectares area use for agricultural purpose in 2011. Besides, Vaduj and Mayani have less than 10 percent simple growth.

6.10 Growth in Agricultural Productivity (Crop Yield)

Watershed Development has given better water irrigation for crops which increase the agricultural productivity. Because Watershed Development has stress on use new techniques in agriculture. So, that reason, Khatav tahsil has noted increased agricultural productivity. (Table 6.11 and fig. 6.10)

Table 6.11

KHATAV TAHSIL: AGRICULTURAL PRODUCTIVITY

Crops	Average Yield (in 2001) per hectares	Average Yield (in 2011) per hectares	Volume of Change
Rice	1810	2155	345
Wheat	1725	1650	-75
Jowar	888.43	1365	476.57
Bajara	930	805	-125
Maize	2102.33	2265	162.67
Udid	650	623	-27
Groundnut	1383.18	1450	66.82
Soyabean	1688	2125	437
Sugarcane	89	103	14
Cotton	336	757	421

Source- Agriculture Department, Khatav tahsil (2001 - 2011).

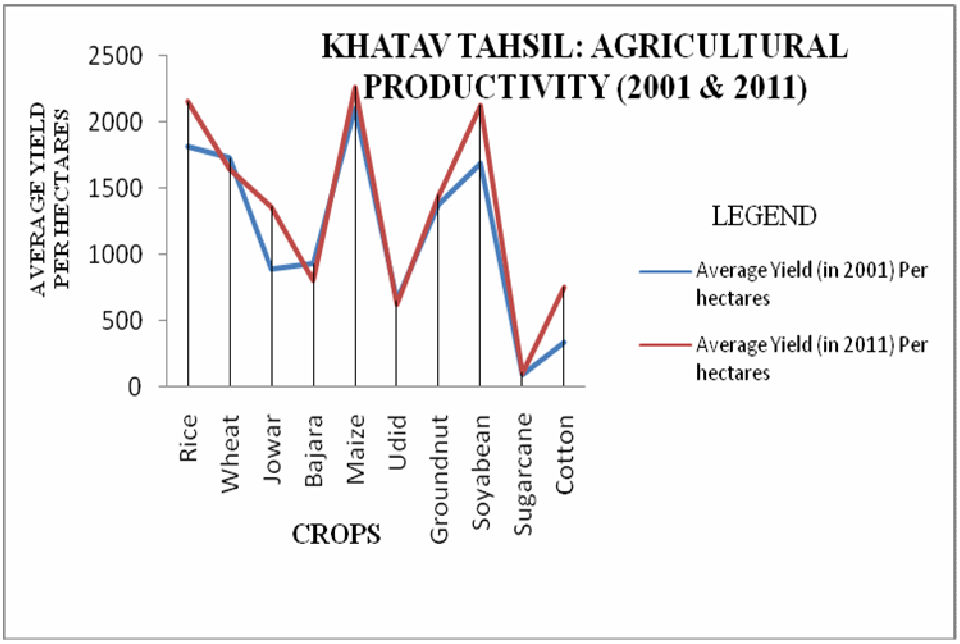

Fig. 6.10

The average yield of various crops before the implementation of the Watershed Development Project and after the Watershed Development Project is calculated (table 6.11 and fig. 6.10). The average yield of Rice was 1810 kg/hect. in 2001 and 2155 kg/ha in 2011. The yield of the Rice is increased by 345 kg/hect. The average yield of Wheat was 1725 kg/hect. in 2001 and 1650 kg/hect. in 2011. The yield of the Wheat is decreased by 75 kg/hect. The average yield of Jowar was 888.43 kg/hect. in 2001 and 1365 kg/ha in 2011. The yield of the Jowar is increased by 476.57 kg/hect. The average yield of Bajara was 930 kg/hect. in 2001 and 805 kg/ha in 2011. The yield of the Bajara is decreased by -125 kg/hect. The average yield of Maize was 2102.33 kg/hect. in 2001 and 2265 kg/ha in 2011. The yield of the Maize is increased by 162.67 kg/hect. Also Groundnut, Sugarcane, Soyabean and Cotton have increased and Udid has decrease crop yields in the tahsil.

6.11 Per Hectare Average Net Benefit of Various Crops:

The net benefit from various crops depends upon input amount, production and market price for the crop. In Khatav tahsil, the net benefit of various crops is increased on an average 78 percent. Before the Watershed Development Programme, the average benefit per hectare of Jowar cultivation was Rs. 13,320 in 2001, the positive highest growth rate of 207.43 percent is observed i.e. the net benefit per hectare is Rs. 40,950. Also Bajara crop has observed about 108 percent simple growth followed by Wheat (91.30 %), Maize (88.57 %), Soyabean (73.09 %) and Groundnut (31.05 %). Per Hectare Average Net Benefit of the Tur and Udid has less than 30 percent simple growth (Table 6.12 and fig. 6.11).

Table 6.12
KHATAV TAHSIL: PER HECTARE AVERAGE NET BENEFIT OF VARIOUS CROPS

Sr. No.	Name of the Crops	Per Hectares Net Benefits (in Rs.) in 2001	Per Hectares Net Benefits (in Rs.) in 2011	Simple Growth (in Rs.)	Simple Growth (in %)
1	Jowar	13,320	40,950	27,630	207.43
2	Bajara	9,660	20,125	10,465	108.33
3	Wheat	25,875	49,500	23,625	91.30
4	Maize	16,816	31,710	14,894	88.57
5	Tur	22,480	28,050	5,570	24.77
6	Mung	18,833	30,000	11,167	59.29
7	Udid	28,035	35,750	7,715	27.51
8	Groundnut	66,384	87,000	20,616	31.05
9	Soyabean	27,008	46,750	19,742	73.09

Source: Field Survey by Researcher (2011-12).

Formula:

$$\text{Simple Growth Rate in Percentage} = \frac{\text{Current Crop Production} - \text{Back Crop Production}}{\text{Back Crop Production}} \times 100$$

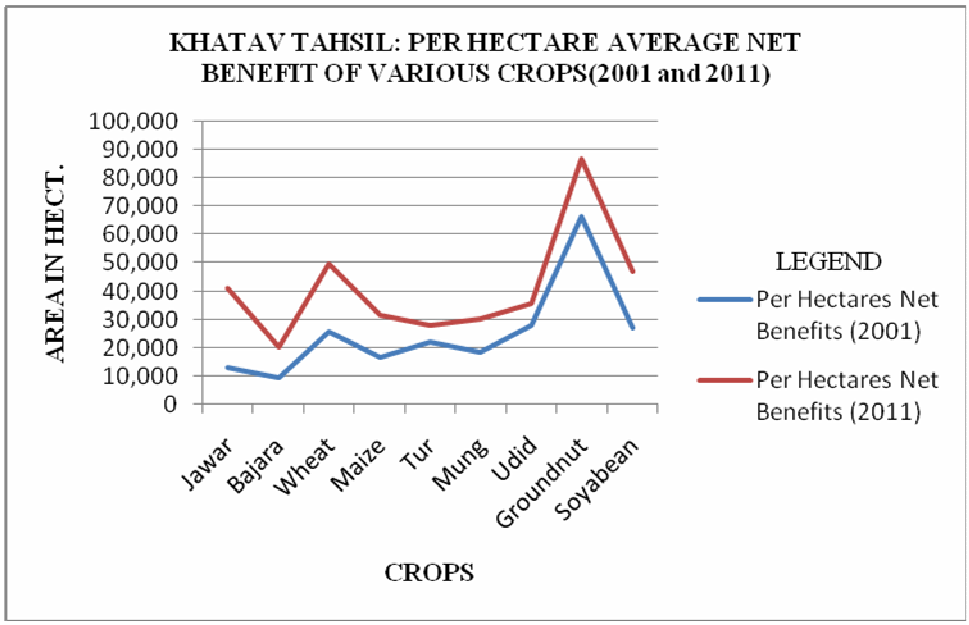

Fig. 6.11

6.12 Livestock Farming and Dairy Development

In livestock farming Hybrid Cow, Hybrid Ox, Indigenous Ox, Buffalo, Male Buffalo, Goats, Sheep's, bullocks, etc. are the main cattle's in study regions while poultry farming is also a subsidiary occupation to agriculture. Grazing is important for livestock farming but, most of the Watershed Development Programme tends to

regards grazing as a harmful practice and restrictions and bans are imposed on free grazing, when watershed interventions are underway.

Social fencing and restrictions on assess bring about a forced migration or reduction of livestock, particularly the small ruminants. In Khatav tahsil, there is no strictly ban on open grazing. The numbers of buffalos, cows, bullocks and goats have increased. The villagers prefer the bigger milk animals, the number of which seems to rising especially crossbred cows and buffalos. Very few farmers are changing their attitude and feeding the cattle in compounded feeding stalls.

Table 6.13
KHATAV TAHSIL: ANIMAL CENSUS

Sr. No.	Animals	2001 Year	2011 Year	Simple Growth in %
1	Hybrid Cow	6,950	11,065	59.20
2	Hybrid Oxen	535	839	56.82
3	Indigenous Oxen	18,488	17,937	-2.98
4	Buffaloes	37,536	41,736	-11.18
5	Male Buffaloes	466	5,652	1112.87
6	Goats	46,785	59,052	26.21
7	Sheep's	30,048	29,393	-2.17
8	Pigs	1507	863	-42.73
9	Hens	16,1442	1,65,217	2.33
10	Horses	50	90	80
11	Donkeys	177	609	244.06
12	Dogs	16,167	17,327	7.18
13	Rabbits	25	130	420
Total		3,20,176	3,49,910	9.28

Source- District Livestock Conservation Officer, ZP Satara. (2011)

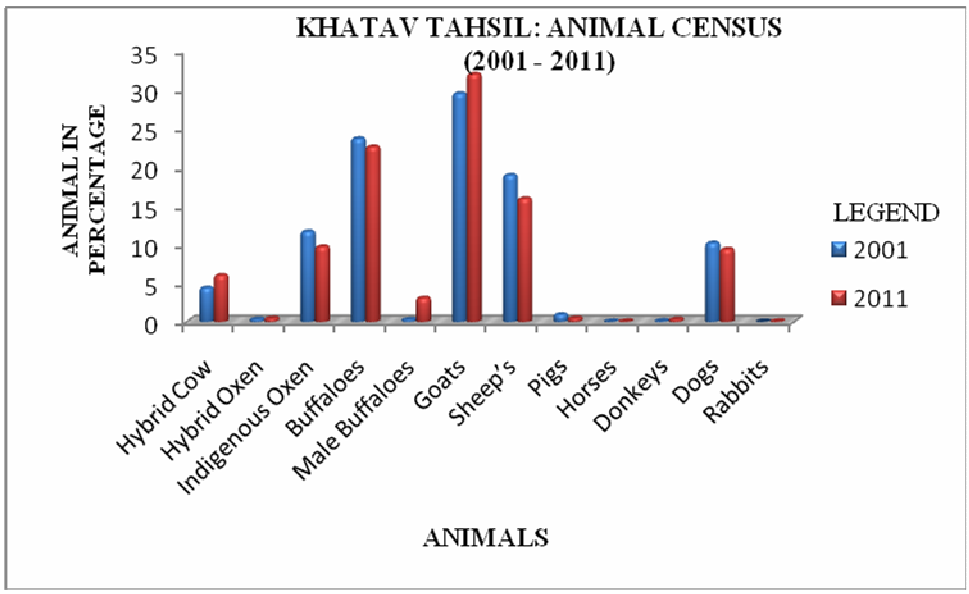

Fig. 6.12

Table 6.13 and fig. 6.12 shows the animal Census of Khatav tahsil. In Khatav tahsil in 2001, there were 3,20,176 animals, which increase 9.28 percent and made 3,49,910 in 2011. In Khatav tahsil in 2001, there were 6,950 Hybrid Cow, 535 Hybrid Ox, 18,488 Indigenous Ox, 37,536 Buffalo, 466 Male Buffalo, 46,785 Goats and 30,048 Sheep's.

In Khatav tahsil in 2011, there were 11,065 Hybrid Cow, 839 Hybrid Ox, 17,937 Indigenous Ox, 41,736 Buffalo, 5,652 Male Buffalo, 59,052 Goats and 29,393 Sheep's. (Table 6.13 and fig. 6.12)

Number of male Buffalo has highest simple growth, about 1112 percent. Also numbers of donkey has increased as simple growth of 244.06 percent. Number of Pigs has highly decreased as 42.73 percent.WDP programme has more effect on livestock, it increase the male Buffalo, Hybrid cow, Hybrid ox etc. animals and decrease Pigs, Buffalo, Indigenous Ox etc. animals. Because of increased mechanization and availability of tractors on rent also is an impact on draft animals, especially bullocks and male buffaloes. It is noticed that in Khatav tahsil, the number of tractors as well as the use of tractors is increased.

In Khatav tahsil, the positive development is seen in dairy farming. Milk is collected by private milkmen, co-operative dairy societies, and chilling plant. In 2001 year, in Khatav tahsil 38,31,040 liter milk was collected through 9 milk chilling plants and 85 milk collecting centers. In 2011, the growth rate 21.95 % is noticed i.e. 4672000 liter milk is collected through 11 milk chilling plants and 131 milk collecting centre's. (Table 6.14 and fig. 6.13)

Table 6.14
KHATAV TAHSIL: PRIVATE MILK CHILLING PLANTS

Sr. No.	Chilling Plant	Daily Milk Collection (liters)			Simple Growth (in %)
		2001	2011	Simple Growth	
1	Siddhanath Milk Collection Centers, Umbarde	2900	4000	1100	37.93
2	Jai Milk and Milk Products, Dharpuri	00	5000	---	---
3	Vijayraj Milk Sangh, Katar Khatav	00	15000	---	---
4	Prithaviraj Milk Collection and Milk Products Banpuri.	16000	20000	4000	25.00
5	Chaitanya Dairy, Vaduj.	15400	20000	4600	29.87
6	Chinchkar Milk Dairy, Vaduj.	2950	4000	1050	35.59
7	Pawar Dairy, Umbarde.	8900	11000	2000	22.47
8	Haranhai Milk Sangh, Nimsod	3900	5000	1100	28.20
9	Dhiraj Milk Sangh, Chorade	1400	1900	500	35.71
10	Ganesh Dairy, Khatav	10550	13000	2450	23.22
11	Shriram Milk Dairy, Pusegaon	4750	6000	1250	26.31
	Total	66750	104900	38150	57.15

Source-Tahsil, Milk Occupation Development Officer, Khatav.

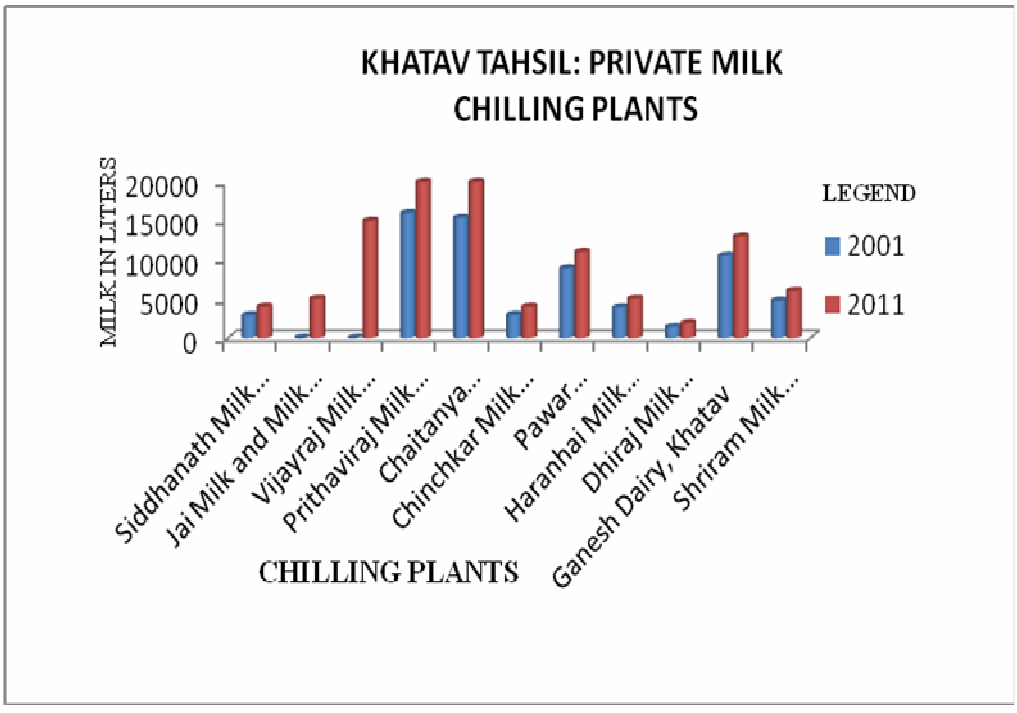

Fig. 6.13

Table 6.14 and fig. 6.13 shows the private chilling plants of Khatav tahsil. In 2001, there were 66,750 liters Milk daily collected which increased 57.15 percent and made 1,04,900 liters milk daily collections in 2011, in tahsil. Prithaviraj Milk Collection and Milk Products Banpuri and Chaitanya Dairy, Vaduj has largest chilling

plant which daily collected about 20,000 liters Milk. Also Ganesh Dairy, Khatav milk chilling plant daily collected about 13,000 liters milk. Besides, all the milk chilling plant daily milk collected about 2,000 liters/ day.

