

**“A SPATIO-TEMPORAL ANALYSIS OF  
AGRICULTURAL LANDUSE AND PRODUCTIVITY  
OF BARAMATI TAHSIL, PUNE DISTRICT  
(MAHARASHTRA)”**

**A Thesis submitted**

**to the**

**Tilak Maharashtra Vidyapeeth, Pune**

**For the Degree of Doctor of Philosophy**

**(Vidyavachaspati) in Geography**

**Under the Faculty of Moral and Social Sciences**

**By**

**Sunil Baburao Ogale**

**Guide**

**Dr. Virendra Nagrale**

**Associate Professor and Head, Department of Geography**

**S.N.D.T. Women’s University Pune Campus,**

**Pune - 411 038.**

**JUNE-2013**

## CERTIFICATE

*This is to certify that the thesis entitled, “A Spatio-temporal Analysis of Agricultural Landuse and Productivity of Baramati Tahsil, Pune District (Maharashtra)”. Which is being submitted herewith for the award of the Degree of Vidyavachaspati (Ph. D.) in Geography of Tilak Maharashtra Vidyapeeth, Pune is the result of original research work completed by Mr. Sunil B. Ogale under my supervision and guidance. To the best of my knowledge and belief the work incorporated in this thesis has not formed the basis for the award of any Degree or similar title of this or any other University or examining body.*

Date :

**(Dr. Virendra Nagrale)**

Research Guide

Associate Professor and Head

Dept. of Geography S.N.D.T. Women's University

Pune Campus, Pune-411038

## DECLARATION

*I hereby declare that the thesis entitled “Spatio-temporal Analysis of Agricultural Landuse and Productivity of Baramati Tahsil, Pune District (Maharashtra)” is the original research work carried out by me under the guidance of Associate Professor and Head Department of Geography S.N.D.T. University Pune Campus, Pune Dr. Virendra Nagrale for the award of Ph. D. degree in Geography to the Tilak Maharashtra Vidyapeeth Pune, Pune. This has not been submitted previously for the award of any degree or diploma in any other university.*

Date :

**Sunil B. Ogale**  
Research Student

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Place: Pune  
Date:

**(Sunil B. Ogale)**  
Research Student

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## ABSTRACT

### **“A SPATIO-TEMPORAL ANALYSIS OF AGRICULTURAL LANDUSE AND PRODUCTIVITY OF BARAMATI TAHSIL, PUNE DISTRICT (MAHARASHTRA).”**

Agriculture in a way is the result of human efforts applied in the exploitation of land resources towards the satisfaction of one of man's basic needs, food. In spite of the rapid growth of industries and service sectors in India, agriculture still is an important economic activity, employing 62 percent of total workers in 2001 (Maharashtra 64 percent in 2001). As compared to India, Maharashtra occupies 9.4 percent of the area, 9.3 percent population, 12.6 percent NSA, 11.4 percent GCA and only 4.6 percent of the gross irrigated area. Among the major crops grown, Maharashtra accounts for about half of the acreage under Jowar 1/3<sup>rd</sup> under cotton. Bajara is another important crop, which accounts 18 percent of area while sugarcane occupies 12.7 percent of the harvested area under that crop in India. Even then, the process of agricultural growth has not been properly channelized due to imbalance allocation of resources, basic infrastructure and uneven rainfall. The present treatise has modest attempt to study a Spatio-Temporal Analysis of Agricultural landuse and Productivity in Baramati tahsil of Pune district for its better landuse planning.

Baramati tahsil is situated in east part in Pune district covering 1382 square kilometer area and having 3,72852 population (2001) and provisional (2011) has 479690 populations.. This taluka consists of 117 revenue villages with one urban settlement. Administratively, this taluka has divided into six revenue circles. Population density of taluka is 270 persons per square kilometer (2001). The study region extends from 18° 2' 44" N to 18° 23' 19" North latitudes and 74° 13' 8" E to 74° 42' 47" East longitudes. The region falls under scarcity zone having rainfall between 400 to 500 mm. Monsoon generally commences in June, occurring highest rainfall in June (158 mm) and lowest in December (12 mm). The highest mean temperature is observed in May (34.6<sup>0</sup> centigrade) and lowest in January (18.5<sup>0</sup> centigrade). The slope of region is towards northwest and southeast. The study area has basaltic base having step like topography. Baramati tahsil is somewhat rectangular in shape.

There are three soil types, namely, coarse shallow, medium black and deep black soils occupying 60 percent, 20 percent and 20 percent respectively. The coarse shallow soil has confined to north and west, medium black soil lying in central and deep black in low lying areas of Nira and Karha rivers. This region offers favourable situation for irrigation and hence agro-based development. Topographically, it is almost a plain region with alluvial soils. The black colour of the soil is the indicator of high fertility status. The generalised direction of slope is from northwest to southeast in the Karha basin and from west to east in the Nira. Baramati tahsil is mainly drained by river Nira and its main tributary Karha.

This treatise has been undertaken to make on indepth and comprehensive study of agriculture landuse, its planning and development in Baramati tahsil by evaluating following objectives:

- Examining the physical background.
- Studying the general and agricultural landuse.
- Identifying crop combination and diversification region.
- Establishing the relationship between landuse and environmental Variables.
- Suggesting remedial measures for better agriculture landuse for Baramati tahsil.

The present study was based on primary and secondary sources. The published sources namely, Taluka Revenue Record, Socio-economic Abstract of Pune District, District Census Handbook, Department of Irrigation, Groundwater Survey and Development Agency, Taluka Land record office to obtain village wise data for various crops in Baramati taluka. Primary data have obtained for six sample villages through questionnaires. The questionnaires cover aspects like crop landuse, farmer's education, income from various sources and problems regarding agriculture and allied sectors. Besides this information concerned Talathi and Sarpanch were contacted to get more information of sample villages. The spatial and temporal aspects of general and agricultural landuse were studied indepth. The village level changes in above aspects have obtained and then mapped by using choropleth method, suitable diagram and graphs have depicted for showing landuse pattern. For delineating crop region, crop ranking method, crop combination method and crop diversification methods have been used for 117 villages in Baramati tahsil. Rafiullah's crop combination technique was applied to

compute crop combination regions and Gibb's Martins Index was applied to show diversification of crops. Enyedi's Method was chosen to compute Crop Productivity for Baramati tahsil. Further landuse pattern was studied for selected variables by applying correlation coefficient, problems faced by farmers related to agriculture, transportation network, communication and linkages with market centres. Lastly problems of agriculture have been identified and suggestions were given for better planning and development of agriculture landuse in Baramati tahsil.

The generalized direction of slope is from northwest to southeast in the Karha basin and from west to east in the Nira. There are three types of soil structures: deep black, medium black and coarse shallow which are identified in the study region. The study area, like other area has witnessed a steady growth of population with its upwards trend. The growth rate of population from 1991 to 2001 was 40.65 percent, due to the agro-industrial development. The average density of population is 270 persons per sq.km.in the region (2001). From spatial point of view, the population density increases towards south-east. Of the total population 84.89 percent working force is engaged in agricultural pursuits. The total working force accounts cultivators is 44.41 percent and agricultural labourers are 30.52 percent. However, the other workers increased by 5.17 percent from 1991 to 2001 in the Baramati tahsil, due to the establishment of small scale industries and the introduction of new industries in Baramati M.I.D.C. The newly established service sector also contributed in the increase.

1971 to 1991 later decades, net sown area shows decline trend. There is an average 6.13 percent increase except for the year 1991 to 2001. This significant increase in net sown area may be due to more land under trees and shrubs, brought subsequently under cultivation. Other types of land previously considered cultivable waste is being used by the farmers for cultivation for growing crops. Moreover, increasing awareness, and mounting pressure of population on landuse pattern has brought this land under cultivation. The net sown area is steadily increasing since 1990-91 to 2000-01. It is seen from 69.18 percent (95600 hectares) area was under cultivation in 1990-91 and it has been stepped to 75.30 percent (104106 hectares) area under cultivation in 2000-01, registering an increase by 6.12 percent. This increase may be attributed to increasing awareness of improved agricultural techniques and introduction of the use of new

improved seeds by farmers. The highest net sown area is recorded at Ghadgewadi (more than 94 percent) in south-east part in study region due to deep black soil and irrigation facility whereas lowest has identified at Vadhane village (39 percent). Non-agricultural land has been substantially decreased for the period 1961 to 2001(1.33 percent). More land that in the past has been put to non-agricultural use brought under cultivation in the study area whereas barren and uncultivated land could not be brought under cultivation being 'barad' soils. This soil is very poor in humus and naturally it is less fertile. Cultivable waste has increase in study region. The general trend of declining fallow land towards north due to existence of fertile soil rising for cultivation. Forest cover is declining slowly (0.41percent). All the categories in the general landuse have direct impact on the area net sown and hence this distribution is of prime importance.

Jowar shows during the study period (1990-91 to 2010-11) has steadily declined. The maximum hectarage of jowar declined in 2010-11 by 7.91 percent to total aerial extent of the study region. Towards north and central parts sugarcane percentage increases. Sugarcane wheat, fruits and vegetable crops shown increasing trend during study period. Increasing irrigation facility is the main cause of this change in the study region. Crops like Bajara, fodder crops, oilseeds and pulses are slightly decreasing in Baramati tahsil. The total reduced of bajra in Baramati tahsil is 3.12 percent from 1990-91 to 2010-11. The variation in landuse relates with the extent of these nine crops with soil characteristics, irrigation, relief, proximity to the market places and accessibility. The relationship among these factors are well established through agricultural landuse analysis of the region. Jowar is identified as first ranking crop occupying 22.44 percent to net sown area. This crop is mainly concentrated in north and central part due to inadequacy of irrigation, undulating topography and soil retentivity (Fig. 4.2). Jowar acreage have been found decreasing trends towards north as sugarcane percentage increases. Sugarcane occupies second position after jowar is on 21.25 percent area. Wheat also has concentration in north on fertile, black and deep soil which favours the cultivation. Bajra is sown on 19984 hectares accounting for 19.2 percent to net sown area in study region. The distribution of this crop is influenced by rainfall amount, terrain characteristics and soil types. Fodder crop occupies 12.71 percent and its cultivation is found in areas of dairy farming and livestock raising activity developed in northwest,

southwest and central parts in study region. Oilseed covers 2.85 percent. Fruits and vegetable contributes 1.98 and 1.02 percent in study region. It is grown close to Baramati urban market places both local as well as surrounding market centres. Crops like pulses occupy 3.08 percent in the study region. It has been noted that among all the factors, soil, irrigation facilities and proximity to the market centres, control the spatio-temporal distribution of crops in the study region.