6.13 Transportation Roads and Vehicles

WDP has all the development in worked area. It has increased town like development status of that villages. WDP work villages have developed the transportation facilities. Roads have increased density or length. Also number of vehicles has increased.

Table 6.15

KHATAV TAHSIL: TYPES AND LENGTH OF ROADS

Sr. No.	Types of Roads	Length in kms. (2001)	Length in kms. (2011)	Change of volume (in kms.)	Change of volume %
1	State Highway	154.53	154.53	00.00	00.00
2	Major District Roads	198.57	241.11	42.54	21.42
3	Other District Roads	148.83	176.45	27.62	18.55
4	Village Roads	506.06	674.26	168.2	33.24
	Total	1007.99	1246.35	238.36	23.64

Source: Socio-Economic Review and District Statistical Abstract of Satara district, (2011-2012).

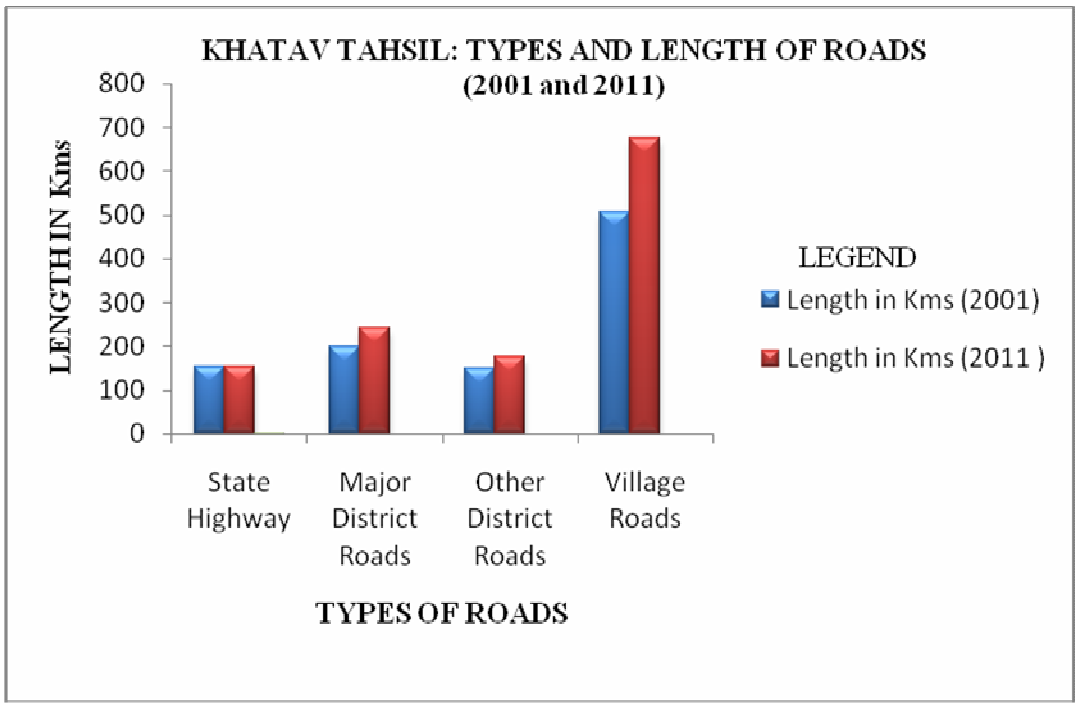

Fig. 6.14

Table 6.15 and fig. 6.14 reveals that between 2001 and 2011, the positive change of volume has observed in different roads length in the Khatav tahsil. The total change of volume has 23.64 percent in the tahsil. Village roads has dominant change of volume, has 33.24 percent growths in tahsil. Also a major district road has about 41.42 percent growth. State highway does not have any change or growth in length. Other district roads have less than 20 percent growth.

With the development roads, WDP work also has positive effect on number of vehicles. About 80 percent increase the vehicles in the Khatav tahsil. (Table 6.16 and fig. 6.15)

Table 6.16

KHATAV TAHSIL: USE OF VEHICLES

Sr. No.	Category	2001	2011	Change of volume	Change of volume (in %)
1	Two Wheeler	10981	19749	8768	79.54
2	Motor Cars	716	1325	609	85.05
3	Jeeps	507	1124	617	121.69
4	Auto Rickshaws	608	376	-232	-38.15
5	Trucks and Lorries	205	465	260	126.82
6	Others	95	246	151	158.9
Total		13138	24275	11137	84.76

Source: R.T. O. Office, Satara district (2011-2012).

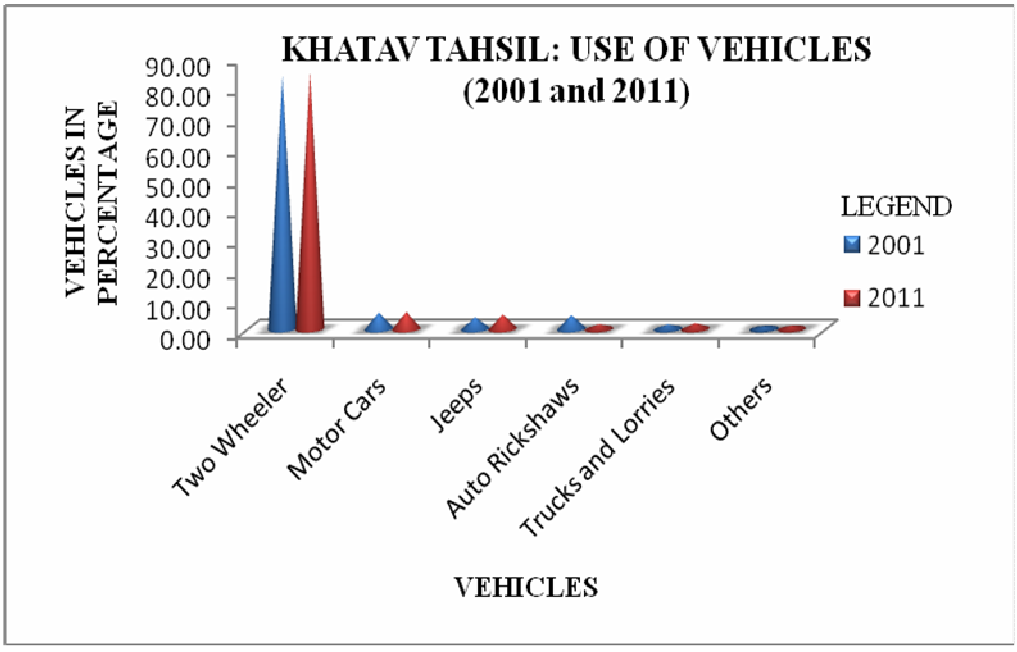

Fig. 6.15

Table 6.16 and fig. 6.15 reveals that between 2001 and 2011, the change of volume has observed in number of vehicles in the Khatav tahsil. The total change of volume has 84.76 percent in the tahsil. Other vehicles has highly change of volume, has 158.9 percent growths in tahsil. Also major jeeps, trucks and Lorries have about equal to 120 percent growth. Two-wheeler has less than 80 percent growth. Auto Rickshaws has decrease change of volume.

6.14 Cultivators

Cultivator is one of the factors which have direct impact of Watershed Development. Watershed Development has developed the irrigation facilities. Therefore, increase the crop production and crop productivity, change the cropping pattern, increase agricultural land-use, etc. mainly occur in the region. After the Watershed Development, farmers have turned to fruit farming in Khatav tahsil. Hence, more people have interested in the farming. The farmland price has increased after the Watershed Development in the tahsil. Also best educational status has taken priority to use the new techniques like green house use, use of shed net green house for sunrays protection, drip and sprinkler irrigation, chemical fertilizers, organic fertilizers, farm ponds, use of modern agricultural machinery and tools etc. for agriculture in the tahsil. Organization of farmers and group farming has occurred in the tahsil. Modernization of agriculture has most not only interest but also attraction of peoples in the tahsil. (Table 6.17 and fig. 6.16).

Table 6.17

KHATAV TAHSIL: CULTIVATORS

Sr. No.	Name of Circle	Cultivators 2001	Cultivators 2011	Simple Growth	Simple Growth (in %)
1	Pusegaon	15817	12724	-3093	-19.55
2	Khatav	8978	8373	-605	-6.74
3	Pusesawali	9247	8821	-426	-4.61
4	Vaduj	13274	12756	-518	-3.90
5	Katar Khatav	10152	8970	-1182	-11.64
6	Mayani	13391	10532	-2859	-21.35
Total		70859	62176	- 8683	-12.25

Source- Agriculture Division, Khatav (Satara).

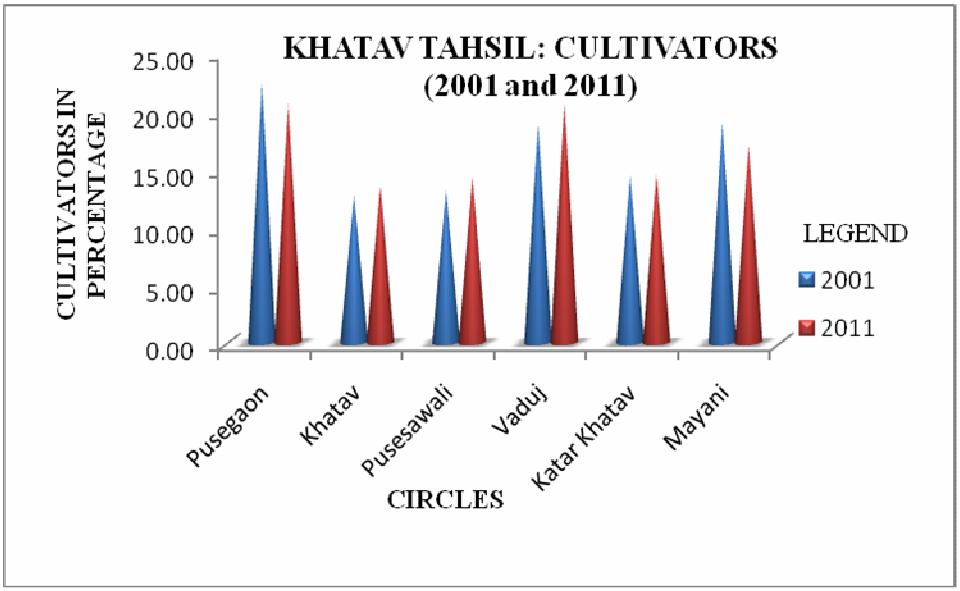

Fig. 6.16

The above table 6.17 and fig. 6.16 represents the data regarding the circle village-wise Cultivators in Khatav tahsil in 2001 and 2011. It is seen that tahsil has 70,859 and 62,176 cultivators in 2001 and 2011 respectively. There is decrease the 8683 cultivators between the both years in the tahsil because of best educational status, youth attraction of secondary and tertiary activities, migration, high price of farmland, politics, selling farmlands of small farmers, high expenditure of agriculture etc. Both years has decreased simple growth percent. Tahsil has decreased the 12.25 percent cultivators during the both years.

Pusegaon circle-village has largest cultivators in both the years, has 15,817 in 2001 and 12,724 in 2011 cultivators (Table 6.17 and fig. 6.16). This circle has highest decreased simple growth (3093). But in Simple growth percentage, Mayani circle-village has dominant decreased cultivator's simple growth in percent (21.35 percent). Pusegaon circle village has second dominant decreased cultivators simple growth in percent (19.55 percent). Besides, other circle has less decreased simple growth in percent.

6.15 Classification of Farmers:

The pressure of population growth and the practice of dividing land equally among the heirs are caused excessive sub divisions of farm holdings. Consequently, the farm holdings are very small and fragmented. The very small size of holdings makes uneconomical farming activity.

Classifications of farmers are generally based on land holdings. Land holdings data were tabulated according to size classes, into 5 major size groups, namely marginal (below 1 hectare), small (1-2 hectare), semi medium (2-4 hectare), medium (4-10 hectare) and large farmers (above10 hectare).

Table 6.18

KHATAV TAHSIL: CLASSIFICATION OF FARMERS

Sr. No.	Category of farmers	Size of land Holding	Percentage
1	Marginal	Below 1 hectare	53. 24
2	Small	1 to 2 hectare	34. 72
3	Semi-medium	2 to 4 hectare	6. 13
4	Medium	4 to 10 hectare	3.05
5	Large	Above 10 hectare	2.86
		Total	100.00

Source: Socio-Economic Review and District Statistical Abstract of Satara, (2010-2011).

In Khatav tahsil, based on land holdings, the classification of farmers has included marginal farmer 53.24 percent followed by small farmers 34.77 percent, semi-medium farmers were 6.13 percent, medium farmers 3.00 percent and large farmers 2.86 percent (Table 6.18).

Watershed Development Programme does not stop the purely stop the divide and fragmentation but, it has increase the power or income of farm lands. It gives best way of farming method. WDP change cultivates traditional crops into modern high productivity crops. This has made well socio-economic rural development in tahsil.

6.16 Source of Drinking Water

Water plays an important role in the evolution of life from molecules to human. “No Water No Life”, is the common saying. In Khatav tahsil has all rural population. Generally, rural peoples are using tap water for drinking purpose. The families which live in the farm land are using the wells water for drinking purpose.

WDP has well effect on drinking water resource in Khatav tahsil. Before the WDP, mans and women’s had went to long distance for drinking water purpose but, after WDP, clean and pure drinking water comes near or front of house with the help of tap and pipeline. It saves the time and hard work (Table 6.19 and 6.20 and fig. 6.17).

Table 6.19

DRINKING WATER FACILITIES (2001)

Sr. No.	Circle	Reg. Scheme	Tap Water	Small Tap water Scheme	Hand Pump	Public Wells	Private Wells	Others (Percolation Tank)	Total
1	Pusegaon	0	11	8	86	17	7	1	140
2	Khatav	3	7	10	79	21	2	1	123
3	Pusesawali	1	9	2	77	0	--	2	91
4	Vaduj	5	12	13	108	3	--	--	141
5	K. Khatav	0	9	7	140	4	2	2	164
6	Mayani	3	6	11	102	13	--	1	136
Total		12	54	51	592	58	11	8	795

Source: Water Supply Department, Panchayat Samiti, Khatav (2001).

Table 6.20

DRINKING WATER FACILITIES (2011)

Sr. No.	Circle	Reg. Scheme	Tap Water	Small Tap water Scheme	Hand Pump	Public Wells	Private Wells	Others (Percolation Tank)	Total
1	Pusegaon	0	27	14	191	29	10	3	293
2	Khatav	5	16	18	164	27	2	1	269
3	Pusesawali	4	21	7	149	1		2	227
4	Vaduj	12	20	21	197	4			261
5	Katar Khatav	4	17	15	234	7	2	2	275
6	Mayani	6	9	20	164	19		1	257
Total		31	110	95	1099	87	14	9	1582

Source: Water Supply Department, Panchayat Samiti, Khatav (2011).

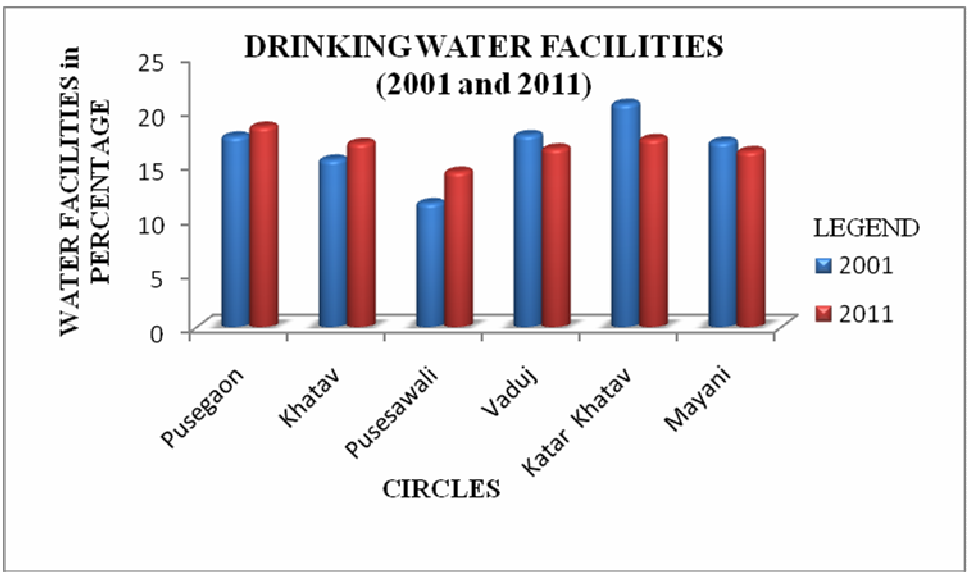

Fig. 6.17

Table 6.19 and fig. 6.17 shows the drinking water facilities of 2001 in Khatav tahsil. Hand pumps play big role in drinking water supply, 592 hand pumps used in tahsil. Most population has lived in farm areas; hence hand pumps are important for drinking water supply. Katar Khatav circle has mostly drinking water supply, which has 164 drinking water facilities. After Katar Khatav, Vaduj circle has dominant means 141 drinking water facilities. Pusegaon, Khatav, Mayani have 140, 123 and 136 drinking water facilities. Pusegaon village is the religious village, so that village has most drinking water facilities. Pusesawali circle has lowest means 91 drinking water facilities. This tahsil has just 8 percolation tanks.

Table 6.20 and fig. 6.17 shows the drinking water facilities of 2011 in Khatav tahsil here also hand pumps play big role in drinking water supply, which largely increased use of 1,099 hand pumps in tahsil. Katar Khatav circle has mostly drinking water supply, which has 275 drinking water facilities. After Katar Khatav, Pusegaon circle has dominant means 293 drinking water facilities. Vaduj, Khatav, Mayani, Pusesawali have 261, 269, 257 and 227 drinking water facilities. Vaduj is the tahsil administrative town, so that town has most regional schemes and tap water for drinking water purpose. This tahsil has just 9 percolation tanks for drinking water purpose.

6.17 Increases in Literacy Rate

Education status has developed after the Watershed Development. Today, boys and also girls have taken higher and occupational education (D. Ed, B.Ed., M.Ed., I.T.I., Pharmacy, Polytechnic, engineering etc.) in the tahsil. Most people have taken priority of higher education. Khatav tahsil has two technical colleges, one medical College and five degree and graduate colleges. Also tahsil has more than 200 small children's schools. The literacy rate has highly increased in the tahsil. According to 2011 census, this tahsil has 72.12 percent literacy. There is 6.02 percent simple growth in literacy rate. (Table 6.21 and fig. 6.18).

Table 6.21
KHATAV TAHSIL: LITERACY AND ILLITERACY RATE

Sr. No.	Name of Circle	2001			2011			Simple Growth	
		Literacy	Illiteracy	Total	Literacy	Illiteracy	Total	Literacy	Illiteracy
1	Pusegaon	40729	19093	59822	45337	15887	61224	4608	-3206
	(in %)	60.08	31.92	23.44	74.05	25.95	22.42	13.97	-5.97
2	Khatav	21271	13106	34377	30442	11374	41816	9171	-1732
	(in %)	61.88	38.12	13.47	72.8	27.2	15.31	10.92	-10.92
3	Pusesawali	22179	10941	33120	24579	9774	34353	2400	-1167
	(in %)	66.97	33.03	12.98	71.55	28.45	12.58	4.58	-4.58
4	Vaduj	36074	17840	53914	41913	15748	57661	5839	-2092
	(in %)	66.91	33.09	21.13	72.69	27.31	21.11	5.78	-5.78
5	K. Khatav	17924	9409	27333	20567	8852	29419	2643	-557
	(in %)	65.58	34.42	10.71	69.91	30.09	10.77	4.33	-4.33
6	Mayani	30469	16113	46582	34140	14507	48647	3671	-1606
	(in %)	65.41	34.59	18.26	70.18	29.82	17.81	4.77	-4.77
Total		168646	86502	255148	196978	76142	273120	28332	-10360
(in %)		66.1	33.9	100	72.12	27.88	100	6.02	-6.02

Source: District Census Handbook, Satara (2001 and 2011).

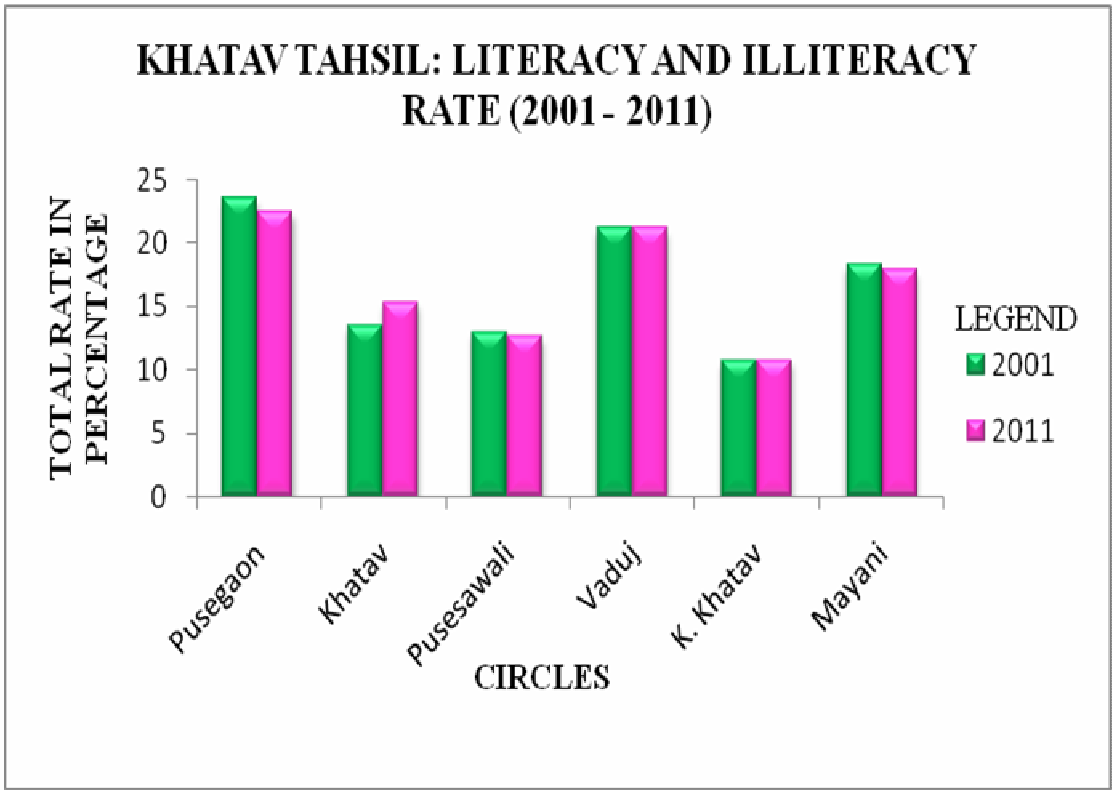

Fig. 6.18

The above table 6.21 and fig. 6.18 represents the data regarding the circle village-wise literacy and illiteracy rate in Khatav tahsil in year 2001 and 2011. It is seen that, in 2001, tahsil has 66.1 percent literacy rate and 33.9 percent illiteracy rate. In 2011, tahsil has 72.12 percent literacy rate and 27.88 percent illiteracy rate. There is increase in the literacy rate and decrease in the illiteracy rate because of economic development and social awareness of people, well transportation facilities, well educational facilities etc.

Pusegaon (13.97 percent) and Khatav (10.92 percent) circle-villages have largest literacy rate of simple growth between the both years (table 6.21 and fig. 6.18). Khatav circle village have dominant (10.92 percent) decreased illiteracy rate in the tahsil. Vaduj (5.78 percent) and Mayani (4.77 percent) circle-villages have medium literacy rate of simple growth between both years. Pusesawali and Katar Khatav circle villages have low literacy rate of simple growth. Also Katar Khatav circle has lowest decrease in illiteracy rate.

6.18 Changes in Occupational Structure

Occupational Structure has changed after the Watershed Development in Khatav tahsil. Primary activities include mainly farming which really has progress after Watershed Development. Farming activities increase the crop production because of well irrigation facilities, use of hybrid seeds, chemical fertilizers and pesticides. Primary activities' progress has positive change on secondary and tertiary activities. A secondary activity includes household industries which have increased after Watershed Development in the tahsil. Also, tertiary activities like teachers, doctors, lowers, banking, LIC employers, engineers, traders etc. have increased after Watershed Development. Because economic development has effects on all sectors development and Watershed Development has economic stability and development. (Table 6.22 and fig. 6.19).

Table 6.22
KHATAV TAHSIL: OCCUPATIONAL STRUCTURE OF POPULATION
(2001 and 2011)

Sr. No.	Name of Circle	(2001) Activities				(2011) Activities			
		Primary	Secondary	Tertiary	Total	Primary	Secondary	Tertiary	Total
1	Pusegaon	23199	845	4512	28556	20585	582	5569	26736
	(in %)	81.24	2.96	15.80	100	76.99	2.18	20.83	100
2	Khatav	14779	439	2615	17833	13193	424	3565	17182
	(in %)	82.87	2.46	14.67	100	76.78	2.47	20.75	100
3	Pusesawali	13216	360	2349	15925	11383	149	2311	13843
	(in %)	82.99	2.26	14.75	100	82.23	1.08	16.69	100
4	Vaduj	18991	1065	5347	25403	18132	498	5618	24248
	(in %)	74.76	4.19	21.05	100	74.78	2.05	23.17	100
5	Katar Khatav	12669	284	1889	14842	12473	235	1855	14563
	(in %)	85.36	1.91	12.73	100	85.65	1.61	12.74	100
6	Mayani	18960	1028	4140	24128	16282	646	4540	21468
	(in %)	78.58	4.26	17.16	100	75.84	3.01	21.15	100
Total		101814	4021	20852	126687	92048	2534	23458	118040
(in %)		80.36	3.17	16.47	100	77.98	2.15	19.87	100

Source: District Census Handbook, Satara (2001 and 2011).

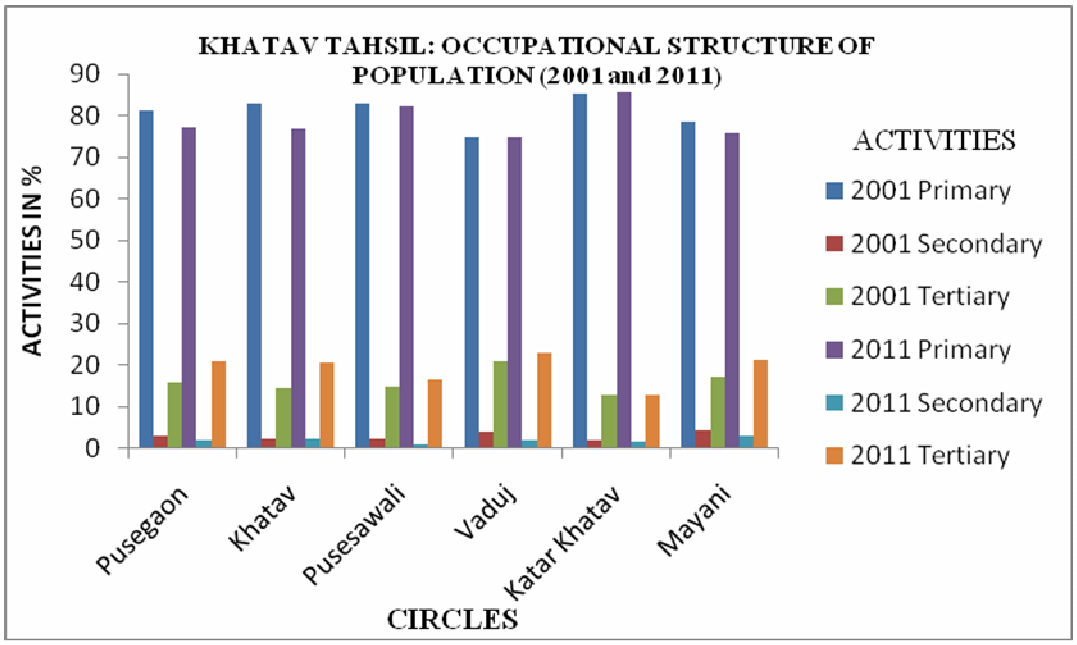

Fig. 6.19

The above table 6.22 and fig. 6.19 represents the data regarding the circle village-wise occupational structure in Khatav tahsil in year 2001 and 2011. It is seen that 80.36 percent in 2001 and 77.98 percent in 2011, population has engaged in primary activities in the Khatav tahsil. There is decrease in the primary activities about 2.38 percent in the tahsil because of high education, migration, priority of

secondary and tertiary activities etc. Katar Khatav circle villages have largest population engaged in primary activities (85%) in the both years. 3.17 percent in 2001 and 2.15 percent in 2011, population has engaged in secondary activities. Compared to all village circles, Mayani circle-villages have dominant population engaged in secondary activities (>3.00 %) in the both years. Tertiary activities have 16.47 percent in 2001 and 19.87 percent in 2011 population engaged in the tahsil. There is increase in the tertiary activities about 3.40 percent in both years. Because, tertiary activities depend on primary and secondary activities.

6.19 Settlement Pattern and Status of House

Settlement Pattern has also affected Watershed Development. An economic development has increased the number of households and develops status of house. Before WDP, generally, the houses had made by mostly mud, stone, tiles, iron sheets, lime, sand and wood in building material in the tahsil. After WDP, mostly houses have made by bricks, standard wood, steel, iron, cement, marbles, sand, metal, glass, etc. in building material. Also high quality colour paints, designed marbles, plain plaster to walls are used for house building materials in tahsil. Now, people use high expenditure, systematic house construction planning, with all house facilities (i.e. Hall, Kitchen room, Bedroom, Gallery, Porch, Toilet facilities, Tap water connection etc.) in the Khatav tahsil. (Table 6.23 and fig. 6.20).

Table 6.23
KHATAV TAHSIL: DISTRIBUTION OF SETTLEMENTS
(2001 and 2011)

Sr. No.	Name of Circle	Area in Hectares.	No. of Villages	No. of Rural Households (2001)	No. of Rural Households (2011)	Simple Growth	Simple Growth (%)
1	Pusegaon	30746.24	34	12365	13595	1380	11.30
2	Khatav	17195.26	27	7795	9134	1369	17.63
3	Pusesawali	17582.35	21	6786	7716	1000	14.89
4	Vaduj	26415.40	22	11074	12392	1318	11.90
5	K.Khatav	19390.83	21	5213	6282	1069	20.51
6	Mayani	26486.42	18	9334	10580	1246	13.35
	Total	**137816.50**	**143**	**52317**	**59699**	**7382**	**14.11**

Source: District Census Handbook, Satara (2001 and 2011).

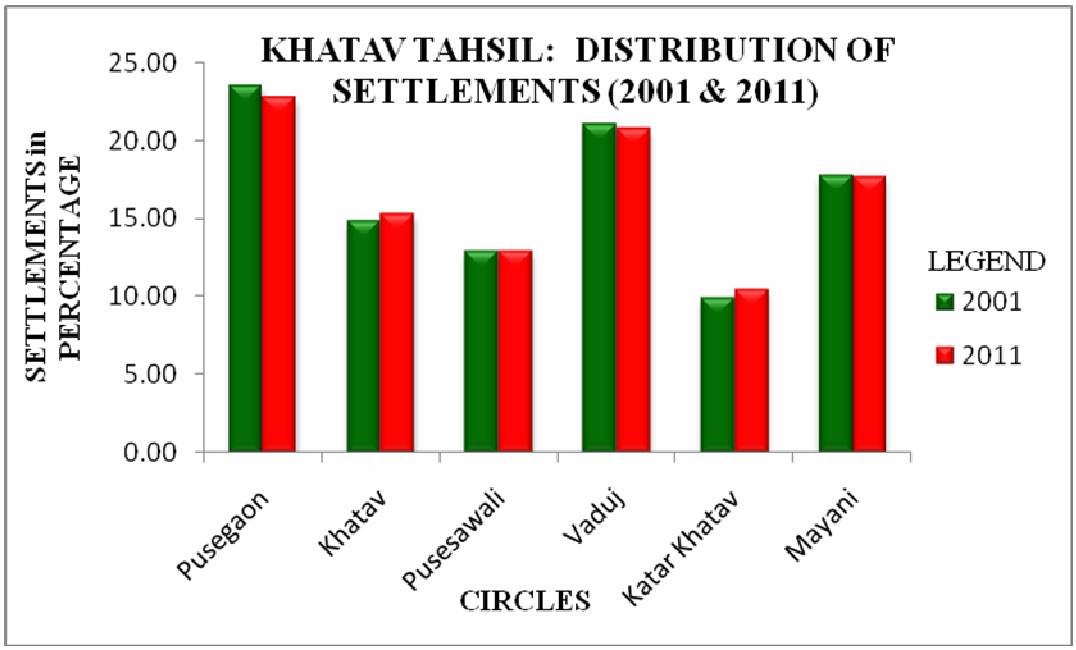

Fig. 6.20

The above table 6.23 and fig. 6.20 represents the data regarding the circle village-wise distribution of settlements in Khatav tahsil in year 2001 and 2011. The average simple growth has 14.11 percent in the tahsil. Katar Khatav has highly simple growth, of 158.9 percent in tahsil. Also Khatav has about 17.63 percent simple growth. Pusesawali has 14.89 percent simple growth. Besides, other circles have less simple growth.