Four crops have been identified as first ranking crops. These four crops are, namely, jowar, wheat bajra and sugarcane. Sugarcane is major crop and it stands as first rank and is found to have largest coverage in 54 villages occupying 46.15 percent area in the study region. The application of Rafiullah's method shows the realistic picture of crop combination. Three crop combination regions has found in study area. Monoculture is in eighty-nine villages. Jowar, sugarcane, bajara and wheat entered in this combination. Jowar, sugarcane, bajara and wheat as monoculture crops. Jowar is cultivated in forty-six villages and sugarcane is cultivated in twenty-nine villages in study area. Two-crop combination region has observed in twenty-six villages and three crop combination has observed two villages. Sugarcane, wheat and fodder crops is grown in this region on irrigation. The crop combination has been computed by applying Gibb's Martin's Index formula. The result of crop diversification established relationship with physical and socio-economic conditions. The largest area under cover high crop diversification in eighty-eight villages, twenty-five villages very high crop diversification. The high diversification of crops covering almost 75.21 percent of gross cropped area is an indication of agricultural development in the study region.

Among all crops, the productivity shows increasing trend toward south to north in the study area. It is an indication of development in agriculture sector. In northern part due to adverse relief condition, coarse shallow soil and non-availability of irrigation leads to low productivity. So there is need to get financial support and integrated efforts for development of agriculture to reduce regional disparities in Baramati tahsil. Nineteen landuse variables have been identified to show the correlation.

The net sown area exhibits positive correlation with jowar, bajara, wheat, sugarcane, irrigated land and population density. The strong positive correlation of net sown area has found with jowar 0.74 and positive correlation of irrigated area 0.33, yield

of wheat, yield of sugarcane. The net sown area shows a moderate correlation with fallow land (0.42) and moderate with area not available for cultivation (0.47). Net sown area exhibits area under jowar has moderate positive correlation with fodder crops (0.68), oilseeds (0.55), pulses (0.66), yield of bajra (0.21) showing jowar crop has proportionate increase with yield of bajra because jowar being a rabi crop followed bajra as a kharif. Wheat crop has found strong positive correlation with sugarcane (0.83), irrigated area (0.84), population density (0.73) and agricultural density (0.73). Area under wheat has moderate correlation with fruits (0.51), vegetables (0.45), yield of wheat (0.41), and yield of sugarcane (0.44). Wheat is mostly cultivated on medium to deep black soil. Hence negative correlation has exhibited with Bajra (-0.12) and area under pulses (-0.10). Sugarcane has strong positive correlation with total irrigation area (0.92), population density (0.74) and agricultural density (0.73) and moderate positive correlation with fruits (0.51), vegetables (0.40). The negative correlation has established with yield of bajra (-0.04), oilseeds (-0.05) and moderate negative correlation with pulses (-0.35). Irrigated area has established strong positive correlation with area under agricultural density (0.71). The spatial distribution of population density is largely associated with agricultural density, total irrigated area, yield of wheat and yield of sugarcane. The strong positive correlation has established with agricultural density (1.00), yield of sugarcane (0.71) and total irrigated area (0.71). Moderate positive correlation with yield of wheat (0.68), yield of Jowar (0.30 and yield of Bajara (0.13) in the study region. Agricultural density distribution exhibits positive correlation with yield of jowar, yield of wheat, yield of bajara and yield of sugarcane. Strong positive correlation is exhibited with the yield of sugarcane (0.71) and yield of wheat (0.68) of Baramati tahsil.

The planning of land use and development in Baramati tahsil is based on past and existing landuse and arising problems. The studied text has examined thoroughly for Baramati tahsil and is found that there are some extent needs to make planning for development of this region. The process of soil salinization should be ceased through controlled irrigation. Saline agricultural fields should be drained by fresh water by cutting the deep trenches. The cultivation of sugarcane crop should slowly change or replaced by vegetables and fruits as there is large scope for grapes, mango, and pomegranate in study area. Sub centers should be developed to link small villages for purchasing agricultural

inputs like implements, seeds, fertilizers, insecticides and pesticides in north and south region for speedy development. Agro-based activities like dairy, poultry and household. This activity should be started in south part in study area. This would help to provide jobs for youth of rural area. Watershed management works namely, minor irrigation projects, contour bunding, nalla bunding, continuous contour trenches (C.C.T.) etc. should be introduced in northern region for conserving water and soil properly. This would help to increase ground water table. Floriculture activity should be introduced in study region due to increasing demand of flowers throughout the year to Baramati city and Pune metropolitan region. The village roads should be constructed in north and south part in study region for mobilizing agricultural products. Baramati is emerging as an industrial area as well therefore, grapes cultivation is the best option for sugarcane and it has certainly a great scope for providing raw material to newly wine park industry introduced at Baramati.



# **CHAPTER-I INTRODUCTION**

**1.1 Introduction**

**1.2 Choice of the Region**

**1.3 Study Area**

**1.4 Objective**

**1.5 Data Sources and Methodology**

**1.6 Arrangement of Text**

**1.7 Limitation**

**1.8 Conclusion**

# CHAPTER-I

## INTRODUCTION

### 1.1 Introduction

Agriculture in a way is the result of human efforts applied in the exploitation of land resources towards the satisfaction of one of man's basic needs, food. In spite of the rapid growth of industries and service sectors in India, agriculture still is an important economic activity, employing 62 percent of total workers in 2001 (Maharashtra 64 percent in 2001). As compared to India, Maharashtra occupies 9.4 percent of the area, 9.3 percent population, 12.6 percent NSA, 11.4 percent GCA and only 4.6 percent of the gross irrigated area. Among the major crops grown, Maharashtra accounts for about half of the acreage under Jowar and 1/3<sup>rd</sup> under cotton. Bajara is another important crop, which accounts 18 percent of area while sugarcane occupies 12.7 percent of the harvested area under that crop in India. Even then, the process of agricultural growth has not been properly channelized due to imbalance allocation of resources, basic infrastructure and uneven rainfall.

The present treatise has modest attempt to study a Spatio-Temporal Analysis of Agricultural landuse and Productivity in Baramati tahsil of Pune district for its better landuse planning. The regional survey of landuse and its mapping was made by Patrick Geddes. But the practical work on landuse study was carried out in 1930 by Late L. D. Stamp in Britain. This was perhaps, the first exercise to survey the land by many geographers, economists and planners who attempted for landuse planning. Agricultural Department in United States (1935), Shafi (1960), Mohmmad Ali (1967), Ganguli (1964), Karimi (1950) and Lahiri (1950) have attempted to study landuse survey and its studies. Later, S. Van Volkenberg, Clark University, Massachussetts brought World Landuse Survey in 1949. United Nation Educational and Social Scientific Organisation supported this idea and appointed a commission in December in 1953 under the chairmanship of Van Volkenberg at the International Geographical Congress and has proposed to carry out landuse survey in many parts of the world. Great Britain, United States of America, China and Poland have carried out Landuse survey which played commandable role in further landuse studies.

Dayal (1957) has studied the agricultural geography of Bihar. Amani (1968) presented two studies to find out the landuse changes that have taken place during the period of forty years (1926–1966) in agricultural landuse and crop production in Aligarh district. In 1967, M. S. Siddiqi and A. Ahmad have studied the crop landuse in Luni Basin wherein they identified crop combinations and scheme of regional classification. B. K. Roy (1961) has conducted landuse study of five villages of Ballia district and examined the physical conditions, occupational structure responsible for better landuse pattern. Mishra (1956) has prepared a model of agricultural landuse for Central Ranchi Plateau. M. Ameen (1956) and E. Ellefseen have studied the landuse of Delhi State. A. N. Raina has studied basic factors affecting landuse types in Kashmir valley in 1971. Jasbir Singh dealt with the optimum carrying capacity of Punjab. B. N. Ganguli has attempted for landuse in Burki village, Bihar. L. S. Bhat (1972) has stressed the necessity concept of planning at village, block and district level.

The notable works in Maharashtra State have been made by C. T. Pawar (1978), Odilla Continho (1980), K. S. More (1980), P. R. Karmarkar (1981), V. S. Datye (1984), S. D. Shinde (1989) and B. C. Vaidya (1997) for landuse study of various parts. Dhindsa and Sharma (1995) analyzed the growth rates of area, production and yield of various crops in relation to the cropping pattern changes in the Punjab state during the period of 1965-66 to 1990-91. The analysis in this study was based on the secondary data obtained from the statistical abstracts of Punjab. The extension of irrigation facilities in the state had largely been instrumental in bringing drastic changes in cropping pattern. Bhandari (2000) analyzed the different cropping systems under irrigated and rainfed conditions in three districts of Punjab (Kapurthala, Jalandhar and Hoshiarpur) at 127 locations. Among these 78 cultivators under irrigated and 49 under rainfed were selected randomly. The results revealed that growing of three crops in sequence like rice-gobhi, sarson-moongbean/rice-wheat-maize were followed under irrigated condition, followed by two crops in a year. While under rainfed conditions, monocrop was observed. Crop such as wheat was followed by bajra/fodder/sunnhemp (green manure)/mungbean, maize *etc.* Tilekar and Nimbalkar (2001) evaluated the impact of mula irrigation project covered under Ahmednagar district, Maharashtra, through socio-economic follow-up survey during the year 1993-94. The comparison of cropping pattern within and outside

command area shows that the percentage of cereals and pulses was to the tune of 80.8 per cent in non-command area, while in the command area, the proportion of perennial and cash crops was the extent of 35 to 42 per cent.

## **1.2 Choice of the Region**

The researcher has selected Baramati tahsil in Pune district for the study. The choice and topic under investigation is influenced by many considerations. Firstly, researcher belongs to Baramati tahsil, hence he is familiar with study region. Secondly, study region falls in drought prone region of Deccan trap of Maharashtra state receiving annual average rainfall between 500-600 mm. Which is distributed unevenly in the study region. Thirdly, study region is gradually merging zone of Nira and Karha rivers and many small streams are lying in study area having fertile soil. Due to irrigation, sugarcane is mainly cultivated as cash crop. Fourthly, study region has undergone so many changes recently due to canal, well and lift irrigation which brought changes in agricultural landuse in the study area. Lastly, this region has not been so far studied indepthly from landuse point of view by geographers.