6.20 Growth in Health and Medical Facilities

Health and medical facility is one of the important facilities for the society. Pathological labs, medical centers, Blood banks, I.C.U. facilities, diagnostic centers, health clinics, Child health care and hospitals give the health and medical facilities. These facilities are divided into two categories-Governmental and Private. There are good medical facilities at private sectors. The government hospitals are not well equipped so the people are giving priority to the private practitioners.

WDP has development of governmental and private health facilities. Private facilities have more development because of well service, good and clean hospitals, urgent services, best modern and highly technical hospital machineries etc. And these services are available for 24 hours in the private hospitals. As compared to government hospitals, private hospitals are costly but these hospitals give facilities

like urban hospitals, hence most people prefer private hospitals. (Table 6.24 and fig. 6.21).

Table 6.24
KHATAV TAHSIL: PRIMARY HEALTH CENTRES AND SUB-CENTERS

Sr. No.	Health Centers	2001		2011		Simple Growth (in %)
		Sub-centers	Private Hospitals	Sub- centers	Private Hospitals	
1	Pusegaon	3	12	4	30	126.66
2	Vaduj	4	17	5	42	123.80
3	Pusesawali	4	9	6	26	146.15
4	Katar Khatav	5	10	7	22	93.33
5	Nimsod	4	2	4	6	66.70
6	Khatav	5	12	6	27	94.11
7	Mayani	5	16	6	35	95.23
Total		30	78	38	188	

Source: Health Department Panchayat Samiti, Vaduj.

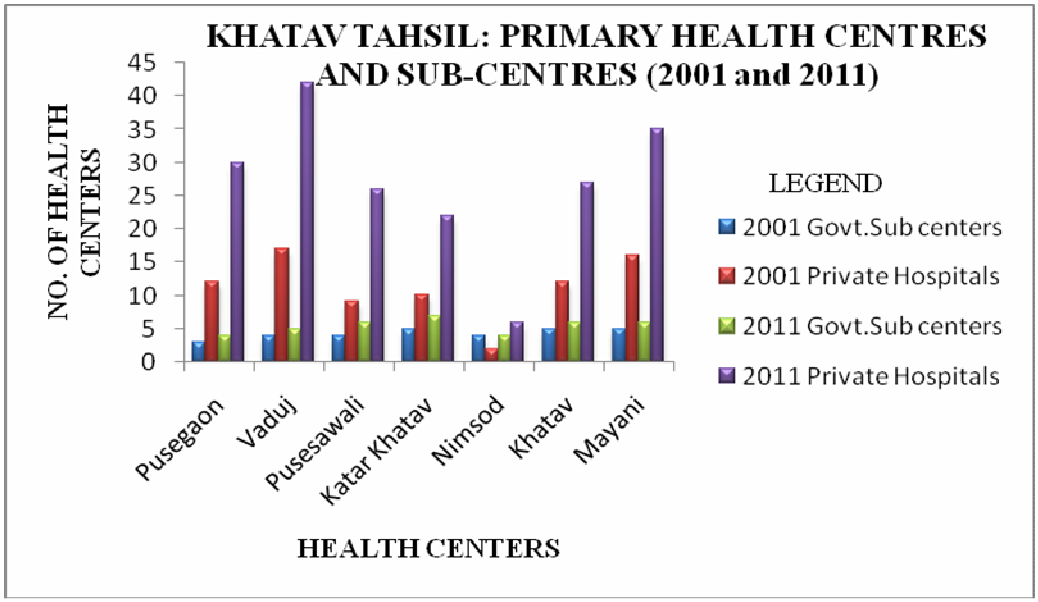

Fig. 6.21

In the Khatav tahsil, mainly circle villages have best hospital facilities. Vaduj circle has the highest developed in health and medical facilities. This place has 123.80 percent growth in health facilities. Mayani circle has the second ranked, 6 sub-centers and 35 private hospitals in 2011. On the third rank- Pusegaon circle has 4 sub-centers and 30 private hospitals in 2011. This circle has 126.66 percent simple growth in health and medical facilities. In Pusesawali, Katar Khatav and Khatav circles 146.15 %, 93.33 % and 94.11 % simple growth seen in governmental and private hospitals respectively (Table 6.24 and fig. 6.21).

The Khatav tahsil has highly "Nirmal Gram Yojana" implementing villages in the Satara district. Nidhal is the first implementing 'Nirmal Gram Yojana' scheme in Satara district. Out of 143 villages, 125 villages have implemented the 'Nirmal Gram Yojana' scheme in the tahsil. This scheme has compulsorily to build the toilet for every family. In tahsil, villages nearly about 80 % families having toilet facilities. (Table 6.25 and fig. 6.22).

Table 6.25
KHATAV TAHSIL: TOILET FACILITIES

Sr. No	Circle	No. of Villages	No. of Households (2001)	No. of Toilets (2001)	No. of Households (2011)	No. of Toilets (2011)	Simple Growth (In %)
1	Pusegaon	34	12,267	4,220	13595	9,379	122.25
2	Khatav	27	7,798	2,439	9134	6,101	150.14
3	Pusesawali	21	6,746	2,432	7716	5,656	93.93
4	Vaduj	22	11,159	3,980	12392	8,483	113.14
5	Katar Khatav	21	5,273	1,705	6282	4,052	137.65
6	Mayani	18	9,379	1,810	10580	3,776	108.62
Total		**143**	52622	16,586	59699	37,444	125.75

Source: Health Department Panchayat Samiti, Vaduj (Satara).

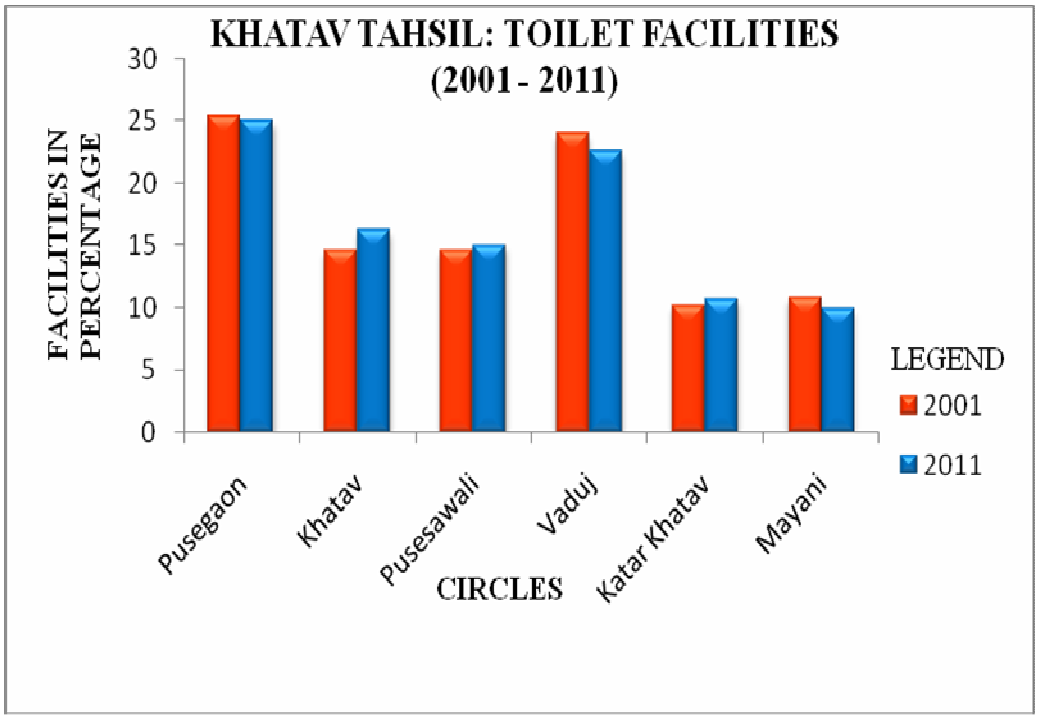

Fig. 6.22

Table 6.25 and fig. 6.22 reveals that, in 2001, 16,586 numbers of toilets are seen in Khatav tahsil; in 2011. It was increased by 125.75 percent making 37,444 numbers of toilets. Pusegaon circle has 4,220 numbers of toilets in 2001 and 9,379 numbers of toilets in 2011. The number of toilets simple growth is 122.25 percent in tahsil, followed by Katar Khatav (137.65 %), Khatav (150.14 %), Vaduj (113.14 %) and Pusesawali (93.93 %.) simple growth in number of toilets.

6.21 Population and Population Density

Population has dominant effect on Watershed Development. Population and population density increased by Watershed Development. Agricultural progresses, irrigation facilities, road-transportation facilities, medical facilities, employment growth, agro-based industries etc. pull factors have highly population migration and growth in the Khatav tahsil. After the Watershed Development, people have well economic situation as well as mental satisfaction which increase the population and population density in the tahsil.

Table 6.26

KHATAV TAHSIL: POPULATION AND POPULATION DENSITY

Sr. No.	Name of Circle	Area in Sq. km	2001		2011		Simple Growth	
			Population	Population Density (in sq.km.)	Population	Population Density (in sq.km.)	Population	Population Density (in sq.km.)
1	Pusegaon	307.38	47257	154	61224	199	13967	45
2	Khatav	171.89	40482	236	41816	243	1334	8
3	Pusesawali	175.78	32680	186	34584	197	1904	11
4	Vaduj	264.08	55702	211	57661	223	1959	7
5	Katar Khatav	193.86	26402	136	29419	152	3017	16
6	Mayani	264.80	46627	176	48647	184	2020	8
Total		**1377.79**	**249150**	**181**	**275274**	**199.79 (200)**	**24201**	**19**

Source: District Census Handbook, Satara (2001 - 2011).

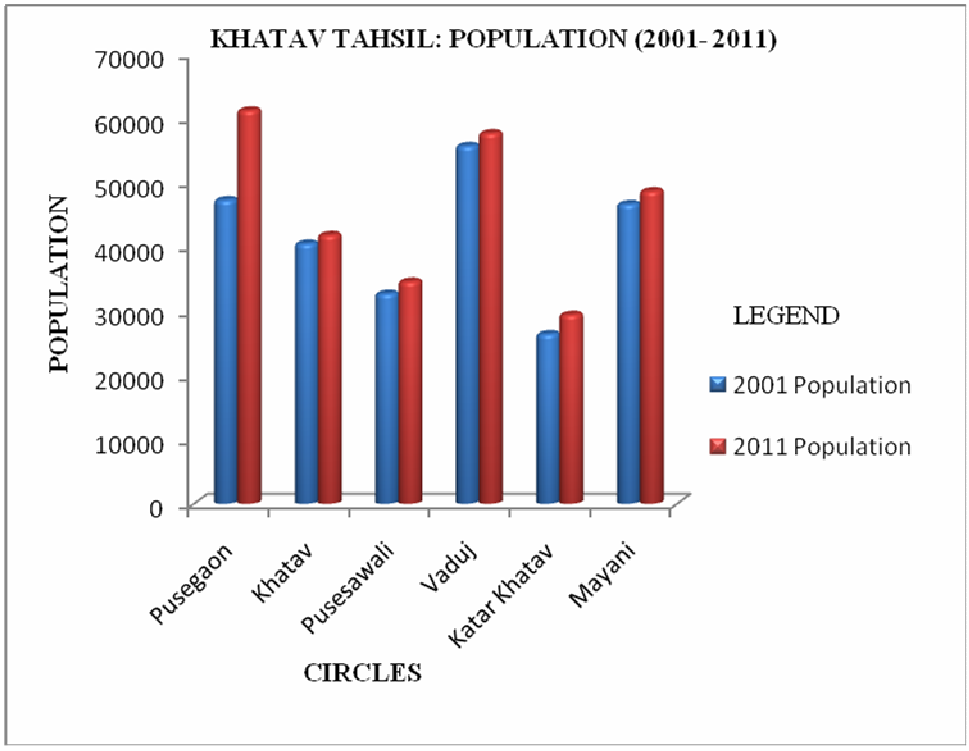

Fig.6.23 (A)

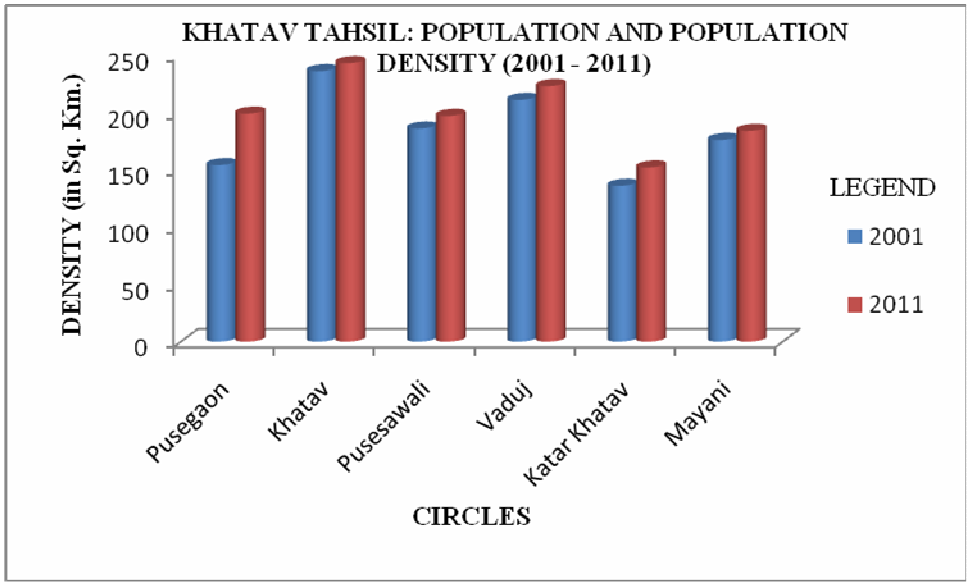

Fig.6.23 (B)

The above table 6.26 and fig. 6.23(A) and fig. 6.23(B) represents the data regarding the circle village-wise population and population density in Khatav tahsil in year 2001 and 2011. It is seen that, in 2001 census, tahsil has 2,49,450 population and 181 per sq. km. population density. In 2011 census tahsil has 2,75,274 population and 200 per sq. km. population density. There is increase of 24201 population and 19 people per sq. km population density between the both years in the tahsil.

Pusegaon circle villages have largest population and population density simple growth in the both years, having 13,967 population and 46 people per sq. km population density simple growth between both years. Katar Khatav circle villages have second dominant in population (3017) and population density (16 people per sq. km) simple growth in tahsil. Pusesawali circle-villages have 1904 population and 11 people per sq. km population density simple growth in tahsil. Besides, other circle villages have less population and population density simple growth.

6.22 Conclusion

Watershed Development has positive developed impact on socio-economic status of population. The ground water level has increased 27.98 percent in pre-monsoon and 0.44 percent in post-monsoon in the tahsil. The intensity of wells has increased 23.86 percent in the tahsil. There is also increased life of wells. Maize crop has mostly sown area in the tahsil. Also change in the Cropping pattern has stress on cash crop in the tahsil. The use of electricity and chemical fertilizers has increased 90.70 percent and 9.43 percent in the tahsil. The net benefit of various crops is increased on an average 78 percent in the tahsil. But, number of Cultivators has decreased 12.25 percent in the tahsil. Literacy rate has increased as 6.02 percent in the tahsil. Health and medical facilities have improved after Watershed Development in the tahsil. Watershed Development has dominant growth in population and population density in the tahsil. That means, all socio-economic factors have increased in the tahsil.

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CHAPTER VII

CONCLUSIONS AND SUGGESTIONS

Water is one of the second basic needs of human being. It is the equally important for the survival of flora and fauna. Drought and water scarcity has mostly in the Khatav tahsil. There are 143 villages in Khatav tahsil out of which nearly 50 villages are having water scarcity. After every 3-4 years this tahsil has drought-prone situation.

Watershed Development Programme (WDP) consists of conservation, regeneration and judicious use of all the resources natural resources like land, water, plants, animals and human-within the watershed area. The main objective of this programme is the water conservation or to protect, to conserve and to develop the surface and sub-surface water and evolve irrigation resources for use in agriculture, raise the sub-surface water levels for the sustainable development.

7.1 Conclusions

The present research work is concerned with the impact of Watershed Development Programme on socio-economic status of population in Khatav tahsil of Satara district (Maharashtra). The tahsil is drought-prone area and the Watershed Development Programme (WDP) has really dominant change in Khatav tahsil. The impact assessment is done at circle (village groups) level as well as village level. The impact of Watershed Development Programme has mostly on the development of irrigation. It has also positive change in groundwater level, cropping pattern, soil composition, fertility, agricultural production and land-use factors. Social changes, standard of living, conditions of houses, education, employment status etc. are also assessed. The special efforts are made to suggest high yielding varieties of various crops suitable for the study area. From the data analysis, field survey, observations and discussion with villagers, farmers, social workers and administrative officers following findings have emerged.