## **1.3 Study Area**

Baramati tahsil lies between 18° 2' 44'' N to 18° 23' 19'' North latitudes and 74° 13' 8'' E to 74° 42' 47'' East longitudes. It is located at an altitude of 538 meters above mean sea level. The tahsil lies in the eastern part of Pune district of Maharashtra (Location of the study area and Fig.1.1). The river Nira flows west to east forming the southern boundary of the Tahsil and the district. The river Karha flows northwest to south – east Baramati tahsil is bounded by Indapur tahsil towards the east, Satara district towards the south, Purandar tahsil towards the west and Daund Tahsil towards the north. Baramati city covers an area of 4.35 sq. km. (Census.2001) (excluding 824.8 hectares of land of Baramati M. I. D. C. and Industrial estate). The total geographical area (TGA) of Baramati tahsil is 1382 sq. km., which is about 8.80 percent of TGA of the Pune district. The distance between Mumbai and Baramati is 260 km by road and between Pune and Baramati; it is 100 km by road and railway. Baramati tahsil is somewhat rectangular in shape. The region falls under scarcity zone having annual rainfall between 400 to 500 mm. Monsoon generally commences in June, having highest rainfall in June (158 mm) and lowest in December (12 mm). The highest mean temperature is observed in May

(34.6<sup>0</sup> centigrade) and lowest in January (18.5<sup>0</sup> centigrade). The slope of region is towards northwest and southeast. The study region is mainly agrarian having 84.89 percent net sown area of the total geographical area. The study region is drained by Nira river and its tributaries. The study region consists of 117 villages and has 372852 population (Census 2001) and provisional (2011) has 479690 populations. Population density is 270 people per square kilometres as per 2001 Census.

The villages are grouped into six Revenue circles, viz. Supe, Loni Bhapkar, Vadgaon Nimbalkar, Malegaon Bk., Undavadi Kade Pathar, and Baramati Rural (Revenue circle of the Baramati Tahsil and Fig.1.2). The administrative headquarter of the tahsil is at Baramati which is the only one urban centre in the tahsil. Nira river lies in south-eastern part in study area. Nira and Karha rivers are non-perennial. These rivers flow with magnificent volume of water during rainy season and become dry during summer. The study area has two main canals. According to 2001, Census the region has 372852 persons of which, 192597 males and 180255 females. The agriculture activity of this region depends on farmers and agricultural labourer. Agricultural land use is the result of inter-action between man and environment. Besides physical factors, irrigation exerts influence on the cropping pattern in study region. The major crops namely, sugarcane, wheat, jowar, fodder crop, vegetables, fruit, pulses, oilseeds and bajara are cultivated in the study area. Sugarcane is the leading crop identified in the study area.

**Table 1.1-Circlewise Total Geographical Area**

Sr. No.	Name of the Circle	TGA in sq.km.
1	Circle Supe	274.63
2	Circle Loni Bhapkar	251.46
3	Circle Vadgaon Nimbalkar	193.71
4	Circle Malegaon Bk.	172.18
5	Circle Undavadi Kade Pathar	305.74
6	Circle Baramati	184.29
Baramati Tahsil		1382.00

(Source: District Census Handbook, Pune District, 2001)

**Fig. 1.1 Location of the Study Area**

**Fig 1.2 Revenue Circle of the Baramati Tahsil**

#### 1.4 Objective

This treatise has been undertaken to make an in-depth and comprehensive study of agriculture land use, its planning and development in Baramati tahsil by evaluating following objectives:

- I) Examining the physical background.
- II) Studying the general and agricultural land use.
- III) Identifying crop combination and diversification region.
- IV) Establishing the relationship between land use and environmental Variables.
- V) Suggesting remedial measures for better agriculture land use for Baramati tahsil.

#### 1.5 Data Sources and Methodology

The present study is based on primary and secondary sources. Survey of India (SOI) Topographical sheet No.-47J/12, 47J/13, 47J/15 and 47J/11 on 1:50000 Scale. Guide Map of Baramati tahsil Socio-economic Abstract-2001. Meteorological data like temperature, rainfall etc. Will be collected from Indian Meteorological Department (IMD), Chhatrapati Co-operative Sugar Factory Bhavaninagar, and Agricultural Trust (KVK) Baramati. Soil map has been prepared by National Bureau of Soil Survey and Land Use Planning Pune and Agricultural Development Trust (KVK) Baramati Tahsil. Data on socio-economic parameter has been collected from villages in Baramati tahsil, 1991, 2001 & 2011 Census of India. Maharashtra State Gazetteer Pune District, 1986. Socio-economic Abstract Pune District, 1991, 2001 & 2006, and Department of Irrigation, Baramati tahsil. Rafiullah's (1965) Crop Combination modified Weaver method and introduced a new method known as 'Maximum Positive Deviation Method' The modified formula –

$$d = \sqrt{\frac{\sum D_p^2 - D_n^2}{N^2}}$$

d = deviation

N = number of crops

D<sub>p</sub> = Positive difference

D<sub>n</sub> = Negative difference



Gibb's Martin Index has been applied for the Crop Diversification and computed for 117 villages in Baramati tahsil. Formula-

$$\text{Index of Diversification} = 1 - \frac{\sum x^2}{(\sum x)^2}$$

I. Area of high crop diversification.

II. Area of moderate crop diversification and

III. Area of low crop diversification

Enyedi's Method was chosen to compute Crop Productivity for Baramati tahsil-

$$\text{Productivity Index} = \frac{Y}{Y_n} \div \frac{T}{T_n} \times 100$$

Y = Production of selected crop in a unit area.

$Y_n$  = Total production of selected crop in entire region.

T = Area under selected crop in a unit area

$T_n$  = Area under selected crop in entire region.

The spatial distribution of productivity for every crop is computed, mapped and interpreted by Enyedi's Index. The relationship between landuse and environmental variables correlation has been computed by applying quantitative technique, namely Correlation Coefficient for 117 village data matrix. Pearson product movement correlation was applied. Integrating all above information and maps with the help of GIS software-Autodesk Map 2007 and Arc GIS 9.3. Various thematic layers are analysed to demarcate 2000 and 2010. The spatio- temporal data Model in the Vector based GIS. Primary data has obtained for six sample villages through questionnaires. The questionnaires cover aspect like Crop Landuse, farmer's education income from various sources and problems regarding agriculture and allied sectors. Besides this information the concerted Talathi and Sarpanch were contacted to get more information of sample villages. The spatial and temporal aspects of general and agricultural landuse studied indepth.

## **1.6 Arrangement of Text**

The proposed study has been arranged into seven chapters. The opening chapter putforths objectives of study, review of literature, sources of data, methodology and limitations of the study. The chapter second has attempted to present the background of

study area with respect to location, physiography, climate, geology, soil, natural vegetation, transportation linkages, weekly market centres and socio economic profile of the population. The chapter three unfolded the spatio temporal analysis of general landuse study, volume of change from 2001 and 2010 for the net sown area, land not available for cultivation, cultivable waste, fallow land and forest cover in Baramati tahsil. The chapter four has investigated the agricultural landuse pattern of ten selected crops with spatio temporal variations in study area. The chapter five has studied crop region by applying techniques like crop ranking, crop combination and crop diversification. The sixth chapter has studied crop productivity for selected villages. These villages were studied indepthly and found out crop productivity. The last chapter deals with the summary and findings of the study. The suggestions for better planning and development to Baramati tahsil are also mentioned in this chapter.

### **1.7 Limitations**

The present study converges upon available data for crops at village level in order to depict clear picture of the existing agricultural landuse pattern in the Baramati tahsil. This study is time limited hence; the study of every piece of land is difficult to assess the agricultural landuse in Baramati tahsil. The study area is mainly based on secondary data obtained from published sources. However, the researcher has also collected primary data through the interviews, field work and questionnaires. The temporal variation in the cropping pattern in the study area has been collected from 1990-91 to 2010-11. But the spatial distribution of nine crops has been studied only for one time point i.e. 2010-11.

Baramati tahsil is divided into six administrative circles viz, Supe, Loni Bhapkar, Vadgaon Nimbalkar, Malegaon Bk., Undawadi Kade Pathar and Baramati Rural. The researcher has selected these six sample villages as a representative village of the circles mention above. The data of these villages impart authenticity to the study of the region. As the researcher has collected primary data of agricultural productivity through the interviews, field work and questionnaires; it gives authenticity to the research work. However, it is observed that the farmers were quite interactive during interview sessions, but reluctant to fill in the questionnaire due to either their lack of correct information or their unwillingness to provide written record of the agricultural details.

This resulted into getting the sampling of the representative villages in administrative circles. The researcher was keen to study the agricultural productivity of the entire Tahsil by collecting primary data, but the reluctant approach of the farmers to share the yield on paper proved to be a stumbling block. However, the researcher has successfully collected the authentic data by winning their confidence and assuring them the usefulness of the research work.

### **1.8 Conclusion**

The present chapter deals with the fourth objectives of study, review of literature, sources of data, methodology and limitations of the study. Baramati tahsil lies between  $18^{\circ} 2' 44''$  N to  $18^{\circ} 23' 19''$  North latitudes and  $74^{\circ} 13' 8''$  E to  $74^{\circ} 42' 47''$  East longitudes. It is located at an altitude of 538 meters above mean sea level. The tahsil lies in the eastern part of Pune district of Maharashtra. The study region is drained by Nira river and its tributaries. The study region consists of 117 villages and has 372852 population (Census 2001) and provisional (2011) has 479690 populations. Population density is 270 people per square kilometres as per 2001 Census. The study region is mainly agrarian having 84.89 percent net sown area of the total geographical area. Primary and secondary data have obtained for 117 villages through questionnaires. The data collected were then converted into percentage. Rafiullah's crop combination technique was applied to compute crop combination regions. Gibb's Martin Index has been applied for the Crop Diversification and computed for 117 villages in Baramati tahsil. Enyedi's Method was chosen to compute Crop Productivity for selected villages of Baramati tahsil.

**CHAPTER-II**  
**PROFILE OF THE STUDY REGION**

**2.1 Introduction**

**2.2 Location, Site and Situation**

**2.3 Physiography and Drainage**

**2.4 Geology**

**2.5 Climate**

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## **CHAPTER-II**

### **PROFILE OF THE STUDY REGION**

#### **2.1 Introduction**

The natural resources of any region are considered of vital importance for the economic development. Hence, it is necessary to explore the potential in term of economic and social aspects. Land is the basic resource of human society. Its utilization shows a common relationship between ecological conditions of a region and man. The varied nature, namely, climate, soil, transportation, occupational structure, population, vegetation, water etc. have provided scope for further development. It is therefore, necessary to evaluate a spatio-temporal analysis of agricultural landuse and productivity in Baramati tahsil. It has an elongated shape which runs in northwest to southeast direction. Physiography in most part of the Tahsil is plain except for a few hills and small ranges. The low divide between the rivers Karha and Nira infects the extension of the southern part of the Saswad surface. This gradually merges in the confluence of the two rivers. Many small streams originate from the southern steps of the divide. These streams infect the main gullies which have thus, developed a kind of badland topography in the close vicinity of the Nira canal.

#### **2.2 Location, Site and Situation**

The Baramati tahsil lies in the eastern part of Pune district of Maharashtra. The river Nira flows west to east forming the southern boundary of the tahsil and the district. The river Karha flows northwest to south-east Baramati tahsil is bounded by Indapur tahsil towards the east, Satara district towards the south, Purandar tahsil towards the west and Daund Tahsil towards the north. Climatologically, it lies in the rain shadow zone of the Western Ghats and geomorphologically, it is located in the Karha and Nira basin, a part of middle Bhima basin. Baramati tahsil lies between 18° 2' 44'' N to 18° 23' 19'' North latitudes and 74° 13' 8'' E to 74° 42' 47'' East longitudes. The total geographical area (TGA) of the tahsil 1382 sq.km. This is about 8.80 percent of TGA of the Pune district. The study region consists of 117 villages and has 372919 populations in 2001(Fig.2.1, Index No. Of villages in the study area) and provisional 2011 census has 479690 population. Population density is 270 people per square kilometres as per 2001

**Table- 2.1 : Name and Code Numbers of the Villages in Baramati Tahsil**

Code No.	Name of the Villages	Code No.	Name of the Villages	Code No.	Name of the Villages	Code No.	Name of the Villages	Code No.	Name of the Villages
1	Vadhane	27	Jaradwadi	53	Palshiwadi	79	Sadobachiwadi	105	Jalochi
2	Dandwadi	28	Undavadisupe	54	Masalwadi (N.V.)	80	Korhale Kh	106	Kanheri
3	Naroli	29	Karkhel	55	Moralwadi	81	Sonkaswadi	107	Katewadi
4	Kololi	30	Sonvadisupe	56	Modhave	82	Malegaon Kh.	108	Pimpali
5	Pansarewadi	31	Undavadi Kade Pathar	57	Umbarwadi	83	Malegaon Bk	109	Gunwadi
6	Supe	32	Gojubavi	58	Chaudhar Wadi	84	Pawnewadi	110	Baramati Rural
7	Kutwalwadi	33	Katphal	59	Waki	85	Yelewasti	111	Malad (baramati)
8	Bhondvewadi	34	Jainakwadi	60	Kanadwadi	86	Pandare	112	Dorlewadi
9	Ambi Kh	35	Sawantwadi	61	Chopadaj	87	Pawaimal (N.V.)	113	Zaragadwadi
10	Ambi Bk	36	Barhanpur	62	Vadgaon Nimbalkar	88	Dhumalwadi	114	Dhekalwadi
11	Jogwadi	37	Nepat Valan	63	Korhale Bk	89	Manappawasti	115	Songaon
12	Morgaon	38	Medad	64	Thopatewadi	90	Kurnewadi	116	Mekhali
13	Chandgude Wadi	39	Tandulwadi	65	Malshikare Wadi	91	Sirshane	117	Ghadagewadi
14	Khadukhairewadi	40	Murti	66	Hol	92	Pimpalewasti		
15	Kalkhairewadi	41	Tardoli	67	Sastewadi	93	Malwadi		
16	Sherechiwadi	42	Loni Bhapkar	68	Magarwadi	94	Bajrangwadi		
17	Baburdi	43	Sayambachiwadi	69	Deulwadi	95	Late		
18	Karhati	44	Malwadi	70	Karanje	96	Pandharwadi		
19	Deulgaon Rasal	45	Jalgaon Kade Pathar	71	Khandobachiwadi	97	Kambleshwar		
20	Jalgaon Supe	46	Anjangaon	72	Gadadarwadi	98	Sangavi		
21	Kharade Wadi	47	Karhavagaj	73	Nimbut	99	Shirawali		
22	Shirsuphal	48	Bhilarwadi	74	Soratewadi	100	Khandaj		
23	Sabalewadi	49	Dhakale	75	Karanjepul	101	Nirvagaj		
24	Parwadi	50	Kamagalwadi (N.V.)	76	Waghalwadi	102	Vanjarwadi		
25	Nimbodi	51	Mudhale	77	Wanewadi	103	Sawal		
26	Gadikhelwadi	52	Jalakewadi Mudhale	78	Murum	104	Rui		

Source: District Census Handbook of Pune, 2001.

**Fig. 2.1 Index No. of the Villages in the Study Area**

Census. This tahsil consists of 117 villages and one urban centre (Table- 2.1, Name and Code No. in Villages of the study area).

### **2.3 Physiography and Drainage**

Baramati tahsil may be divided into two physiographic regions according to altitude. The first one is the hilly track above the 550 meters contour having altitude from 550 to 650 meters. The other one is gently sloping belt along Nira and its tributary Karha. There are two water divides; one divides the Nira and the Karha basin while the other runs from west to east between Karha and Bhima. The northern one runs along the northern border of the tahsil and forms the water divide between Bhima and Karha. The second belt of hilly region runs from northwest to southwest corner of the tahsil. This is the highest point in the region (650 m) and lies at the junction of the three tahsils of the Pune district viz. Daund, Purandar and Baramati. The hilly zone locally called as *Malran* (open, non cultivated land) shows that agriculture is poor. The riverine belts along Nira and Karha occupy 40 percent area of the tahsil. This region offers favourable situation for irrigation and hence agro-based development. Topographically, it is almost a plain region with alluvial soils. The black colour of the soil is the indicator of high fertility status. The generalised direction of slope is from northwest to southeast in the Karha basin and from west to east in the Nira. Baramati tahsil is mainly drained by river Nira and its main tributary Karha (Fig.2.3, Drainage Pattern in study area). Nira is an important tributary of river Bhima. It is a natural boundary between Pune and Satara District. The total length of the Nira in the Tahsil is nearly 61 kms. The river Karha meets Nira river at Songaon in the south-east corner of the Tahsil. It flows from northwest to south- east. Baramati city is located on the left bank of the river Karha. Both the Nira and Karha rivers are non perennial. They flow with a large volume of water during the rainy season only and are nearly dry during summer.

### **2.4 Geology**

The study area is the part of Maharashtra plateau and hence rock formation is associated with the flows of basic lava. There are two types of traps, viz. Massive and Zeolitic. Massive trap is found on the large scale as compared to Zeolitic trap in the study area according to the Geological Survey Department (Fig.2.4, Geological Map of the study area). Zeolitic trap is found in the narrow strips, the largest of which is along the Nira river. This trap has a good aquifer quality and hence it provides scope for well irrigation.



**Fig. 2.3 DEM and Drainage Pattern in Study Area**

**Fig. 2.4 Geological Map of the Study Area**

The same belt shows river channels and canal irrigation, which are responsible for recharge. On the other hand, massive trap provides limited scope for groundwater accumulation. This has led to very low potential of well irrigation. The field study has revealed that the wells in the areas of massive lava are deep and highly seasonal in character. There are unable to fulfill the demand of water resource in dry spell of monsoon.

## **2.5 Types of Soil**

Soil plays a vital role in cultivation of crops in the area of Baramati tahsil. Physiography, drainage and climate exert influence on the growth of plants. The fertility of soil is one of the factors affecting land capability of agricultural development. There are three types of soil found in the study area, namely, coarse shallow plateau soil, medium deep soil and deep black soil. Coarse shallow soil is observed in the hilly region. The region is locally called as '*Malran*' and thickness of the soil is less than 5 cms. The reddish brown colour is due to oxidation accelerated by aeration in the dry zone. Such soil is unable to support agriculture and hence is barren or covered with thin grass. This soil is locally known as '*barad*' soil. This soil is very poor in humas and naturally it is less fertile. The medium black soil appeared in the surrounding area of Nira river and its tributary Karha. The depth is about 50 cms and 1 meter and the colour is gray to medium black. This kind of soil is found in the villages Baburdi, Tardoli, Morgaon, Ambi Bk., Ambi Kh., Loni Bhapkar, Malwadi, Jalgaon Kade Pathar, Jalgaon Supe, Karha Waghaj, Anjangaon, Medad, Baramati rural, Gunawadi, Malad and Songaon villages (Fig.2.5, Soil map of the study area). This soil is suitable for cultivation of sugarcane, wheat, oilseeds and pulses. The deep black soil lies along the bank of Nira river occupying 20 percent of the study region. This soil is rich in moisture and has high retentive capacity. It has varied depth of 1 meter to 5 meter and is suitable for commercial farming. Sugarcane cultivation is well grown in this soil. This soil is comparatively more fertile than earlier medium deep soil. Sugarcane, wheat, vegetables and fodder are common crops grown on this soil in the study area. The qualities of soil and irrigation facility have supported the sugarcane, which is the major cash crop in the study area.

## **2.6 Climate**

Climate is one of important aspects influencing agricultural landuse pattern. The climate exerts influencing on crop growth in the study area. The vegetation cover and

**Fig. 2.5 Soil Map of the Study Area**

prevalent climate relate to the formation of soil types and later this soil responsible for existing agricultural landuse. The suitable climate is essential for better yield, growth, production and reproduction. The study area experiences hot and dry climate during a major part of the year. There are three seasons experienced in the study area, namely, winter, rainy season and summer. The region receives rainfall from the south-west monsoon. Monsoon sets in the month of June and lasts upto October. The average annual rainfall ranges between 400 and 500 mms. The study area receives average annual rainfall of 364 mm. (Table-2.2, Monthly Average Rainfall).

**Table-2.2: Monthly Average Rainfall**

Months	Rainfall (mm)	Months	RAINFALL (MM)
January	Nil	July	158.00
February	24.00	August	112.00
March	Nil	September	58.00
April	Nil	October	Nil
May	Nil	November	Nil
June	Nil	December	12.00

Source: Department of Irrigation Agricultural Development Trust, Baramati (2011).

Agroclimatically, the study region comes under a scarcity zone. October and November receive rainfall from retreat of monsoon. The annual rainfall receives 80 percent during rainy season. The highest rainfall is received in July (158.00 mm) and the lowest in December (12.00 mm). This rainfall seems to be uneven and also inadequate and irregular (Rainfall and Temperature of the study area, Fig. 2.6). Winter is observed from November to February and summer from March to May. The mean annual maximum temperature is recorded in May (34.6° centigrades) while the mean annual minimum temperature is in January (18.5° centigrades). The mean summer temperature is 28.2° centigrades whereas the mean winter temperature is 22.4° centigrade. The mean maximum temperature is recorded in May (39 centigrades) and mean minimum temperature in November (8 centigrades). The average summer temperature is 35.5 centigrades whereas mean winter temperature is 19.75 centigrades (Rainfall and Temperature, Table 2.3).

**Fig. 2.6 Temperature and Rainfall of the Study Area**

**Table-2.3: Mean Monthly Temperature**

Months	Temp. Maxi. (°C)	Temp. Mini. (°C)	Mean (°C)
January	27	10	18.5
February	32	12	22.0
March	36	18	27.0
April	38	20	29.0
May	42	27	34.6
June	34	18	26.0
July	29	21	25.0
August	27	20	23.5
September	29	19	24.0
October	33	22	27.5
November	30	15	22.5
December	29	13	21.0

Source: Department of Irrigation Agricultural Development Trust, Baramati (2011).