1. The tahsil is a part of Maharashtra Deccan basaltic plateau with an average height of 600 m above mean sea level. Some part of Mahadev hill ranges has come in the tahsil. Hilly ranges cover 32.06 percent, foot hills cover 44.12 percent and plains cover 23.82 percent area of tahsil.

2. The tahsil is drained by the river Yerala and her small tributaries-river Nani, river Karpur and river Chand. All these rivers are not permanent and are flowing in the deep and low land areas. Water of this sources does not use for irrigation because of highland area. For this area, lift irrigation is economically very costly.
3. The tahsil has mainly two colours of soil. The major portion is covered by brown soil 99.60 percent and Black soil has only 0.40 percent area.
4. Khatav tahsil comes in rain shadow area. The rainfall decreases from west to east from 600 mm to 250 mm. This tahsil has yearly normal rainfall between 450 mm. to 550 mm. After every 3-4 years this tahsil has scarcity of water.
5. According to 2011 census, the total population of Khatav tahsil was 2,75,274 with 49.70 percent male and 50.30 percent female population. This tahsil has only rural population. An average literacy rate of the tahsil is 72.11 percent with 77.90 percent male literate and 66.29 percent female literate. The sex ratio of the tahsil is 1012 females for 1000 males. The average density of the population is 200 people per sq. km, which was less than state average i.e. 315.
6. According to 2011census, tahsil has 59,699 numbers of households. Mostly big villages has ribbon or linear pattern settlement because there mostly villages have situated on the bank of Yerala river.
7. According to 2011census, in tahsil, the 70.43 percent population has engaged in primary activities, 2.87 percent in secondary activities and 26.7 percent in tertiary activities.
8. Khatav tahsil has mainly 6 historical and religious centers. Pusegaon is the popular for Sevagiri Maharaj temple, where more than 2 lakh people come in December from all over Maharashtra. This religious center has got 'B' grade pilgrimage status of Government of Maharashtra. The Mayani for Bird Sanctuary Flamingoes (comes from Siberia) is also big tourism center in tahsil.
9. The Khatav tahsil has 1,37,816 hectares the total geographical area. There has 1,11,378 hectares net agricultural usable area, 4,911 hectares area under forest, 8,173 hectares area not available for use, 1,225 hectares area under non-agriculture, 1,01,082 hectares total follow land, 5,540 hectares grazing land and 10,296 is net sown area.

10. As the population of tahsil has been increasing and need of water has also been increasing, it is necessary to develop watershed from 'Top to Bottom' and the surface water harvesting structures must be constructed according to topography, slope, soil type and geology of the watershed to meet the needs of the people as far as possible.
11. The total lengths of roads are 1256.54 km having an average density of 91.20 km of road length per 100 sq. km in tahsil.
12. This tahsil has more Watershed Development Programme Work (WDP). Uptil now, different WDP schemes have 1990.16 lakh rupees expenditure and irrigated 1451 hectares area irrigated in tahsil. Different WDP has 610 water storage number of work which storage 40,580 cubic meter water storage capacity through percolation tanks, village tanks, Kolhapur type bunds, daivartation bunds, underground bunds, lift irrigation, storage irrigation scheme, bridge mixed bunds, cement bandharas and earthen bunds etc. included in WDP scheme in the tahsil.
13. Different NGO's has also done various Watershed Development works in the tahsil. The NGO's like Phenix Organization, Vaduj; Panlot Vikas Sanstha, Nidhal; Gram Parivarthan Sanstha, Katgun; Sevagiri Devasthan Trust, Pusegaon; Sankalp Foundation, Vaduj etc. are in the tahsil for Watershed Development work.
14. Pusegaon circle has high WDP work in tahsil, involved 486.6 lakh rupees expenditure done on the 137 water storage structures in different WDP schemes. Mayani circle has second in WDP work in tahsil, involving 382.11 lakh rupees expenditure on the 105 water storage number of works in different WDP schemes.
15. Nidhal village is ideal village of district that has more than 42 water storage number of work. Hence, this village does not have shortage of water in summer season as well as drought condition.
16. Yerala is the major seasonal river in tahsil. This river is dry in the summer season. Hence, River Valley Project scheme has greatly followed in the Yerala river in tahsil.
17. In 2011, Khatav tahsil has 1589.68 hectares area and 95.37 lakh rupees project cost for IWDP (Integrated Watershed Development Programme) scheme project. Central Government has shared 87.43 lakh rupees and state

government has shared 7.94 lakh rupees. But expenditure was 9.60 lakh rupees.

18. From 2007-08, Hariyali Scheme has harvested every drop of rainwater for purpose of irrigation, drinking water, plantations including horticulture and floriculture, pasture development, fisheries etc. in the Hivarwadi, Kanasewadi, Khatwal, Palasgaon, Yelmarwadi etc. 5 villages of Katar Khatav circle only.

19. Khatav tahsil has most work under the MPJBSA (Mahatma Phule Jal va Bhoomi Sandharan Abhiyan) scheme in Satara district, implemented on 12,054.48 hectares area in the Khatav tahsil.

20. Khatav tahsil has 60 percent foothill region. Hence, this area is mostly cereal as well as pulse crop area. A sugarcane and cotton crop has just 10 percent area in the tahsil.

21. Vaduj, Pusesawali and Pusegaon circle have more than 60 percent sown area because these circles have majority Watershed Development Programme works in the tahsil.

22. Rabbi season has dominant crop cultivation and its production has 76.34 percent area under different crops. Besides, 21.72 percent area in Kharif season and 1.94 percent area in summer season have cultivated area under different crops.

23. Khatav tahsil is the “Cereal Granary” of Satara district because Cereal crops are predominant crops of tahsil, has 27,307 hectares, i.e., 73.55 percent sown area under cereal crops. Besides, 15.38 percent, 7.57 percent, 3.50 percent area under the pulse crops, cash crops, oilseed crops have sown in the tahsil respectively.

24. Khatav tahsil is also the “Jowar Storehouse” of Satara district because Jowar crop is the predominant crop of tahsil, has 65.87 percent sown area under Jowar crop. Others, 8.94 percent, 5.60 percent, 5.00 percent area under the Gram crop, Sugarcane crop, Bajara crop etc. have sown in the tahsil respectively.

25. As a result of WDP, the ground water level has increased in the Khatav tahsil, has 27.98 percent in pre-monsoon and 0.44 percent in post-monsoon groundwater level increased in the tahsil.

26. Tanks, cement bandharas, wells, borewells and medium tanks are the main sources of irrigation in the tahsil. The intensity of wells and tubewells have

increased after the Watershed Development in the tahsil. Intensity has increased 23.86 percent wells in the tahsil. There is also increase life of wells and tubewells.

27. Availability of water for irrigation, soil pattern, climate, physiography, rainfall, market price of crops, economic status of farmer etc. are the responsible factors for the change in cropping pattern in the 85 percent area of tahsil.

28. Sown area has increased from 65,078 hectares in 2001 to 80,944 hectares in 2011, showing a 24.38 percent simple growth.

29. Due to Watershed Development, tahsil has increased sown area of summer season, which is 42.89 percent area in this season. Also 35.09 percent sown area has increased in Kharif season in the tahsil.

30. Cash crops and pulse crops have dominantly increased sown area after Watershed Development in the tahsil; increasing 157.08 percent cash crops and 106.46 percent sown area of pulse crops in the tahsil.

31. Maize crop has mostly increased sown area from 1,875 hectares in 2001 to 3,744 hectares in 2011, showing a 49.91 percent increase.

32. Watershed Development has also increased the use of electricity, which is cause of growth in agro-based industries and well pumps in tahsil. Total use of electricity has increased from 6,27,37000 kg watt in 2001 to 1,19,632737000 kg watt in 2011, showing a 90.70 percent simple growth in the tahsil.

33. Use of agricultural machineries and agricultural tools has increased from 7016 in 2001 to 9645 in 2011, showing a 37.47 percent simple growth in the tahsil. Especially use of sugarcane crusher, oil engine pumps, electric pumps, petrol pesticide pumps; H.T.P., threshers, power tiller, and tractors etc. have increased after the Watershed Development in the tahsil.

34. Also the use of chemical fertilizers after the Watershed Development Programme has increased. This has increased from 21,369 metric tons in 2001 to 23,385 metric tons in 2011, showing a 9.43 percent improvement in the tahsil.

35. Mainly Pomegranate has growth about 38.81 percent after Watershed Development in the tahsil. Fruit farming have increased from 108 hectares in 2001 to 142.38 hectares in 2011, showing a 31.83 percent progress in the tahsil.

36. Aundh division has increased the dominant agricultural land use from 21,899.69 hectares in 2001 to 24,885.89 hectares in 2011, showing a 13.63 percent progress in the tahsil.

37. Jowar crop has dominant increased the agricultural productivity from 888.43 kg. per hectares in 2001 to 1,365 kg. per hectares in 2011, showing a 52.63 percent growth in the tahsil.

38. The net benefits of various crops are increased on an average 78 percent in the tahsil. (discussed in detail in chapter VI)

39. In Khatav tahsil, the positive development is seen in Livestock farming and Dairy farming. Livestock animals have increased from 3, 20,176 in 2001 to 3,49,910 in 2011, showing a 9.28 percent growth in the tahsil. Also, Daily Milk collection has increased from 66,750 liter in 2001 to 1,04,900 liter in 2011, showing a 57.15 percent growth in the tahsil.

40. Watershed Development work also has positive effect on number of vehicles. About 84.76 percent increase in the vehicles in the Khatav tahsil, increasing density and length of roads, due to increase of agricultural income and profit.

41. The pressure of population growth and the practice of dividing land equally among the heirs is caused excessive sub divisions of farm holders in the tahsil. In Khatav tahsil, marginal farmer has 53.24 percent quantity of farmers followed by small farmers 34.77 percent, semi- medium farmers were 6.13 percent, medium farmers 3.00 percent and large farmers 2.86 percent in the year 2011.

42. After Watershed Development, clean and pure drinking water comes near or in front of house with the help of tap and pipelines in the tahsil. Hand pumps play important role in drinking water supply, 592 hand pumps are in use in tahsil.

43. Education status has developed and became higher and occupational education (D. Ed, B.Ed., M.Ed., I.T.I., B.C.A, English medium schools, Computer training course, Pharmacy, Polytechnic Engineering etc.) in the tahsil.

44. Before the WDP, there had 66.92 percent literate population, 74.95 percent male literate population and 59.08 percent female literate population in the tahsil. There is increase by 5.19 percent literate population in after the WDP and were created 66.92 percent literate population, 74.95 percent male literate population and 59.08 percent female literate population.

45. In 2001, there was 66.92 percent literate population, 74.95 percent male literate population and 59.08 percent female literate population. There is increase by 5.19 percent literate population in 2011.

46. Due to progress of primary activities there is positive change on secondary and tertiary activities after Watershed Development in the tahsil.

47. A Watershed Development has increased the number of households and develops status of house in the tahsil. The numbers of households have 14.11 percent average simple growth in the tahsil. Now, people have interest in high expenditure, systematic house construction planning, with all house facilities, including hall, kitchen room, bedroom, gallery, porch, toilet facilities and water connection in the Khatav tahsil. In short, they want to improve standard of living.

48. Health and medical facilities have been improved (Sub-centers about 30 percent and private hospitals- about 141 percent) after Watershed Development in the tahsil. Private health and medical facilities have more development (about 141 percent) because of well service, good and clean hospitals, urgent services, best modern and highly technical hospitals and machineries etc.

49. Watershed Development has dominant growth in population and population density in the tahsil. Pusegaon circle has maximum effect on population and population density during 2001 and 2011, has simple growth about 13,967 population and 46 people per sq. km population density on after the Watershed Development.

50. The dis-advantages of Watershed Development Programme works are:-

    i. It is seen that villages have increased the quarrels and corruptions. Such things are reaching in the tahsil and circle administrative offices.

    ii. The WDP adopted villages has been increases concentration of the population. There is found the maximum immigration from other tahsils for agricultural works.

    iii. Salinitization of farmland is increased in the excessive water use area. Those areas majorly observed near the large water resources like dam, canals, percolation tanks, cement bunds etc.

iv. The WDP adopted villages have shortage of labour in kharif and rabbi season. This dis-advantage occurs because of the same period have some work in all that villages.

v. There is increased the value of farm land. The permanent water availability for agriculture and agricultural productivity is increased in the WDP adopted villages. So, there is noted maximum value of Farm land.

vi. Since the maximum landuse, the deforestation is increased in the area. The permanent water availability for agriculture have increased the agricultural land use. Therefore, wasteland, follow land and forestation area came under the agricultural land use.

vii. Due to high use of Pesticides and Insecticides, chemically polluted food-grains and vegetables comes in the daily life. The permanent water availability for agriculture is increased the fruits farming and truck farming in the WDP adopted villages. So, there used the maximum pesticides and chemical fertilizers. It has also impact on ecosystem and biodiversity in that area.

viii. Since the high availability of water, Cash crop has mostly concentrated in that area. Also, the permanent water availability for agriculture is changed cropping pattern in the WDP adopted villages. And farmers concentrated on the cash crops cultivation like Sugarcane crop.

ix. Cultivators have negative impact of Watershed Development, affecting their decrease from 70,859 in 2001 to 62,176 in 2011, showing a 12.25 percent loss in the tahsil. It is because of their migration to cities in search of work, education, business and scarcity of land and their despair.

Case Study-Selected Sample Farmers-Concluded that

1. In the post-watershed development work period, the area of fallow and dry land has shown a decreasing trend and there has been a considerable increase in the seasonal and permanent land area. It is the basic benefit of the Watershed Development work.

2. Sample farmers study analyses that, in the study area, after the Watershed Development work, decreasing trend of the area under cultivation for pulses. On the other hand, the area under cultivation in respect of crops like cereals, cash crops, oilseeds, fruits and vegetables are increased. The simple growth rate has consistently remained positive. All the sample farmers have abandoned cereals and turned to some other cash crops.

3. The main thing to be noted is that, the maximum growth rate of all crops has occurred in the medium farmers' category (382.57 %).

4. The highest rise in vegetables (105 %) while the lowest rise in red gram (Tur) (3.64%) occurred in Khatav tahsil.

5. Out of 326 sample farmers, 163 (50 %) farmers have opined that, the cash crops are more beneficial than other crops. Only 18 (5.52 %) farmers have opined that the oilseeds crops are more beneficial. The crops of fruits and vegetables 87 (26.69 %) and cereals 58 (17.79 %) are also beneficial to some extent.

6. Before Watershed Development the total area under irrigation was 336 hectares, increasing (105.95 percent) to 692 hectares after Watershed Development work.

7. The notable thing is that area under surface irrigation and sprinkler irrigation is very high in the case study of sample farmers.

8. In the post-watershed development work period, there has been substantial increase in the use of both chemical and compost fertilizers among all the categories of the farmers. On an average, the use of chemical fertilizers has grown from 4.78 quintals/hectare (41.82 %) to 6.65 quintals/hectare (58.18%) at a simple growth rate of 39.02%. There is also an increase in the average use of compost fertilizers from 6.27 quintals/hectare (45.43 %) to 7.53 quintals/hectare (54.57%) at a simple growth rate of 20.21%. The growth of compost fertilizers is less than that of chemical fertilizers.

9. Before the Watershed Development work, the overall use of pesticides per hectare was Rs. 4464.33 per hectare (17.83 %), which increased after the

Watershed Development work to Rs. 20,571.33 per hectare (82.17%), especially in the fruits and vegetable farming. Its growth rate has been 360.80 %.

10. The numbers of mandays consumed by the farmers for their agricultural work are seen to have increased.

11. In the post-watershed development work period, many farmers have taken to horticulture and hence, the largest number of farmers owns a sprayer (for spraying insecticides and weedicides). Harvester saves huge labour on large pieces of land. Nearly, one-fifth farmers own a tractor, which in turn has reduced the number of farmers owning a bullock cart. In recent times, as the area under sugarcane crop has increased, so that the use of rotor and slightly more than one-fourth farmers own it. Evidently, large farmers own a large number of implements, while the small and marginal farmers own less number of implements.

12. The gross income before Watershed Development work period of the respondents was Rs. 137.17 lakh (24.67 %), which has increased to Rs. 418.6 lakh (75.33 %) after the Watershed Development work to as 205.17 % simple growth rate.

13. Above Rs. 1.0 to 2.0 lakh income range dominantly increased after the Watershed Development work showing 420.77 % simple growth rate.

14. The average savings of the respondents was Rs. 6,586.78 (18.49 %) before the Watershed Development work period, which has increased after the Watershed Development work period upto Rs. 29,038.3 (81.51 %). It means that the impact of Watershed Development work period is seen on the saving of respondents showing 390.6 % simple growth rate.

15. The standard of living of the farmers in the study area has improved remarkably in the post-watershed development period, mainly in the use of TV, Gas and Motorcycle. (above 100 %).

16. In the pre-watershed development work period, the respondents collectively held a total of 1948 animals; their number increased to 4846 animals in the

post-watershed development work period, counting a growth rate of 148.77 %, mainly noted increase in milk animals like cows and buffalos.