## 2.7 Natural Vegetation

Irregular and uneven rainfall in the study area exerts influence on vegetation. The natures of soil and climatic condition have a direct impact on the growth of vegetation. Forest in 1991 was 4 percent and it declined to 3.57 percent in 2010. The total decline is 0.43percent. It is also observed that the villages of Vadhane, Dandevadi, Supe, Sablewadi, Paravadi, Gadikhelwadi, Undawadi Kade Pathar, Korhale Bk., Deulwadi villages have 4 to 8 percent forest. This area is owned by the Forest Department therefore, trees and forest have been preserved. The natural vegetation is mainly of low scattered trees occurring along the border of the study area. The hot and dry climate has resulted mixed thorny trees, stunted grass and scanty vegetation. Trees like Mango (*Mangifera India*), Jambhul (*Syzygium Cummi*), Neem (*Azadiracta India*), Babhul (*Accacia Arabica*), Bor (*Zizaphus Jujubal*), Chinch (*Tamaridus India*), are obtained scantily throughout the study region. Shrubs like Ghaneri (*Lantena*), Tarwad (*Casia Cuviculata*), Rui (*Caletropus Gigatio*), Ghayapat (*Agave Sissatana*) are associated with culturable waste lands. Harali (*Cynaden Clactylon*), Kunda (*Jachycomumy regasum*), Kusali (*Hetropogan Contestus*) and Gajar grass (*Partherim Clactylon*) are found on open spaces near 'gaonthan' and along the bunds of agricultural fields.

## 2.8 Transportation

Transport plays an important role for agricultural development in study regions. It acts as the main vehicle for bringing different raw materials, seeds, fertilizers, implements together and distributes the final product within the region. Transportation helps to bring in a variety of seeds, fertilizers, agricultural implements and sends out agro-production. In addition to this, transportation gears up products within the region. The study area has six state highways, major districts roads other districts roads, village road and unmetalled roads. Most of the rural settlements have been linked with *kaccha* and *pakka* roads. Dense link road has facilitated the movement of agricultural produce from the farm to factory and the market. The road transport support for collecting and distributing agricultural products. The major district roads and village roads link with Baramati-Nira and Baramati-Phaltan state highways. The total length of Baramati-Nira State highway No.66 in the study area is 45 kilometres. Baramati-Phaltan state highway No.68 runs in the southeast direction in the study region having the length of 22 kilometres. The study region is also served by a broad gauge railway line connecting Baramati-Daund however, the railway track of only 40 km. length comes in the study area (Fig.2.7, Transportation map of the study area). In addition, there are many roads along the Nira left bank canal and its tributaries but they are in the possession of the Irrigation Department and are not open to the public transport. There are many other approach roads connecting a number of villages to the main road. The construction of an airstrip in the industrial area has been completed. The name of this strip is Baramati airstrip. This is 10 kms away from, and is situated at the north of Baramati town. The services of this airstrip are being made available to the entrepreneurs of Baramati industrial area. Baramati has S. T. D, I. S. D., fax all leading telecommunication and internet facilities as means of communication. All India radio, Pune, broadcasts programmes and 'Baramati Krushi' Radio channel, called as 'Vasundhara' broadcasts programmes on Agriculture and general education. Which is it most effective audio-visual communication media -television- is spreading very rapidly in the Tahsil. Trucks and tractors are common for transportation of agricultural productions in the study region. However, poor and marginal farmers still use traditional bullock-cart for transport purpose.



**Fig.2.7 Transportation Map of the Study Area**

## **2.9 Irrigation**

The availability of irrigation facility plays a vital role in the socio-economic and agricultural development of area. It is also the key issue the study area. The Bhatghar dam having a capacity of 672 mm<sup>3</sup> is built on the Nira river. This dam has left a diversion weir at Veer and Nira left and right canals. It was started in 1881 and was completed in 1882. From the dam two canals have been constructed. One canal is on the right side of the Nira river which is 130 miles long. It serves 80,000 acres, farming part of Satara and Solapur districts. The second canal is on the left bank of the river being 101 miles in length. It serves 67500 acres farming part of cultivated land of Baramati tahsil. Nearly 18600 hectares i.e. 18.46 percent of land is under canal Irrigation. In Baramati Tahsil, out of 117 villages 38 villages that is 1/3 area gets the benefit of Nira Left canal and the remaining 79 villages, that is 2/3 of the area, depend on uneven rainfall. All these villages fall under the drought-prone area. Nira and Karha rivers are the main sources of water for these regions.

## **2.10 Population Density**

Population is an important factor for regional development influencing economic activity and it determines the level of consumption and agriculture force. It is a part of the workforce in terms of cultivators and agricultural labourers. The population in the study area is 372852 persons according to 2001 Census and provisional 479690 persons 2011 Census, having a population density of 270 persons per square kilometre. In 1991 the population was 266014 with a density of 225 persons per square kilometre. In 1981 the density was 186 and 97 persons in 1951 in Baramati tahsil. The growth rate of population from 1991 to 2001 was 40.65 percent. It was 33.64 percent from 1981 to 1991. It is noted that the growth was almost three times from 1961 to 1991 in Baramati tahsil. The population density in the present chapter has been studied to understand the regional variations in the study area. The spatial distribution of population density has been shown for the years 1991 to 2001 (Appendix-C).

**Fig. 2.8 Population Density Map**

**Table-2.4: Density of Population**

Regions	Population Density Per square kilometres						
	1951	1961	1971	1981	1991	2001	2011
India	177	142	177	216	267	325	382
Maharashtra	104	129	164	204	257	315	365
Pune District	125	157	203	266	354	462	603
Baramati Tahsil	96	124	165	186	224	270	347

Source: Census of India Handbook, 1951 to 2011

**Table-2.5: Growth Rate of Population in Baramati Tahsil**

Year	Total Population	Density	Growth Rate
1951	134271	96	15.14
1961	173817	124	29.45
1971	227707	165	31.00
1981	257511	186	13.09
1991	266014	224	20.55
2001	372852	270	20.10

Source: Pune District Census Handbook, 1951 to 2001

Note: Growth Rate are given in percent

It is observed from this figure that the highest population density for 2001 was recorded at Malegaon Bk. (1011 persons per square kilometres) followed by Waghawadi (990 persons). There were ten villages having a population density ranging between 500 and 750. These villages are Rui (746), Jalochi (589), Dorlewadi (572), Baramati Rural (590), located in the eastern part. Sangvi (636), Pandare (543), Pawanewadi (534), located as south part, Supe and Sherechiwadi are located in north-west part and Wanewadi (608), Karanjepul (598), located in the south-west part (Population Density Map-2001, Fig. 2.8/B). These villages have high density due to irrigation; sugarcane is mainly cultivated as cash crop. Thirty-two villages having a population density ranging between 250 and 500 in south part of the Baramati tahsil. Namely Vadgaon nimbalkar (432), Khandobachiwadi (482), Murum (418), Yelewasti (499), Manappawasti (443), Dhupalwadi (405), Kambleshawar (431), Malad (450), Gunawadi (477), Nirawagaj (400), Zargadwadi (448), Pimpri (433), Katewadi (456) and

Supe (441), Malwadi (463) located as south part of the study area. Seventy-three villages in the study region have a density less than 250 persons observed throughout the study region. This area of low density attributed to less fertile soil of the region having low yield per hectare. The spatial distribution of population density in 1991. The density of population in 1991 was 226 persons per square kilometer in the study region. Two villages, namely, Nimbut (1176), Waghawadi (960) and Malegaon Bk. (774) show a considerable increase in population density during the study period due to their locations at nodal place. Nimbut, Waghawadi and Malegaon Bk. are located at a point where there is Baramati-Nira State highway and it is also marked as the mostly irrigated land of the study area (Population Density Map-1991, Fig. 2.8/A).

### **2.11 Weekly Market Centers**

Weekly market centres in Baramati tahsil mobilize rural local resources. There are eighteen weekly market centers in the study area. Weekly market centres provide an opportunity to consumers, sellers, traders and mediators for exchanging goods. Murti, Karanje, Vadgaon Nimbalkar, Pandare and Wanewadi lie on State Highway No.-66 and are accessible market centres throughout the year. Morgaon market centre has a slender connection with other market centres in the study area owing to its isolated location. Korhale Bk., Loni Bhapkar and Supe lie on State Highway No.-62. Market centers, namely, Shirsuphal, Karhati, Katewadi, Songaon, Karkhel and Mekhali are linked with state highways and major district roads. Among these market centres, Baramati is well known for cattle marketing in the study area. Table- 2.5 presents weekly market centers, market days and their distance in the study region (Weekly Market Centers of the study area, Fig. 2.9). In most of peasant societies markets are periodic rather than the daily and permanent. It is not opened every day for marketing but once in a few days on a regular scheduled basis. Hence, per capita demand for goods sold in this market is small weekly market centers can be regarded as the lower order goods and services to its surrounding areas as a fixed day in a week. In rural economy area weekly market centers play an important role in exchanging the local produce through certain norms. The weekly market centers play important role in accelerating rural development, particularly in economic and social life of the people in the peasant society in developing countries. The weekly market centers provide knowledge to surrounding villages.

**Fig. 2.9 Weekly Market Centres**

**Table- 2.6: Weekly Market Centres in Baramati Tahsil**

Sr. No.	Market Centres	Days	Distance (in km)
1.	Supe	Monday	25
2.	Morgaon	Saturday	28
3.	Murti	Tuesday	43
4.	Karanje	Monday	21
5.	Vadgaon Nimbalkar	Sunday	26
6.	Baramati	Thursday	00
7	Shirsuphal	Friday	20
8	Loni Bhapkar	Friday	22
9	Pandare	Tuesday	15
10	Sangvi	Friday	10
11	Korhale Bk.	Wednesday	20
12	Karhati	Monday	17
13	Wanewadi	Thursday	20
14	Katewadi	Saturday	10
15	Songaon	Tuesday	12
16	Manajinagar	Saturday	18
17	Mekhali	Friday	18
18	Jalgaon K.P.	Sunday	12

Source: District Census Handbook, Pune.

Note: Distance is measured from Baramati.

## 2.12 Occupational Structure

The availability of labour resource and its involvement in agriculture indicates the labour intensive cash crop cultivation. The agricultural activity of this region depends on farmers and agricultural labour. The Planning Commission of India in 1951 classified population into three occupational structures, namely, total, main workers, non-workers and marginal workers. These workers have been further classified into three categories, namely, cultivators, agricultural labours and other workers. Main workers mean those who are engaged in economic productive activity for the major part of the preceding year (at least six months or 180 days) while marginal workers mean those who work for some time but not for the entire year. Other workers consist of those who are engaged in livestock, forestry, fishing, hunting, plantation, orchard, mining, quarrying, manufacturing, processing, servicing, construction work, trade and commerce and other

**Fig. 2.10 Occupational Structure of the Baramati Tahsil**



services. Table-2.6 shows the decadal changes of occupational structure in the study region for 1981 to 2001. It is clear from this figure that cultivators have increased to 37.45 percent in 1981 and 38.85 percent in 1991 respectively. The total change from 1981 to 1991 in the study area was recorded 1.4 percent. Percentage of agricultural labour shows a steady decrease during 1981 and 1991. There was 1.7 percent decrease in 1991 and 3.31 percent decrease in 2001. In the study area marginal workers have declined by 7.45 percent from 1991 to 2001. Other workers have increased by 7.43 percent from 1981 to 2001 (Fig.2.10, Occupational structure in the study area).

**Table- 2.7: Occupational Structure in Baramati Tahsil**

Sr. No.	Years	Cultivators	Agricultural Labours	Other workers	Marginal Workers
1.	1981	37.45	35.53	16.02	9.76
2.	1991	38.85	33.83	18.28	9.13
3.	2001	44.41	30.52	23.45	1.68

Source: District Census Handbook, Pune District

Note: Figures are given in percent

### 2.12.1 Distribution of Cultivators

The spatial distribution of cultivators in 1991 and 2001 is shown in the Fig.2.11. In 1991 the total cultivators were 50127 persons accounting for 38.85 percent of the total population in the study area. The distribution of cultivators in the study area appears to be uneven. The number of cultivators in Baramati tahsil increased from 1991 to 2001 in both the directions i.e. south-west and north from central part. Jaradwadi village in the north-east part shows (88 percent) the highest number of cultivators in 1991 while lowest cultivators are found in Malegaon Bk., Malad and Waghawadi (15 percent) villages. Twenty-two villages in the study area had 60 to 80 percent cultivators distributed in three patches. Among them, twelve villages are located in west part; seven villages are located in north three villages in eastern parts in the study area. Thirty-nine villages having less than 40 percent cultivators have been observed in all parts in the study area (Fig. 2.11, Distribution of cultivators) owing low fertility of soil in the Baramati tahsil. In 2001 in the Baramati tahsil that the overall percent of cultivators increased farm workers. The highest percentage of cultivators is observed at Gadikhelwadi, Jaradwadi, Chandgudewadi accounting for 90 percent followed by Sablewadi, Pansarewadi and

**Fig. 2.11 Cultivators , Agricultural Labours & Other workers**

Kutwalwadi accounting for more than 80 percent located by northern part of the study area where more percent of workers are involved in agriculture. Thirty-seven villages having 60 to 80 percent of cultivators is recorded at Baramati tahsil. Thirty villages having 40 to 60 percent cultivators are well distributed in the study area. Seventy-two villages show less than 40 percent cultivators of the total population occupied throughout the study area (Fig.2.11 and Appendix-D).

### **2.12.2 Distribution of Agricultural Labours**

The data regarding agricultural labourers has converted in percentage for the year 1991 and 2001. The highest percentage of agricultural labourers is seen in Karanje village (73 percent) located by south part and lowest at Kalkhairewadi (4 percent) north-west part in 1991 (Fig. 2.11). Twenty villages have 45 to 60 percent agricultural labour in south part of the study area. Thirty-eight villages having 30 to 45 percent of agriculture labour is recorded at Baramati tahsil. Sixteen villages have found less than 15 percent of agricultural labour in 1991. The spatial distribution of agricultural labour in 2001 for the Baramati tahsil has been shown in Fig. 2.11. The main feature of agriculture labourers decreased considerably during study period. The agricultural labour in the study region contains 43273 persons accounting for 30.52 percent. The highest percent of agricultural labourers is seen in Karanje (60 percent) located by south part and lowest is at Chandgudewadi located by north-west accounting 2 percent in 2001. Twenty-eight villages lying north-west and north-eastern part in study region have less than 15 percent of agricultural labour in 2001. 45 to 60 percent accounting for Nimbut, Murum, Hol, Korhale Bk., Kambleshawar, Shirasne, malad, Gunawadi and Zaegadwadi lies in south part of the study region. Seventy-eight villages, having less than 15 percent agriculture labour are well distributed within the study region. These villages have not shown any significant increase in the number of agricultural labourers.

### **2.12.3 Distribution of Other Workers**

The spatial distribution of other workers in Baramati tahsil for 1991 and 2001 is shown in Fig. 2.13. In the study area, 21506 other workers are distributed in all parts in the study region. In 1991 Tandulwadi village had the highest percent of other workers i.e. 54 percent followed by Rui (43 percent), Jalochi (41 percent) and Jainakwadi (42 percent). Twenty-eight villages lie in the category of 40 to 60 percent located in the west and south-east part. The remaining eighty-four villages having other workers less than 20 percent are distributed in all the parts in Baramati tahsil (Fig.2.11).

The distribution of other workers in 2001 in Baramati tahsil is given in Fig. 2.11. The total of other workers in the study area was 33259 persons. Jalochi village having the highest percent of other workers is located in east (80 percent). Baramati rural (64 percent), Tandulwadi (63 percent), and Rui villages (73percent) lie in the south-east part having 60 to 80 percent other workers in the study region. The percent of other workers has increased due to industrial area in the study area. Thirty-two villages lying in the south-eastern and western parts have other workers between 20 to 40 percent. Seventy-nine villages having less than 20 percent of other workers are spread all over the study region (Appendix-E).

### **2.13 Conclusion**

The present chapter deals with the profile of physical and socio-economic aspects in the study area, namely relief, drainage, soil types, climate, irrigation, transportation, marketing, population and occupational structure in the study region. The generalised direction of slope is from northwest to southeast in the Karha basin and from west to east in the Nira. There are three types of soil structures: deep black, medium black and coarse shallow which are identified in the study region. The study area, like other area has witnessed a steady growth of population with its upwards trend. The growth rate of population from 1991 to 2001 was 40.65 percent, due to the agro-industrial development. The average density of population is 270 persons per sq.km.in the region (2001). From spatial point of view, the population density increases towards south-east. Of the total population 84.89 percent working force is engaged in agricultural pursuits. The total working force accounts cultivators is 44.41 percent and agricultural labourers are 30.52 percent. However, the other workers increased by 5.17 percent from 1991 to 2001 in the Baramati tahsil, due to the establishment of small scale industries and the introduction of new industries in Baramati M.I.D.C. The newly established service sector also contributed in the increase.

**CHAPTER-III**  
**GENERAL LANDUSE PATTERN**

**3.1 Introduction**

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**3.3 Temporal Variation in Landuse**

**3.4 Spatial Variation in Landuse Pattern**

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**3.5 Conclusion**

## **CHAPTER-III**

### **GENERAL LANDUSE PATTERN**

#### **3.1 Introduction**

The general landuse of any region is influenced by numerous factors. Physical and socio-economic factors play a major role in shaping the general landuse. The spatial variation in general landuse is the result of man-environmental relationship. Therefore, the study of general landuse pattern of Baramati tahsil was selected to examine both temporal and spatial landuse. This chapter is devoted to the study of spatio-temporal analysis of general landuse in study region. The general landuse pattern has been classified as, net sown area, land not available for cultivation, cultivable waste, and forest cover. The data regarding crops has been obtained for 1991 and 2001. The obtained data was converted into percentage to total geographical area. Further, these have been used for showing the spatial distribution with suitable cartographic maps. A Compound bar diagram exhibits the temporal variation of land classification for a period of forty years in the study area. This percentage was then categorized into various groups, and then the volumes of change were computed and are shown in figures and interpreted in the text. The description of each land classification has been supplemented by numerous spot-inquiries, besides information embodied in the relative District Census Handbook, District Gazetteer and District Socio-Economic Review of Pune District.

#### **3.2 Classification of General Landuse**

Land can be divided into different categories according to a set of factors. It is controlled by climatic factors, soil characteristics, slope of land, and degree of erosion, water supply, drainage and similar environmental conditions. In past, several attempts have made in different countries to classify general landuses from different viewpoints by employing various methods. Stamp (1968) was regarded as a pioneer in the field of land classification. In his book, "The Land of Britain : Its Use and Misuse" he has classified land into six categories, namely Forest and woodland, Arable land, Meadow land and Permanent grass, Heath and moorland, Gardens, Orchards, nurseries and unproductive land like land under buildings, mines and wastelands. Internationally, landuse has been classified into nine categories such as, (a) Settlement and non-agricultural use, (b) Horticulture, (c) Trees and permanent crops, (d) Cropland, (e) Improved permanent pastures, (f) Improved grazing land, (g) Woodland, (h) Swamps

and marshes and (i) Unproductive land. Landuse types have been grouped on the basis of land capability, local relief, climate, soils and vegetation cover. In this category landuse is divided into two in the United States of America such as (a) land capable of carrying various crops or grass in rotation or permanent and (b) Land suitable for economic uses, grazing or afforestation. The National Resource Planning Board of the United States of America has classified the land into four categories, namely (a) Land classification in terms of inherent characteristics, (b) Land classification in terms of present day use, (c) Land classification in terms of recommended uses, and (d) Land classification in terms of programme implementation. Land classification in the Union of Soviet Socialist Republics has been categorized into six types such as (a) Land belonging to the urban-rural localities of the industrial and transport department, (b) Arable land, and perennial plantation, (c) Natural grasslands, (d) Forests, (e) Bogs and peats and (f) Unsuitable land. A.K. Phibrick (1980) has classified land of China into categories such as (a) Agricultural land, 60 percent or more under cultivation, (b) Agricultural land, at least 20 percent under cultivation, (c) Advancing agriculture and afforestation, (d) Upland with some cultivation and patches of forests, (e) Natural forest, (f) Steppes and desert, grazing land, some cultivation and patches of forests and (g) Major drought prone areas.

The National Atlas Organization, Kolkata in 1957 classified land into eight categories : (a) Forest, (b) Scrub, (c) Arable land with trees, (d) Plantation, (e) Pasture, (f) Wasteland, (g) Alpine grass and scrub and (h) Glaciated region. The Damodar valley region has been classified into ten major categories, (a) Field crops, (b) Orchards, (c) Dense forests, (d) Light forests, (e) Non-agricultural land, (f) Unproductive land, (g) Water bodies, (h) Culturable waste, (i) Village and (j) City and towns. Before 1951, landuse statistics collected by Ministry of Agriculture, Government of India were arranged into six categories: (a) Total geographical area, (b) Area under forests, (c) Area not available for cultivation, (d) Current fallow land, (e) Other uncultivated land and (f) Net sown area. E. Ahmad in 1954 has classified rural landuse into eleven categories, namely, (a) Single cropped land (b) Double cropped land (c) Triple cropped land (d) Fallow land (e) Land under grove and orchards (f) Land under scrubs and grasses (g) Land permanently under water (h) Built-up land (i) Land under transport and communication (j) Barren land and (k) Forests. Land Record Department, Government of India has officially classified land under following twelve categories such as : (a) Reported area for land cultivation purposes (b) Forests (c) Barren and uncultivable land (d) Land put to non-agricultural uses which is again classified into types such as: (i)

Culturable waste (ii) Permanent pasture and other grazing land. (e) Land under miscellaneous trees, crops and groves not included in net area sown which is of two types (i) Current fallows (ii) Other follow land(f) Net sown area (g) Area sown more than once and (h) Total cropped area. These twelve categories are finally grouped into five classes such as: (a) Net sown area (b) Land not available for cultivation (c) Cultivable waste (d) Fallow land and (e) Forest land. For the present study these five categories have been studied by assessing temporal and spatial landuse in the study area.