17. The Watershed Development work has recharged the underground aquifers making the water levels in the wells to rise up. There is 99.51 % simple growth in wells and 301.17 % simple growth in tubewells.

18. Prior to the undertaking of the Watershed Development work, the milk production was normally at 573 liters/day, but after the Watershed Development work period, the production has risen to 2182 liters/day showing 293.11 percent simple growth rate.

19. In the opinion of 72 (22.09 %) respondents, the people's participation was none, another 48 (14.72 %) respondents opined that it was only fair, and lastly, 206 (63.19 %) respondents felt that it was good.

20. The advantages of Watershed Development programme works changes noted in the land-use and cropping patterns, increase in crop production and productivity, beneficial crops, sources and methods of irrigation, use of fertilizers and pesticides, employment generation, agricultural income, gross income and income ranges, savings, investments, standard of living, adoption of modern farming techniques, livestock and income from them, ground water level, people's participation in Watershed Development works, satisfaction with water conservation works about water conservation work.

Observation of researcher while direct visit to farms, villages and discussion with farmers and experts-Concluded that-

1. It is seen that there is less quantity of traditional agriculture and farmers shifted towards modernization of agriculture because in every year agro exhibition held in the month of November at Karad in respect of varied governmental departments, foreign companies, agro based technical demonstration, new finding in agro field etc.
2. Through such agro exhibition farmers get information about farm and related field information and use it in their own land in respect of agricultural tools, machineries, transportation , vehicles, seeds, fertilizers, pesticides, agricultural journals, organic farm, foreign agricultural technology, different models, dairy

industry, livestock medicine, livestock feed, nontraditional energy sources, information about livestock conservation, agricultural financial aid, manufacturing based on saving group, agricultural education, chain of cement bandharas, ideal marketing committee, micro irrigation, Watershed Development, direct marketing of vegetable, ideal village, water management controlled by solar energy etc.

3. Farmers are growing new agricultural products like foreign vegetables. For examples- Broccoli, Cabbage, Cauliflowers, Silverbeet, Chard etc.
4. New chained cement bandharas are wide and deep so as to increasing water storage capacity planed at low cost.
5. Due to direct contact between producers of technology and farmers opportunity available in respect of information about products and solution of many doubts of farmers.
6. It is seen that water availability period increased where Watershed Development work take place.
7. Along with Watershed Development work there is increased participation of women in different social works like 'self help group', 'Tanishka Group' like social, political, educational etc.
8. It is seen that due to increased Watershed Development programme and increased benefit farmers are sending their children to take higher education in different cities and different faculties on a large scale.
9. It is observed from survey that drought condition in 2002-03, 2012-13 leads increasing farm pond, drip irrigation, sprinkler irrigation, increased awareness of importance of water among farmers.
10. It is seen that there is increase in agricultural productivity due to permanent availability of water in the study area.
11. Due to Watershed Development programme there is increase in employment seen at village level, but unavailability of labours and increased wages of labour farmers' trend goes from labour to machinery.
12. Many farmers have used auto starters, mobile starters in order to save energy, electricity, time and money, etc.
13. Now the generation of farmers is coming to agricultural field having modern scientific knowledge of agriculture.

14. Farmers are getting quick decision about marketing for agro products about prices about price list of products, using mobiles, telephone and internet to brokers.
15. Cash crops like cotton, sugarcane, ginger, potato, peas, onion, horticulture and floriculture etc. crops are getting fixed rate, so farmers are selecting specific kinds of crops.
16. Traditional crops like pulses, oilseeds are also getting higher rates as compared to cash crops.
17. Where Watershed Development works completed the rate of barren land around it increased about double or triple rates, due to permanent water availability.
18. It is seen that some farmers select crops according to the availability of water.
19. It is seen that agro-based occupations increased like juice centers, fruit centers, and vegetable centers etc. along roadside in Watershed Development programme area.
20. People are visiting agro exhibitions every year on a large scale in order to get modern techniques in crops and fields at Pune and Karad.
21. Farmers are using drip irrigation, sprinkler for cash crops in permanent period e.g. sugarcane, cotton, ginger, turmeric etc.
22. Farmers are turning to dairy industry on large scale as compared to the past.
23. It is seen that now farmers are using cow dung on a large scale in spite of chemical fertilizers and increasing productivity of their land because of increased rates of chemical fertilizers and its adverse effects.
24. It is seen that farmers are taking inter crop pattern i.e. sugarcane with other crops like onion, wheat, ladyfinger, groundnut, maize, potato etc.
25. To avoid electricity problem it is seen that farmers are building water tanks or farm ponds at high level in farm and given water for crops using slope pressure.
26. Farmers are building farm ponds by taking 50 % governmental subsidies in their fields for availability of water for crops, according to farm area.
27. People from developed area are now ready to accept marital relations with the people from area of Watershed Development work. Children of farmers turned to higher education, achieved services in best sectors, increased

standard of living, increased agricultural production and income as a result of Watershed Development programme.

28. The work of Watershed Development is divided into three groups, viz; upper, middle and lower part of watershed. In upper part of watershed CCT, plantation and forestry is done. In the middle part, vegetative contour, graded bunds, bench terracing, ill drain land, improvement trenches are constructed. In lower part of the watershed, earthen structures, loose boulder structures, gabion bunds, underground bunds, dugout sankan pond, farm pond, recharging trench, nala bund stabilization, cement nala bunds, vanarai bandhara and percolation tanks are constructed.

7.2 SUGGESTIONS

After every 3-4 years, Khatav tahsil has problem of drought. Its people have shortage of water every year in summer season. Drinking water supply through tankers cannot be permanent solution on drought as well as drinking water problems. People want permanent solution for water shortage in the tahsil. There is really a need of water conservation and water reuse planning. Sustainable, potential alternative water resources finding and conservation is important for solution for water scarcity problems. Providing irrigation to the maximum extent possible is the major step in relieving the drought affected areas from scarcity conditions. Watershed Development on a large scale is the best solution to overcome such problems.

The recommendations with respect of the solution of the water scarcity problems are based on the field work undertaken by the researchers, geographers, geologists, planners, engineers, agricultural officers, farmers etc. views expressed by the water conservation experts and activists, informal discussions with the concerned government officials and representatives of the NGOs working in this field as well as academicians. These recommendations are presented below:

1. For the success of Watershed Development programme, participation of people has immense importance. Therefore, there should have village wise organizations or groups of people. With that organizations/ committee or groups, people should make various water conservation and water storage plans for future at village level.
2. Farmers should select crops according to rainfall ratio and water availability in the village.

3. Watershed Development scheme should built best quality construction of watershed work for water conservation and storage.
4. Government should keep the one supervisor for watershed work maintenance or care after completion of WDP.
5. Watershed Development work should be built on suitable places and there should be no any political interference.
6. Farmer should take short duration varieties of crops.
7. Government should have different useful policies to increase agro-based industries like cold storage, cotton industries, sugar industries, grains and fruit processing industries and milk products and milk chilling centers etc. at the tahsil level by considering local resources.
8. People should give stress on Group Farming Agriculture.
9. Government should organize agricultural exhibitions for farmers at tahsil level.
10. Government should establish at least one Agricultural mahavidyala at tahsil level.
11. The farmers should be trained in crop rotation methods and long-term crop planning on their lands, instead of taking only one or two particular crops every year and thereby reducing soil fertility and creating problems of water logging and salinity in the tahsil.
12. Because of the availability of additional surface and sub-surface water, inter cropping should be extensively promoted for better exploiting land productivity and their by increasing farmers' income.
13. The people's participation in the establishment of the water conservation structure needs to be enhanced. Particularly, the farmer population that is going to be directly benefitted by the proposed structures should be encouraged to come forward for such participation. Part of the project cost may be recovered from the farmers who retrain from making their contribution.
14. Government should educate and train the farmers about better exploiting the available resources of land and water, so as to enhance crop yields. This could be better organizing through agricultural schools and colleges. Agricultural extension workers should motivate the farmers to attend such training camps.

15. The smaller water conservation structures like percolation tanks, cement bandharas, bunds and ponds, can effectively substitute for large dams provided the quality of the work to avoid misuse of energy, time and extra expenses and minimize the environmental impact.
16. The scope of the water conservation work needs to be enhanced. In a particular geographical area, only such work at appropriate places, need to be undertaken and finished within the scheduled time and without falling victim to the local pressures or any political interfere.
17. Water literacy among the people needs to be spread more widely for reducing the intensity of problems of water for human, animal, agricultural and other consumption.
18. Government should give sufficient funds for incomplete watershed schemes and that fund should be really spent on it, so that these schemes will be completed.
19. Government should give decision power or responsibility to "Village Community" (Gramsabha) for Watershed Development work.
20. Government should ban too deep tubewell digging and should stress on the farm ponds.
21. Regulated agricultural produce market mechanism need to be enforced in the areas where farm produce have shown more than 50 percent increase during last 3 years. This would ensure remunerative prices for the farm produce and also would alleviate the marketing problems of the farmers.
22. There should be village-wise water and soil testing laboratory and suggestions should be given to the farmers regarding crops, use of fertilizers, insecticides, pesticides etc.
23. National and commercial banks should provide low interest rate of finance for small farmers.
24. Watershed Development has significant impact on groundwater recharge and access to groundwater. Therefore government should focus on chain cement bunds which mainly increase groundwater recharge.
25. An effective measure for preventing the misuse of water is to supply electricity to irrigation pumps on metered basis, rather than on "per horse power" basis. Free supply of electricity should be strictly avoided.

26. Every effort should be undertaken to educate the farmers to avoid the misuse of precious water, such as cultivating crops that need minimum water and avoiding crops needing maximum use of water, adaptation of drip and sprinkler irrigation methods, rewarding prizes to the farmers making optimal use of water, undertaking research on the crops that need less water and are ready for harvesting in a short period of time etc.

27. The waste water of industrial and urban areas should be processed for its re-use for agricultural purposes.

28. The idea of rainwater harvesting and roof top harvesting need to be forcefully promoted for recharging underground aquifers.

29. The billing for drinking water supply to be done on metered basis, instead of on the pipe diameter basis.

30. All water conservation and irrigation works need to be brought under the control of a single State Ministry headed by a Cabinet Minister.

31. The responsibility for the maintenance of the completed Watershed Development works should be entrusted to the beneficiary farmers; and the maintenance work should be supervised by the Tahsil Agricultural Officer of the State Government.

32. If 50 percent of the likely beneficiary farmers demand for the establishment of a particular Watershed Development structure, it should be completed in time and on priority basis.

33. Pipelines need to be brought into wider use for carrying water from different sources to the standing crops in order to avoid losses through leakages and evaporation when the water is carried through open canals and channels.

34. The farmers whose land become saline due to over use of water need to be punished with such as suspending the privilege of water use per irrigation, denying crop loans and other financial assistance to such farmers.

35. A flat uniform surcharge should be levied on the farmers benefiting from a particular Watershed Development work established at the public cost.

36. The people's representatives, Government, Government Officials and the beneficiary community should become alert to the indispensability of the Watershed Development work and misuse of water.

37. In the watershed areas, different Watershed Development structures need to be established from the hilltop to bottom. Only when all the works in

watershed area are fully completed, the works in the next watershed area may be undertaken.

38. Permanent water sources and continuous electric supply should be provided to farmers in order to enhance agricultural income.
39. There should be good condition of roads and short roads should be provided to farmers towards their farms by government.
40. For every crop government should declare fixed rate according to production cost of crop and income.
41. Farmers should provide attention to agro-based occupations in order to enhance agricultural income like nursery, sugarcane juice centers, organic vegetable shopping centers, floor mill, milk product shopping centers and giving tractors, rotors, hollers on rental basis.
42. Farmers should grow medicinal plants Alovera, Jambhal, Hirda, Anjaan, Chandan, Surangi, Adulsa etc. farming to increase their income.
43. The beneficiary community should take aside saturated soil deposition from cement bandhara from their own contribution and the same soil deposition should be used in the farms and government should not waste money.
44. Establishing weather station at tahsil level. If the farmers get information from grampanchayat about rainfall in the surrounding water table level, available water storage and daily climate etc. they can easily plan their farming activities.
45. In every village government servants, farmers need to come together and form committee and they should use it for development of their village and preference should be given to Watershed Development programmes.
46. Roof top harvesting should be done compulsory, so as to increase water table level.
47. Cash crops like sugarcane, turmeric, banana, ginger, cotton etc. should be taken with the help of drip irrigation instead of over use of water by stream irrigation.
48. Farmer should not be allowed lifting water from where Watershed Development Programmes take place. They should use drip irrigation from the surrounding wells and borewells for their crops.
49. Farmers should collect soil deposition often their own and use it in their farm so as to increase the fertility of their land and also increase water table level

from the surrounding where the percolation tanks, cement bandharas, earth bunds, etc. built up.

50. Small farmers in the village should come together and send their products to market on their own and then they should get reasonable rate for their agricultural products.

51. Farmers should grow good quality of agricultural products and export it to world market so as to get more income for them.

52. Farmer should provide essential water controlled by computer system to their crops with the help of drip irrigation.

53. Farmer should accept new techniques and use it in order to make less expenditure in agricultural products.

54. Now-a-days there is problem of agricultural labours increasing wages on a large scale. So farmer should get information about different agricultural instruments and tools from agriculture exhibitations and use it to make less labour of farmers.

55. Many agricultural products processing industries should be developed in the surrounding area to remove the problem of waste agricultural goods.

56. Farmer should sell their products direct to consumer, so as to get better benefits of their products.

57. The government should repair leakage of percolation tank, cement bandharas, earthen bunds, canals etc.

58. Farmer should grow agro based tourism centers and should provide different facilities to tourists like travel by cart, swimming, *hurda party, vanbhojan,* different facilities for children etc., juice centers, organic vegetables and fruit stalls etc. so as to increase income and employment.

59. All the villages in the tahsil should participate in governmental Jalyukta Abhiyan based schemes to increase water level by prohibiting everywhere to avoid shortage of water in future.

60. In order to avoid future crop damage, the farmer should record about their new experiences from earlier crops because 'farm is research laboratories of different crops'.

61. To get more profit from crops the farmer should have seed process on seeds before sowing so as to increase growth capacity of crops like raizobiaum, azotobacter etc.

62. The farmer should plan about quality and quantity of crops so that agricultural merchants will purchase agricultural products with maximum rates by coming to fields.

63. Farmer should have gradation in respect of good quality; attractive packing and they will get more profit.

64. Farmer should use evalock chemical to less water evaporation speed of storage of water in farm ponds.

65. The government should permit for the machinery such as JCB, tractors etc. for Watershed Development work where the labours are not available.

66. A village should be taken as unit for Watershed Development. All the micro watersheds of a village should be treated at one time so that the total socio-economic development will be measured.

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APPENDIX

Appendix – I

KHATAV TAHSIL: SEASON WISE ALL CROPS (2012-13) (in Hect.)

Sr. No	Season	Crops	Pusegaon	Khatav	Pusesawali	Vaduj	Katar Khatav	Mayani	Total
		Cereals	447	479	459	482	489	514	**2870**
		Pulses	301	291	342	272	275	281	**1762**
1	Kharif	Oilseeds	178	161	167	157	148	135	**946**
		Cash Crops	547	443	515	428	272	279	**2484**
		Total	**1473**	**1374**	**1483**	**1339**	**1184**	**1209**	**8062**
		Cereals	3564	3948	3741	3975	4214	4377	**23819**
		Pulses	597	467	764	676	659	599	**3762**
2	Rabbi	Oilseeds	--	16	--	9	24	19	**68**
		Cash Crops	128	112	91	77	58	42	**508**
		Total	**4289**	**4543**	**4596**	**4737**	**4955**	**5037**	**28157**
		Cereals	**48**	**--**	**37**	**25**	**--**	**--**	**110**
		Pulses	--	--	--	--	--	--	--
3	Summer	Oilseeds	114	--	97	73	--	--	**284**
		Cash Crops	133	120	117	76	38	32	**516**
		Total	**295**	**120**	**251**	**174**	**38**	**32**	**910**
Total Crop Area			**6057**	**6037**	**6330**	**6250**	**6177**	**6278**	**37129**

Source: Agricultural Department of Khatav Tahsil (2012-13)

Appendix – II
KHATAV TAHSIL: CEREAL CROPS (2012-13) (in Hect.)