### 3.3 Temporal Variation in Landuse

The general landuse of any area undergoes changes in any given period of time. The temporal variation in landuse pattern of study area has studied for the period of forty years (1960-61 to 2000-01) to find out the trend in general landuse and to identify possible causes responsible for these changes. The temporal variation in general landuse for the study area is given in Table-3.1and Fig.3.1.

**Table- 3.1: Temporal Variation in General Landuse Pattern**

Landuse Types	Years				
	1960-61	1970-71	1980-81	1990-91	2000-01
Net Sown Area	70.91	68.34	65.99	69.17	75.30
Land not available for Cultivation	11.22	7.22	10.49	10.42	9.88
Cultivable Waste	1.08	0.08	15.13	1.81	4.17
Fallow Land	11.65	19.53	2.89	14.62	7.08
Forest	5.14	4.83	5.50	3.98	3.57
Total	100.00	100.00	100.00	100.00	100.00

Source: i) Socio-economic Abstract, Pune District

Note: Area is given percentage

It is found that net sown area is steadily increasing since from 1960-61 to 2000-01 as indicated in Fig.3.1. In 1960-61 the total net sown area was registered as 98000 hectares accounting for 70.91 percent. After forty years i.e. in 2000-01 it was recorded as 104106 hectares (i.e. 75.30 percent). The highest net sown area in Baramati tahsil was recorded in 2000-01 as 104106 hectares accounting for 75.30 percent. This increase may be attributed to increasing awareness of improved agricultural techniques and introduction of the use of new improved seeds by farmers. From 1970-71 to 1990-91 later decades, net sown area shows decline trend.



### Temporal Variation in General Landuse Pattern

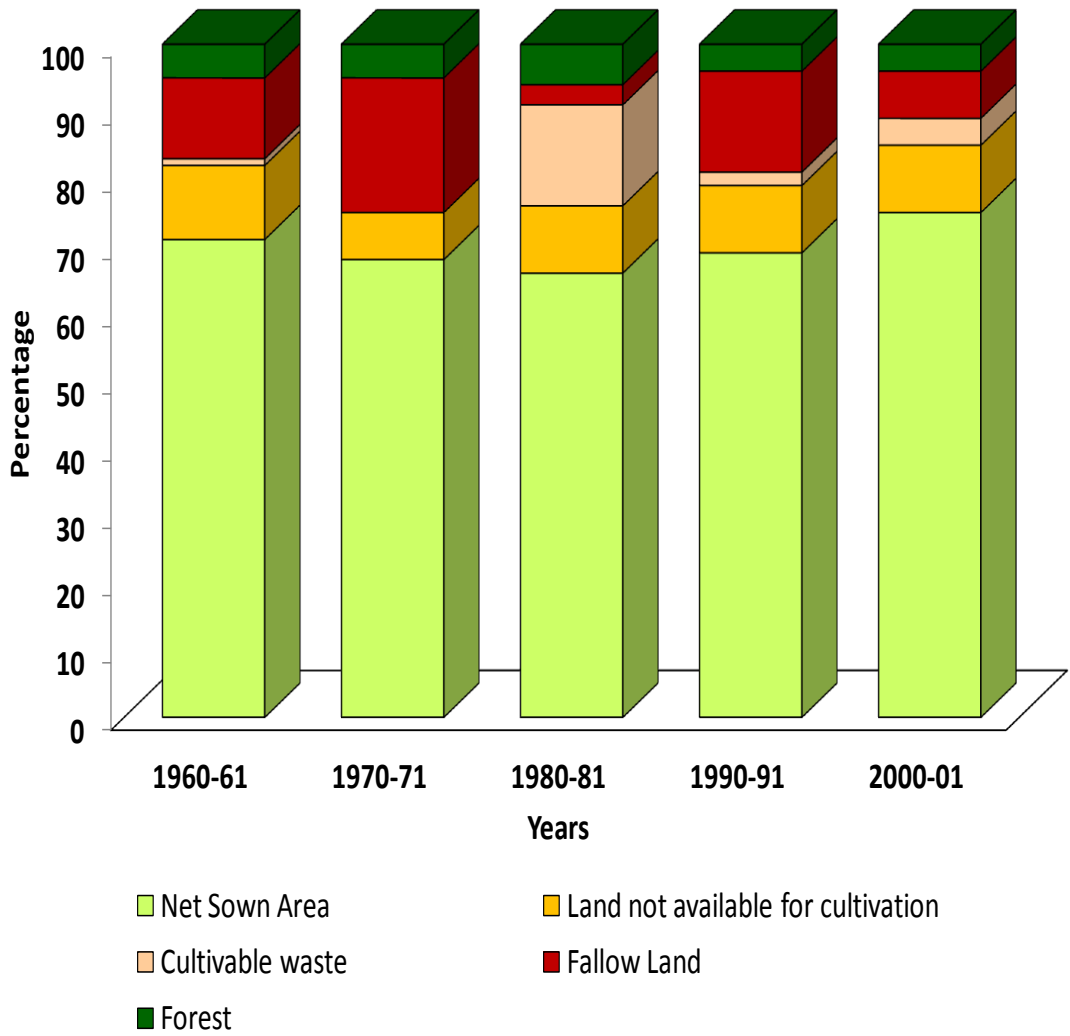


Fig.3.1

There is an average 6.13 percent increase except for the decade 1990-91 to 2000-01. This significant increase in net sown area may be due to more land under trees and shrubs, brought subsequently under cultivation. Other types of land previously considered cultivable waste is being used by the farmers for cultivation for growing crops. Moreover, increasing awareness, and mounting pressure of population on land use pattern has brought this land under cultivation. The land which not available for cultivation has steadily declined from 1960-61 to 2000-01 in the study region. The total decline during the study period is 1.33 percent (Temporal Variation in General Landuse Pattern, Table-3.1). There is a slight decline during the last decade. The land not available for cultivation has been decreasing due to the increase in the land under cultivation. Fig 3.1 shows the temporal variations in land out of non-agricultural uses and barren and uncultivated land.

Non-agricultural land has been substantially decreased for the period 1960-61 to 2000-01(1.33 percent). The land that was put under non-agricultural use has been brought under cultivation in the study area whereas barren and uncultivated land has not been brought under cultivation due to the 'barad' soil. This soil contains less humus and naturally it is less fertile. This indicates that there is a tendency of farmers to bring more land under cultivation hence; cultivable waste has been increased in the study region. The cultivable waste includes such sub-types as permanent pasture and other grazing land, miscellaneous tree crops and groves not included in net sown area and cultivable waste. The trend of increase in the cultivable waste is shown in Fig 3.1 and table 3.1(Temporal Variation in General Landuse). The fallow land includes permanent fallow, current fallow and other fallow. The permanent fallow means the land kept uncultivated for the period of more than five years. It includes land under permanent pasture, other fodder land, miscellaneous trees and bushes. Current fallow land includes the land, which is kept uncultivated during the one agricultural year or even less than that. The reason behind this is due to lack of capital, natural calamity like drought or to regain the soil fertility by keeping it uncultivated. Other fallow includes the land kept uncultivated for the period of 2 to 5 years due to various reasons like non-availability of capital, lack of agricultural knowledge, indebtedness of farmers etc. Fallow land in Baramati tahsil covers 9783 hectares having 7.08 percent (2000-01). In 1960-61, this land was 16100 hectares accounting for 11.65 percent. During the study period, from 1960-61 to 2000-01 the fallow land shows fluctuations (Temporal Variation in General Landuse Pattern, Fig. 3.1). It reveals up and down trends. Initially, fallow land was 11.65

percent in 1960-61 and it has steadily decreased in later two decades. It was decreased upto 2.89 percent in 1980-81. Between 1980-81 and 1990-91, this land has increased by 11.72 percent in 1990-91 then fall down to 7.54 percent in 2000-01. This indicates the change in the area under this category as; farmers want to use every piece of land for growing crops in study region. Baramati tahsil has 4929 hectares land under forest accounting for 3.56 percent to total geographical area (2000-01). Forest shows decreasing trend from 1960-61 to 2000-01 (1.57 percent).

### 3.4 Spatial Variations in Landuse Pattern

The spatial variation in general landuse of the study area is the result of socio-economic, physical and cultural environment, amount of rainfall and its distribution. The spatial variation is studied for five categories, namely, i) Net Sown Area, ii) Land Not Available for Cultivation - a) Land Put to Non Agricultural Use b) Barren and Uncultivated Land, iii) Cultivable Waste - a) Permanent pasture and grazing land b) Land under miscellaneous trees, iv) Fallow Land - a) Permanent fallow, b) Other fallow, c) Current fallow, v) Forest. The above mentioned landuse categories have been used to examine the spatial pattern of landuse in the study area. The percent of each landuse type has been calculated to total geographical area of the Baramati tahsil. The area and percentage of landuse types has given in Table 3.2 (Appendix-A and B).

**Table-3.2: General Landuse (1990-91 to 2000-01)**

Sr. No.	Types of Landuse	Years				Volume of Change
		1990-91		2000-01		
		Area (Hectares)	Percent	Area (Hectares)	Percent	
1	Net Sown Area	95600	69.18	104106	75.30	+ 6.12
2	Area not available For Cultivation	14400	10.41	13665	9.88	- 0.53
3	Cultivable waste	2500	1.81	5765	4.17	+2.36
4	Forest	5500	3.98	4929	3.57	- 0.41
5	Fallow Land	20200	14.62	9783	7.08	-7.54
	Total	138200	100	138248	100	-

Source: Land Revenue Record, Baramati Tahsil, Baramati

**Fig. 3.2 General Landuse of Baramati Tahsil (2001)**

### 3.4.1 Net Sown Area

The net sown area is steadily increasing since 1990-91 to 2000-01 (Net Sown Area, Fig. 3.3). It is seen from fig. 3.3 that 69.18 percent (95600 hectares) area was under cultivation in 1990-91 and it has been stepped to 75.30 percent (104106 hectares) area under cultivation in 2000-01, registering an increase by 6.12 percent. This increase may be attributed to increasing awareness of improved agricultural techniques and introduction of the use of new improved seeds by farmers. Fig.3.3 shows spatial distribution of net sown area in the study region. In 1990-91, net sown area in the study area shows steady decline towards northern parts due to lack of irrigation. It is obvious from Fig. 3.3/A that in the south and north-west part villages have dominant net sown area due to irrigation facility, fertile soil and transport facilities in the region (Net Sown Area, Fig. 3.3/A). The highest net sown area is recorded at Ghadgewadi (more than 94 percent) in south-east part in study region due to deep black soil and irrigation facility whereas the lowest net sown area has been identified at Vadhane village (39 percent). 75 to 90 percent area under net sown is found in forty-two villages of three patches have been identified in south-east, south-west and north-west parts of the study region. In this region, soil is found deep black and plain topography with gentle slopes. Increased irrigation percent has added the crop cultivation.