Sr.No.	Season	Crops	Pusegaon.	Khatav	Pusesawali	Vaduj	Katar Khatav	Mayani	Total
1	Kharif	Paddy	--	--	--	--	--	--	**--**
		Jowar	86	92	91	95	101	105	**570**
		Bajara	273	304	287	309	320	337	**1830**
		Wheat	--	--	--	--	--	--	**--**
		Maize	88	83	81	78	68	72	**470**
		Other	--	--	--	--	--	--	**--**
		Total	**447**	**479**	**459**	**482**	**489**	**514**	**2870**
2	Rabbi	Paddy	--	--	--	--	--	--	**--**
		Jowar	3342	3744	3532	3778	4028	4198	**22622**
		Bajara	--	--	--	--	--	--	**--**
		Wheat	154	142	149	138	131	126	**840**
		Maize	68	62	60	59	55	53	**357**
		Other	--	--	--	--	--	--	**--**
		Total	**3564**	**3948**	**3741**	**3975**	**4214**	**4377**	**23819**
3	Summer	Paddy	--	--	--	--	--	--	**--**
		Jowar	--	--	--	--	--	--	**--**
		Bajara	--	--	--	--	--	--	**--**
		Wheat	--	--	--	--	--	--	**--**
		Maize	48	--	37	25	--	--	**110**
		Other	--	--	--	--	--	--	**--**
		Total	**48**	**--**	**37**	**25**	**--**	**--**	**110**
Total Cereal Crops			**4059**	**4427**	**4237**	**4482**	**4703**	**4891**	**26799**

Source: Agricultural Department of Khatav Tahsil (2012-13).

Appendix – III
KHATAV TAHSIL: PULSE CROPS (2012-13) (in Hect.)

Sr. No.	Season	Crops	Pusegaon.	Khatav	Pusesawali	Vaduj	Katar Khatav	Mayani	Total
1	Kharif	Tur	9	7	17	11	12	6	62
		Mung	99	108	115	102	95	111	630
		Udid	20	17	28	15	18	12	110
		Other	173	159	182	144	150	152	960
		Total	**301**	**291**	**342**	**272**	**275**	**281**	**1762**
2	Rabbi	Grams	453	360	614	557	540	504	3028
		Mung	--	--	--	--	--	--	--
		Udid	102	75	113	89	90	71	540
		Other	42	32	37	30	29	24	194
		Total	**597**	**467**	**764**	**676**	**659**	**599**	**3762**
3	Summer	Tur	--	--	--	--	--	--	--
		Mung	--	--	--	--	--	--	--
		Udid	--	--	--	--	--	--	--
		Other	--	--	--	--	--	--	--
		Total	--	--	--	--	--	--	--
Total Pulse Crops			**898**	**758**	**1106**	**948**	**934**	**880**	**5524**

Source: Agricultural Department of Khatav Tahsil (2012-13).

Appendix – IV
KHATAV TAHSIL: CASH CROPS (2012-13) (in Hect.)

Sr.No.	Season	Crops	Pusegaon	Khatav	Pusesawali	Vaduj	Katar	Mayani	Total
1	Kharif	Cotton	140	106	129	92	--	--	**467**
		Sugarcane	407	337	386	336	272	279	**2017**
		Total	**547**	**443**	**515**	**428**	**272**	**279**	**2484**
2	Rabbi	Cotton	--	--	--	--	--	--	**--**
		Sugarcane	128	112	91	77	58	42	**508**
		Total	**128**	**112**	**91**	**77**	**58**	**42**	**508**
3	Summer	Cotton	133	120	117	76	38	32	**516**
		Sugarcane	--	--	--	--	--	--	**--**
		Total	**133**	**120**	**117**	**76**	**38**	**32**	**516**
Total Cash Crops			**808**	**675**	**723**	**581**	**368**	**353**	**3508**

Source: Agricultural Department of Khatav Tahsil (2012-13).

Appendix – V

KHATAV TAHSIL: OILSEED CROPS (2012-13) (in Hect.)

S. N	Season	Crops	Pusegaon	Khatav	Pusesawali	Vaduj	Katar Khatav	Mayani	Total
1	Kharif	Groundnut	--	--	--	--	--	--	--
		Seasum	--	--	--	--	--	--	--
		Niger	13	20	15	19	28	21	116
		Sunflower	--	--	--	--	--	--	--
		Soyabean	165	141	152	138	120	114	830
		Total	**178**	**161**	**167**	**157**	**148**	**135**	**946**
2	Rabbi	Groundnut	--	--	--	--	--	--	--
		Seasum	--	--	--	--	--	--	--
		Niger	--	16	--	09	24	19	68
		Sunflower	--	--	--	--	--	--	--
		Soyabean	--	--	--	--	--	--	--
		Total	**--**	**16**	**--**	**9**	**24**	**19**	**68**
3	Summer	Groundnut	114	--	97	73	--	--	284
		Seasum	--	--	--	--	--	--	--
		Niger	--	--	--	--	--	--	--
		Sunflower	--	--	--	--	--	--	--
		Soyabean	--	--	--	--	--	--	--
		Total	**114**	**--**	**97**	**73**	**--**	**--**	**284**
Total Oilseed Crops			**292**	**177**	**264**	**239**	**172**	**154**	**1298**

Source: Agricultural Department of Khatav Tahsil (2012-13).

Appendix –VI

KHATAV TAHSIL: ALL CROPS AREA
(2001, 2006 and 2011)

Sr. No.	Year	Crops	Cropping Season						Total		Volume of Change
			Kharif		Rabbi		Summer				
			Area in Hect.	%	Area in Hect.	%	Area in Hect.	%	Area in Hect.	%	%
1	2001	Cereals	31385	82	22738	85.36	120	16.44	54243	83.35	---
		Pulses	3700	9.81	2825	0.60	00	00	6525	10.03	---
		Oilseeds	1820	4.83	1075	4.04	285	39.04	3180	4.88	---
		Cash Crops	805	2.14	00	00	325	44.52	1130	1.74	---
		Total	**37710**	**100**	**26638**	**100**	**730**	**100**	**65078**	**100**	**---**
2	2006	Cereals	42345	68.57	27005	83.28	135	20.45	69485	73.27	-10.83
		Pulses	13820	22.57	4215	12.99	00	00	18035	19.02	+8.99
		Oilseeds	3680	5.96	1205	3.73	360	54.56	5245	5.53	+0.65
		Cash Crops	1905	3.09	00	00	165	24.99	2070	2.18	+0.44
		Total	**61750**	**100**	**32425**	**100**	**660**	**100**	**94835**	**100**	**----**
3	2011	Cereals	34564	67.85	25395	85.84	110	26.38	60069	74.21	+0.94
		Pulses	10263	0.15	3209	10.85	00	00	13472	16.64	-2.38
		Oilseeds	3212	6.30	979	3.31	307	73.62	4498	5.56	+0.03
		Cash Crops	2905	5.70	00	00	00	00	2905	3.59	+1.41
		Total	**50944**	**100**	**29583**	**100**	**417**	**100**	**80944**	**100**	**---**

Source: Agricultural Department of Khatav Tahsil (2001, 2006 and 2011).

Appendix – VII

KHATAV TAHSIL: ALL CROPS AREA
(2001, 2006 and 2011)

Ranking No.	Crops	2001		2006		2011	
		Area in Hect.	Area in %	Area in Hect.	Area in %	Area in Hect.	Area in %
1	Jawar	28475	44.08	33875	39.65	26800	36.38
2	Bajara	23520	36.41	29245	34.23	26655	36.2
3	Wheat	3185	4.93	4815	5.64	4510	6.12
4	Maize	1875	2.9	4595	5.38	3744	5.08
5	Tur	1548	2.4	2340	2.74	2363	3.2
6	Mung	1390	2.15	1935	2.27	1900	2.58
7	Udid	1115	1.73	1765	2.06	1814	2.46
8	Groundnut	1070	1.66	1630	1.91	1378	1.87
9	Sesamum	580	0.9	1130	1.32	1117	1.52
10	Niger	555	0.86	1005	1.18	1090	1.48
11	Sunflower	550	0.85	940	1.1	1020	1.38
12	Soyabean	485	0.75	805	0.94	589	0.8
13	Cotton	170	0.26	735	0.86	477	0.65
14	Sugarcane	65	0.1	310	0.36	204	0.28
15	Paddy	15	0.02	305	0.36	0	0
	Total	**64598**	**100**	**85430**	**100**	**73661**	**100**

Source: Agricultural Department of Khatav Tahsil (2001, 2006 and 2011).

Appendix – VIII
KHATAV TAHSIL: GENERAL LAND USE
(in Hectares)

Sr. No.	Circles Name	Total Geographical Area	Land Under Forest	Area Not Available for Cultivation	Non-Agricultural Use	Total Follow Land	Cultivable Land	Net Sown Area	Grazing Land
1	Pusegaon	30746	1055	851	213	15499	17313	1814	926
2	Khatav	17195	374	1402	191	16847	18558	1711	923
3	Pusesawali	17582	567	890	204	16808	18588	1780	849
4	Vaduj	26415	718	1362	271	15163	16908	1745	831
5	Katar Khatav	19390	952	1938	174	18571	20140	1569	997
6	Mayani	26486	1245	1730	172	18194	19871	1677	1014
Total		**137816**	**4911**	**8173**	**1225**	**101082**	**111378**	**10296**	**5540**

Source: Socio-Economic Review and District Statistical Abstract of Satara District (2011-2012)

Appendix – IX
KHATAV TAHSIL: OCCUPATIONAL STRUCTURE OF TOTAL POPULATION
(1981-2011) (In Percentage)

Sr. No.	Year	Activities	Worker Population	Male Worker	Female Worker
1	1981	Primary	84.42	55.44	44.56
		Secondary	2.64	99.13	0.87
		Tertiary	12.94	98.15	1.85
2	1991	Primary	85.52	51.38	48.62
		Secondary	2.43	99.10	0.90
		Tertiary	12.05	98.27	1.73
3	2001	Primary	79.84	55.91	44.09
		Secondary	2.94	98.49	1.51
		Tertiary	17.22	95.02	4.98
4	2011	Primary	70.43	67.43	76.56
		Secondary	2.87	2.43	3.76
		Tertiary	26.7	30.14	19.68

Source: District Census Handbook, Satara (1981-2011).

Appendix – X

KHATAV TAHSIL: ANIMAL CENSUS (2001 and 2011)

Sr. No.	Animals	2001 Year	2011 Year	Simple Growth in %
1	Hybrid Cow	6,950	11,065	59.20
2	Hybrid Ox	535	839	56.82
3	Indigenous Ox	18,488	17,937	-2.98
4	Buffalo	37,536	41,736	-11.18
5	Male Buffalo	466	5,652	1112.87
6	Goats	46,785	59,052	26.21
7	Ships	30,048	29,393	-2.17
8	Pigs	1507	863	-42.73
9	Hens	16,1442	1,65,217	2.33
10	Horses	50	90	80
11	Donkey	177	609	244.06
12	Dogs	16,167	17,327	7.18
13	Rabbits	25	130	420
Total		3,20,176	3,49,910	9.28

Source- District Livestock Conservation Officer, ZP Satara (2001 and 2011).

Appendix – XI

Semi-Structured Questionnaire for the Beneficiaries of Watershed Development Programmes in Khatav Tahsil

1) Name of family-head farmer :
   Village :

2) Age (in years) : 1) 21- 40 2) 41-60
   : 3) Above

3) Members in the family :

4) Education : a) illiterate b) upto 10^{th} c) upto 12^{th} d) Graduate e) Post-graduate

5) Type of Family : 1) Nuclear 2) Joint

6) Category: a) SC b) ST c)OBC d) SBC e)NT f) Open

7) Do you provide vocational education to your children? Yes / No
   If yes- a) Engineering b) Medical c) Agricultural d) MBA
   e) B. Ed. / D. Ed. f) Law g) Other

8) Are you beneficiary of watershed? Yes / No

9) Major source of income: a) Agriculture b) Business c) Service d) Labour e) Other

10) Pre-and Post- Watershed Development Programmes Size of Land Holding:
   a) Pre- Watershed Development Programmes Period :
      i. Irrigated Holding
      ii. Fallow : _____ hectares
      iii. Seasonal : _____ hectares
      iv. Perennial : _____ hectares
      v. Rainfed Holding : _____ hectares
   Total Holding : _____ hectares

   b) Post- Watershed Development Programmes Period : :
      i. Irrigated Holding : _____ hectares
      ii. Fallow : _____ hectares
      iii. Seasonal : _____ hectares
      iv. Perennial : _____ hectares
      v. Rainfed Holding : _____ hectares
   Total Holding : _____ hectares

11) Change in cropping method, if any : 1) Yes 2) No

12) Crops taken

Sr.No.	Pre-Work Period (2001)		Post-Work Period (2011)	
	Area	Production	Area	Production
(a) Food Crops				
1. Rice	----------		----------	
2. Jowar	----------		----------	
3. Bajara	----------		----------	
4. Maize	----------		----------	
5. Wheat	----------		----------	
6. Others	----------		----------	
(b) Cash Crops				
1. Sugarcane	----------		----------	
2. Cottan	----------		----------	
3. Potato	----------		----------	
4. Gingar	----------		----------	
5. Other	----------		----------	
(c) Oilseeds				
1. Soyabean	----------		----------	
2. Groundnut	----------		----------	
3. Sunflower	----------		----------	
4. Seasum	----------		----------	
5. Niger	----------		----------	
6. Others	----------		----------	
(d) Pulses				
1. Tur	----------		----------	
2. Mung	----------		----------	
3. Gram	----------		----------	
4. Udid	----------		----------	
5. Others	----------		----------	
(e) Fruit & Vegetables				
1. Pomegranate	----------		----------	
2. Grapes	----------		----------	
3. Other fruits	----------		----------	
4. Vegetables	----------		----------	

13) Which of the above crops are more profitable?

1) Food Crop 2) Cash Crops 3) Oilseeds

14) Irrigation Methods and Hectare : 1) Well _____Hectares
: Borewell _____Hectares
: Canal _____Hectares
: Lift Irrigation _____ Hectares

15) Method of Water Flow: 1) Flow 2) Drip Irrigation 3) Sprinkler Irrigation

16) Application of Fertilizers: Pre -Work Period (2001) Post -Work Period (2011)
(Quintals/ Hectare)

a) Chemical Fertilizers _____ _____
b) Compost Fertilizer _____ _____
c) Organic Fertilizer _____ _____

17) Use of Insecticides / Weedicides : Yes / No
If Yes, Pre -Work Period (2001) Post -Work Period (2011)
Amount (in Rupees) ---------- ----------

18) Agricultural Income Pre -Work Period (2001) Post -Work Period (2011)
Crops

a) Food Crops _____ _____
b) Cash Crops _____ _____
c) Oilseeds _____ _____
d) Fruits/Vegetables _____
_____
e) Others _____ _____
Total _____ _____

19) Changes in Employment: Pre -Work Period (2001) Post -Work Period (2011)
Occupation

a) Agriculture _____ _____
b) Dairying _____ _____
c) Poultry _____ _____
d) Sheep & Goats Keeping _____ _____
e) Other _____ _____
Total _____ _____

20) Is there change in your income due to Watershed Development Programmes:
Yes / No If Yes,
Occupation Pre -Work Period (2001) Post -Work Period (2011)

1) Agriculture _____ _____
2) Dairying _____ _____
3) Poultry _____ _____
4) Sheep & Goats Keeping _____ _____

5) Other _____ _____

Total _____ _____

21) Is there change in your savings due to Watershed Development Programmes?

Yes / No If Yes,

	Pre -Work Period (2001)	Post -Work Period (2011)
Amount (in Rupees)	_____	_____

22) Investments made in agriculture in Post-Watershed Development Programmes Periods:

Sr.No.	Particulars	Year	Amount (Rs.)
a)	Purchase of Land	_____	_____
b)	Land Improvement	_____	_____
c)	Well Digging	_____	_____
d)	Pipeline Laying	_____	_____
e)	Electric Pump	_____	_____
f)	Drip Irrigation	_____	_____
g)	Agricultural Implements	_____	_____
h)	Farm House		_____
i)	Residential House	_____	_____
j)	Education		_____
k)	Marriage		_____
l)	Others		_____

23) Is there any improvement in your standard of living: Yes / No

If Yes, What are the domestic assets/applications that you own?

i) TV set ii) Tape recorder iii) CD player iv) Radio v) Elec. fan vi) Refrigerator vii) Telephone viii) Mobile ix) Bicycle x) Mixer xi) Gas xii) Dish/Cable xiii) Cooler xiv) Washing Machine xv) Air cooler xvi) Air conditioner xvii) Table & Chair xviii) Computer xix) Internet xx) Dining Table xxi) Motor Cycle xxii) Car xxiii) Tractor xxiv) Jeep xxv) Truck

24) Do you use modern methods of farming? : Yes / No

If Yes, What are these methods? : 1) Soil testing 2) HYV seeds 3) Use of Fertilizers 4) Mechanized Equipment 5) Modern methods of sowing

25) What are the farming improvements undertaken?

1) Well digging 2) Land improvement 3) Pipeline Laying 4) Drip Irrigation 5) Electric pump set 6) Farm implements 7) Others: _____

26) What are the problems/difficulties faced in adopting modern farming techniques?

1) Fund shortage 2) Land improvement 3) Drip Irrigation 4) Electric Pump set 5) Farm implements 6) Others: _____

27) Have you taken any loans for your agricultural development? : Yes / No

28) Duration of Water Availability :

a) Before Watershed Development Programmes Periods:

1) Upto 4 months 2) Upto 8 months 3) Upto12 months

b) After Watershed Development Programmes Periods :

1) Upto 4 months 2) Upto 8 months 3) Upto12 months

29) Rise in the Water Level : Yes / No

If yes, How much?

a) Before Watershed Development Programmes Periods: _____ meter

b) After Watershed Development Programmes Periods: _____meter

30) a) Problem of drinking water after Watershed Development Programmes Periods:

1) Decreased 2) Resolved 3) Same as before

b)Problem of agricultural water after Watershed Development Programmes Periods:

1) Decreased 2) Resolved 3) Same as before

31) Which of the Watershed Development structure has benefitted you?

a) Percolation Tank b) farm Pond c) Cement Bandhara d) Earthen Nallah Bund e) CCT f) K. T. Weirs g) Diversion Bandhara h) Boulder Dam i) Well Recharging

32) Is there an increase in your family income after Watershed Development Programmes Periods: Yes / No

If Yes, How it was utilized: 1) House Construction 2) House Repairs 3) Purchase of Land 4) Land Improvement 5) Purchase of Farm Implements 6) Children's Education 7) Children's Marriages 8) Medical expenses 9) Bank Deposits 10) Loan Repayment 11) Shares Purchases 12) Purchase of Ornaments 13) Purchase of vehicles 14) Investment in Agro-ancillary Activities 15) Horticultural plantations.

33) People's participation in Watershed Development Programmes:

1) None 2) somewhat 3) Good

34) Are you satisfied with the Watershed Development Programmes in your village? : Yes / No

36) Future measures for resolving the water problem: a) Increase water literacy b) Strict measures against misuse of water c) Change the cropping pattern d) Impose Drip irrigation e) Supply metered water to farms f) Increase the Scope of water Conservation g) _____

37) Use of agricultural technology.

	Before WDP (2001)	After WDP (2011)
a) Holler	_____	_____
b) Tractor	_____	_____
c) Petrol Pesticide pump	_____	_____
d) HTP	_____	_____
e) Harvester	_____	_____

38) Use of Energy Resources

	Before WDP (2001)	After WDP (2011)
a) Cow dung	_____	_____
b) Wood	_____	_____
c) Agricultural waste	_____	_____
d) Goober gas	_____	_____
e) Kerosene	_____	_____
f) LPG	_____	_____

39) Health and Medical facilities: a) Toilet- Yes / No b) Use of Toilet- Yes / No
c) Medical facility: Government / Private

40) Availability of drinking water
a) Well: Yes / No b) Bore well: Yes / No c) Tap water: Yes / No

41) No. of wells and water level in meter: Before WDP: _____ After WDP:_____

42) Construction of house and status of house
a) kacha house b) Mixed house c) pukka house d) banglow

43) Use of telephone and mobile
a) Telephone: before WDP: _____ after WDP:_____
b) Mobile: before WDP: _____ after WDP:_____

44) Milk Production in liter: before WDP: _____ after WDP:_____

45) Information about Cattles:

Animals	Numbers		Income (Rs. in '000')
	Before WDP	After WDP	
a) Farm Animal			
1. Bullock			
2. Male Buffaloes			
b) Milk Animal			
3. Cows			

4. Female Buffaloes

c) Petty Animals

5. Goats

6. Sheep's

d) Poultry

7. Hens

8. Ducks

e) Others

46) Vehicles:

a) Cycle: before WDP: ____ after WDP: ____

b) Motor cycle before WDP: ____ after WDP: ____

c) Travel vehicle before WDP: ____ after WDP:____

d) Occupational travel vehicles: before WDP: ____ after WDP:____

47) People participation in social work in family member

a) Youth mandals:_____ b) women saving groups:_____

Place: Sign

Head of the family

Date:

APPENDIX- XII

Village-wise Names of the Respondents

(1) Nidhal

1. Khuspe Vithal Namdev
2. 2.Khuspe Tulshiram Dattu
3. Dalvi Pandurang Narayan
4. Satre Balkrushna Tulshiram
5. Jadhav Yeshwant Kundlik
6. Nirmal Vithal Shankar
7. Dalvi Aanadrav Ganpat
8. Inje Anil Laxman
9. Dalvi Jagannath Dadu
10. Jagdale Duryodhan Bhungrav
11. Khuspe Raghunath Dattu
12. Khuspe Rajaram Jotiram
13. Khuspe Madhav Keshav
14. Khuspe Dashrath Sambhaji
15. Khuspe Sarjerav Kisan
16. Nirmal Chagan Bapu
17. Inje Pralhad Sambhaji
18. Nirmal Shrirang Dadaso
19. Khuspe Ramchandra Jagnnath
20. Khuspe Bhagwan Shankar
21. Khuspe Dinkar Vishnu
22. Khuspe Pandurang Dagdu
23. Karne Dattatray Rajaram
24. Khuspe Vithoba Ganu
25. Khuspe Dnyanu Tukaram
26. Khuspe Aappa Khashaba
27. Khuspe Dhondiram Gulab
28. Khuspe Dada Kundlik
29. Khuspe Jotiram Jijaba
30. Suryawanshi Nitin Hanmant
31. Ghadge Shankar Tatyaba
32. Mali Vithoba Navnath
33. Khuspe Jotiram Vilas
34. Khuspe Aanna Khashaba
35. Khuspe Bapu Khashba
36. Khuspe Aappaji Pandurang
37. Khuspe Pandurang Sakharam
38. Suryawanshi Shrirang Gulab
39. Khuspe Dhondiram Jijaba
40. Khuspe Narayan Tukaram
41. Khuspe Bababai Ganpat
42. Ghadge Shivaji Ramchandra
43. Dalvi Baban Ganpat
44. Mali Kashinath Rama
45. Jadhav Gajanan Malhari

(2) Katalgewadi

46. Jadhav Dagadu Ramchandra
47. Jadhav Kundlik Mahadev
48. Jadhav Dada Shamrav
49. Jadhav Pandharinath Nana
50. .Jadhav Balwant Aappji
51. Jadhav Suresh Mahadev
52. Jadhav Shankar Mahipati
53. Jadhav Rajendra Balaso
54. Jadhav Dhanaji Baburav
55. Jadhav Bhagwan Dinkar
56. Jadhav Narayan Dinkar
57. Jadhav Gopichand Devaba
58. Mane Murlidhar Jyoti

(3) Satewadi

59. Bote Sayaji Bhiku
60. Bote Prabhakar Keshv
51. Bote Gautam Jotiram
62. Kale Nanaso Kisan
63. Gosavi Narayan Gulab
64. Roman Vikas Ankush
65. Bote Vishnu Sarjerav
66. Dombale Dattatray Pandurang
67. Mohite Pratik Shankar
68. Bote Amol Bhagwan
69. Bote Hanmant Sakharam
70. Bote Vishwas Ramchandra
71. Kale Samar Bajrang
72. Kale Sanjay Pandurang
73. Mane Shankar Kedari

74. Bote Mahadev Tayappa
75. Patil Mahesh Shivaji
76. Mulani Raphik Badshaha
77. Dabade Amit Ashok
78. Dabade Yogesh Jalindhar
79. Dhokle Shivaji Balwant
80. Khandekr Nagnath Tushar
81. Sakhare Vijay Mahadev
82. Kale Shankar Ramchandra
83. Kolekar Hanumant Madhukar
84. Mane Jotiram Baban

4) Varud

85. Shinde Vilas Vishnu
86. Mane Eaknath Pandurang
87. Mane Janardhan Raghunath
88. Mane Balasaheb Shrirang
89. Mane Uttam Dnyanu
90. Mane Hanmant Khashaba
91. Mane Haridas Namdev
92. Mane Tanaji Baburav
93. Mane Shrimant Baburav
94. Waghmare Kisan Baburav
95. Bobade Sandip Arvind
96. Jagdale Shamrav Tukaram
97. Waghmare Bajrang Murlidhar
98. Mane Maruti Dadasaheb
99. Mane Motiram Yeshwant
100. Vedphatak Shidheswr Pandurang
101. Mane Balutai Namdev
102. Mane Baban Yeshwant
103. Waghmare Shashikant Madhukar
104. Mane Sahebrav Aanna
105. Mane Navnath Shivnath
106. Mane Arun Mohan
107. Mane Baban Mahadev
108. Mane Shankar Mahadev
109. Mane Narayan Mahadev
110. Mane Sahebrav Krushna
111. Mane Pandurang Krushna
112. Mane Vinayak Krushna
113. Mane Shankar Dattu
114. Mane Subhash Namdev
115. Mane Ramchandra Baburav
116. Mane Satish Kashinath
117. Mane Jaydip Shivaji
118. Mane Lalaso Rajaram
119. Mane Bhimrav Sopan
120. Mane Prakash Vaman
121. Mane Nitin Vishwas
122. Mane Rajendra Sampat
123. Ghadge Hanmant Bajirav

5) Gageshwadi

124. Gopne Kundlik Namdev
125. Gopne Shankar Namdev
126. Burungle Mahadev Dhondiba
127. Gopne Pandurang Namdev
128. Raut Dattatry Dashrath
129. Gopne Rajaram Nivruti
130. Hande Sandip Pandurang
131. Raut Ankush Jotiram
132. Raut Ravindra Aanandrav
133. Kale Tanaji Masku
134. Gopne Dnyandev Nivruti
135. Gopne Ganpat Namdev
136. Gopne Shivaji Vithal
137. Karmare Khashaba Vithoba
138. Raut Ashok Kiran
139. Shinde Bajirav Shiva
140. Deshmukh Sunil Sahebrav
141. Bote Bhagwan Bhau
142. Kolekar Suresh Madhukar
143. Bote Kakaso Shrirang
144. Bote Narayan Baji
145. Bote Adhik Krushna
146. Bote Ramchandra Yedu
147. Patil Mahesh Shivaji
148. Mulani Raphik Badshaha
149. Sakhare Vijay Mahadev

(6) Katar Khatav

150. Bagal Ashok Ganpat
151. Bagal Kakaso Damodar
152. Bagal Vanat Vishnu
153. Bagal Nivruti Sambhaji
154. Bagal Bhiku Dnyanu
155. Bagal Shivaji Ganpat
156. Bagal Sukhdev Laxman
157. Bagal Dadaso Shivram
158. Bagal Eaknath Jagannth
159. Bagal Bhimrav Jagannth
160. Bagal Ashok Eaknath
161. Shinde Dnyandev Maruti
162. Shine Mahendra Bhanudas
163. Tambe Sadashiv Govind
164. Chavan Ratnakar Sambhaji
165. Shinde Hanmant Ganpat
166. Bagal Maruti Tatyaba
167. Tambe Aappso Govind
168. Bagal Ashok Kisan
169. Bagal Rajendra Ganpat
170. Bagal Aanand Kedari
171. Bagal Sadashiv Namdev
172. Shinde Sayaji Kondiba
173. Bagal Daolat Tatyaba
174. Bagal Bhagwan Sandipan
175. Mali Lalaso Aappa
176. Bajal Aananda Sandipan
177. Bagal Kashinath Namdev
178. Shinde Dadaso Khashaba
179. Bagal Vinayak Khashaba
180. Bodke Hindurav Narayan
181. Bodke Dinkar Dhondiram
182. Bodke Balaso Dhondiram
183. Bodke Shivaji Mukund
184. Bodke Dhananjay Hanmant
185. Bodke Pradip Shankar
186. Bodke Lalaso Dinkar
187. Bodke Nanaso Narayan
188. Bodke Dagdu Hariba
189. Bajal Ramakant Shrirang
190. Bagal Rohit Baban
191. Bagal Amol Ashok
192. Bodke Akshay Viswanath
193. Bodke Dattatray Kashinath
194. Bodke Ganesh Rambhau
195. Bagal Laxman Shripati
196. Bagal Dada Shivram
197.. Shinde Amol Baban
198.. Bagal Balaso Narayan
199. Bagal Chagan Kedari
200. Bagal Rambhau Kedari
201. Bagal Ashok Laxman
202. Bagal Vijay Vishnu
203. Dabade Amit Ashok
204. Sutar Kamlakar Aanna

(7) Kaledhon

205. Dhokle Narayan Vithoba
206. Dhokle Dipak Mahadev
207. Salunkhe Milind Hanmantrav
208. Kandekar Popat Shankar
209. Khandekar Subhash Shamrav
210. Dhokle Pandurang Shitaram
211. Dhokle Madhadev Ramchandra
212. Dhokle Vishanath Narayan
213. Mali Sambhaji Lingappa
214. Mali Sudam Dada
215. Mali Ashok Shankar
216. Mali Vijay Narayan
217. Mali Yashwant Kisan
218. Ingole Shivaji Pandurang
219. Mali Kundlik Dada
220. Mali Aappaso Lingappa
221. Salunkhe Tukaram Mahadev
222. Dhokle Nanaso Baburav
223. Dhokle Ramdas Baburav
224. Khandekar Tulashiram Shitaram
225. Khandekar Narayan Namdev
226. Dhokle Raghunath Nivruti
227. Mali Hindurav Shankar

228. Mali Sandipan Dada
229. Mali Tulshiram Shankar
230. Dabade Rajaram Pandurang
231. Dabade Sayaji Pandurang
232. Kanse Santosh Baban
233. Bandgar Rajendra Uttam
234. Mali Sambhaji Mahadev
235. Shete Umesh Madhukar
236. Ingwale Chandrakant Bhikaji
237. Bhushari Rajkumar Balkrushna
238. Gurav Bajrang Aanna
239. Kanse Dipak Bajrang
240. Salunkhe Malhari Vijay
241. Mali Popat Esawara
242. Shekh Husen Balekhan
243. Lokhande Baban Raghunath
244. Sakhare Sharad Narayan
245. Todkar Mahesh Raghunath
246. Kanase Vishnu Jotiram
247. Dikshit Avinash Sadashiv
248. Tarlekar Gajanan Vaman
249. Shete Prakash Kalappa
250. Mahajan Shekhar Sadashiv
251. Shethe Suhas Prabhakar

(8 Mhasurne

252. Dabade Ramesh Vishnu
253. Mane Aappso Tatyaba
254. Mane Natha Vithoba
255. Mane Mahadev Khashaba
256. Pawar Mahadev Sahadev
257. Mane Tanaji Hambirav
258. Mane Uttam Bandu
259. Mane Rajendra Dnyanu
260. Mane Hiraji Govind
261. Mane Harichandra Govind
262. Mane Pandurang Kundlik
263. Mane Tanaji Nana
264. Mane Dipak Jalindhar
265. Mane Sambhaji Bhimrav
266. Khandagle Santosh Shivaji
267. Mane Suresh Aakaram
268. Mane Aakaram Khashaba
269. Yadev Prallhad Laxman
270. Chavan Dipak Uttam
271. Mane Aananda Dnyanu
272. Mane Suryaji Ganpat
273. Mane Ramchandra Dnyanu
274. Koli Anantkumar Bhagwan
275. Mane Subrav Ganpati
276. Mane Gajanan Ramchandra
277. Mane Bhimrav Ramchandra
278. Mane Narayan Ramchandra
279. Mane Namdev Ramchandra
280. Mane Tanaji Nana
281. Kadam Jitendra Shivaji
282. Mane Mahadev Patalu
283. Kadam Lalaso Kaka
284. Mane Arjun Tulshiram
285. Mane Rajaram Shidu
286. Jadhav Mahadev Rangnath
287. Mane Ashok Aananda
288. Mane Vasant Ganpat
289. Mane Ankush Gangadhar
290. Mane Aappso Aananda
291. Mane Arvind Shrirang
292. Mane Mahadev Raghunath
293. Mane Vithal Vishnu
294. Mane Viswas Popat
295. Suryawanshi Shashikant Raghunath
296. Yadav Amol Raghunath
297. Suryawanshi Satyashil Ramchandra
298. Suryawanshi Uttam Kundlik
299. Suryawanshi Balkrushna Jayshing
300. Suryawanshi Sunil Yeshwant
301. Pawar Shankar Bhanudas
302. Suryawanshi Pandurang Kondiba
303. Kadam Gorakhnath Ramchandra
304. Kadam Sandip Aananda
305. Kadam Pandurang Tukaram
306. Kadam Dadaso Dnyanu

307. Kulkarni Anil Sadashiv
308. Paear Yogesh Jalindhar
309. Jadhav Ramchandra Jagannath
310. Shinde Shivaji Balwant
311. Mane Mohan Dadaso
312. Mane Chandrakant Kashinath
313. Patil Hanmant Vithal
314. Dabade Janardhan Rajaram
315. Gore Shivaji Narayan
316. Kale Tatyaba Aanna
317. Suryawanshi Tulshiram Laxman
318. Chavan Shankar Daji
319. Mane Sopan Yeshwant
320. Khandekr Nagnath Tushar
321. Dabade Nandkumar Narayan
322. Mane Sadashiv Joti
323. Kadam Dadaso Vithal
324. Mane Balasaheb Eaknath
325. Suryawanshi Sandip Sudhakar
326. Suryawanshi Yuvraj Sukhdev

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