Fifty-two villages of three extensive patches have been identified in east, south-west and third in central parts ranging between 60 to 75 percent net sown area on medium relief. Another two isolated patches are concentrated in north-east, and west parts ranging between 45 to 60 percent under net sown area consist of nine villages. Four villages have been identified less than 45 percent net sown area in northern parts in Baramati tahsil. The spatial distribution of net sown area for 2000-2001 is shown in Fig. 3.3/B. In 2000-01 the highest net sown area is observed at Ghadgewadi (98 percent) in the south-east and the lowest at Modhave and Katphal (47 percent) in west and east. There are eleven villages having more than 90 percent net sown area. These villages are spread into three patches concentrated in the south on deep and fertile soil and also in the east on coarse shallow soil. Sixty-two villages having 75 to 90 percent net sown area have found distributed all over the study region. Thirty-three, villages having 60 to 75 percent net sown area are found in patchy pattern. Two major patches are found in east and west parts.

**Fig. 3.3 Net Sown Area& Area not Avail. For Cultivation**

Eleven villages in the north-east and north-west part having net sown area between 45 to 60 percent appearing in isolation. The study area shows an increase of 6.12 percent net sown area during two decades: 1990-91 to 2000-01.

The volume of change more than 30 percent net sown area nineteen villages in the study region (Volume of Change, Fig. 3.3/C). This significant increase in net sown area may be due to more land under trees and shrubs, brought subsequently under cultivation. Therefore, other types of land have continuously declined from 1990-91 to 2000-01 (Volume of Change, Fig. 3.3/C). Other types of land previously considered cultivable waste is being used by the farmers for cultivation for growing crops. Moreover, increasing awareness, and mounting pressure of population on land use pattern has brought this land under cultivation. Sixty villages have substantially increased net sown area by more than 15 to 30 percent. These villages consist of four patches that lie in south, north-west, north-east and central parts in Baramati tahsil.

#### **3.4.2 Land not Available for Cultivation**

This category is subdivided into two types namely, Land put to non-agricultural uses and Barren and Uncultivated land. The land put to non-agricultural use include land under settlement/ gaonthan, roads, railways, streams, canals and rivers. Barren and uncultivated land consisting of land of rock exposure, small hillocks and mountains and *potkharaha*. '*Potkharaha*' is a rural term applied to land having inherent bad quality and it requires huge cost for bringing it under cultivation. Baramati tahsil covers 10.41 percent (14400 hectares) area under land not available for cultivation in 1990-91 and 9.88 percent (13665 hectares) in 2000-01. This land is marked by gradual decrease from the north to the south. Village Shirsuphal has found 33 percent while Hol and Wanewadi have 1 percent land not available for cultivation in the study region. Shirsuphal is located at extreme north and Hol and Wanewadi in the south-west part in the study area (Land not available for cultivation of the study area, Fig. 3.3/A). Less than 10 percent of land is not available for cultivation is in the central, south-west and eastern parts of the study region. Six villages fall in the range of 20 to 30 percent of land not available for cultivation in the study area. Thirty-one villages fall in the range of 10 to 20 percent of land not available for cultivation in the study area. This region is marked out in the north-east, west, and south-east parts in the study region.

Land not available for cultivation in 2000-01 is displayed in Fig. 3.3/B. There are two villages in the study area, in which more than 30 percent land is not available for cultivation and these villages located Modhave (44 percent) in the west and Rui village (31 percent) in the east. Seven villages have land not available for cultivation between 20 and 30 percent. Thirty-five villages having 10 to 20 percent land not available for cultivation and seventy-two villages less than 10 percent land not available for cultivation is in the north, south and north-west parts of the study region. The land not available for cultivation indicates decreasing trend in fifty-six villages whereas fourteen villages have increasing trend and no change for 10 villages. Vadhane village has recorded highest decline of 28 percent during the study period. Modhave village has witnessed highest increase under land not available for cultivation (25 percent) in west part (Volume of Change, Fig. 3.3/C). This land unlike fallow in study area has declined in Baramati tahsil. This tract is hilly, not suitable for cultivation by the prevalent techniques of agricultural practices.

### **3.4.3 Cultivable Waste**

The cultivable wasteland includes other uncultivated lands including fallow land. This category is divided into three namely, permanent pastures and other grazing miscellaneous tree crops and groves and culturable waste. The permanent pastures and grazing lands include all land, are under grass-cover, government and private land or permanent pastures which are kept reserved as a village common grazing ground or vast tract of protected land, not open for free grazing and unreserved grass lands. Total area under cultivable waste has 1.81 percent (2500 hectares) for 1990-91 (Table- 3.2). All villages have been identified under cultivable waste of less than 10 percent are distributed scatterly within the region (Cultivable Waste of the study area, Fig.3.4/A). The land under cultivable waste in Baramati tahsil covered on 2.36 percent (5765 hectares) in 2000-2001. The distribution under cultivable waste in 2000-2001 in study region reveals two major patches in north and north-east highest recorded cultivable waste (28 percent) in northern part Karkhel Village in Baramati tahsil. The cultivable waste having 10 to 20 percent land is found in seven villages (Cultivable Waste of the study area, Fig. 3.4/B). These villages are confined to two patches in north and north-east parts. One hundred seven villages of study area have cultivable waste less than 10 percent in study area.



The area under cultivable waste land in tahsil registered increased (2.36 percent) during study period. The permanent pasture and grazing lands include grass cover both government and private, or permanent pasture which kept reserved as a village common grazing ground or vast tract of protected land, not open for free grazing and unreserved grass lands. The miscellaneous tree crops and groves include land under grasses, bamboo, bushes and other groves which are not included under orchard or forest are included in this category and the land not cultivated during the preceding five years is called cultivable waste.

#### **3.4.4 Fallow Land**

The fallow land is divided into three sub-types such as (a) Permanent fallow, (b) Current fallow and (c) Other fallow. The permanent fallow means the land kept uncultivated for the period of five years or more. The land includes land under permanent pasture, other fodder lands miscellaneous trees and bushes. Current fallow land is kept cultivated during one agricultural year or even less than that due to insufficient capital, drought occurrence or to regain soil fertility. Other fallow land means the land kept uncultivated for 2 to 5 years due to non-availability of capital, lack of agricultural knowledge, indebtedness of farmers etc. Fig. 3.4 represents spatial distribution of fallow land in Baramati tahsil accounting for 14.62 percent (20200 hectares) in 1990-91. The concentration of this land lie is south and east parts in study area (Fallow land of the study area, Fig. 3.4/A). The highest fallow land was recorded at Karanjepul (55 percent) lying in south-west and lowest was recorded at Waki, Pawanewadi and Yelewasti in west and south having 3 percent land in this category. The total area under fallow land accounting 2000-2001 for 7.08 percent in Baramati tahsil. This fallow land is well distributed all over the study region. The highest fallow land is found at Murti village of 27 percent in west (Fallow land of the study area, Fig.3.4/B).

#### **3.4.5 Forest Land**

Forest cover in Baramati tahsil for 1990-1991 was 3.98 percent (5500 hectares) to total area. This has declined to 3.57 percent (4929 hectares) in 2000-2001. The total decline is 0.41 percent. Supe lying in north-west part in study area has highest percent under forest in 1990 (30 percent). This fact suggests that forest land has been brought under cultivation. Moreover, there is loss of forest by various human interference (Forest Land of the study area, Fig. 3.5/A).

**Fig. 3.4 Cultivable Waste & Fallow Land in Study Area**

**Fig. 3.5 Forest Land in Study Area**

Choudharwadi (22 percent) under forest are located in south-west parts in Baramati tahsil. Ten villages have 20 to 30 percent forest cover in study region. Less than 10 percent forestland has been identified in One hundred five villages. Forest cover is declining slowly (3.57 percent) in 2000-2001. Supe (29 percent), Deulwadi (25 percent) and Choudharwadi (21 percent) having more than 20 percent under forest land in study region (Forest Land of the study area, Fig. 3.5/B). Volume of change is located by Chopdaj village (19 percent) south-west part in study area (Volume of change, Fig. 3.5/C).

### **3.5 Conclusion**

The discussion in above mentioned text indicates spatio-temporal distribution of general land use for Baramati tahsil. 1971 to 1991 later decades, net sown area shows decline trend. There is an average 6.13 percent increase except for the year 1991 to 2001. This significant increase in net sown area may be due to more land under trees and shrubs, brought subsequently under cultivation. Other types of land previously considered cultivable waste is being used by the farmers for cultivation for growing crops. Moreover, increasing awareness, and mounting pressure of population on land use pattern has brought this land under cultivation. The net sown area is steadily increasing since 1990-91 to 2000-01. It is seen from 69.18 percent (95600 hectares) area was under cultivation in 1990-91 and it has been stepped to 75.30 percent (104106 hectares) area under cultivation in 2000-01, registering an increase by 6.12 percent. This increase may be attributed to increasing awareness of improved agricultural techniques and introduction of the use of new improved seeds by farmers. The highest net sown area is recorded at Ghadgewadi (more than 94 percent) in south-east part in study region due to deep black soil and irrigation facility whereas lowest has identified at Vadhane village (39 percent). Non-agricultural land has been substantially decreased for the period 1961 to 2001 (1.33 percent). More land that in the past has been put to non-agricultural use brought under cultivation in the study area whereas barren and uncultivated land could not be brought under cultivation being 'barad' soils. This soil is very poor in humus and naturally it is less fertile. Cultivable waste has increase in study region. The general trend of declining fallow land towards north due to existence of fertile soil rising for cultivation. Forest cover is declining slowly (0.41 percent). All the categories in the general land use have direct impact on the area net sown and hence this distribution is of prime importance.

**CHAPTER-IV**  
**AGRICULTURAL LANDUSE PATTERN**

**4.1 Introduction**

**4.2 Temporal Variations in Agricultural Landuse Pattern**

**4.3 Spatial Distribution of Agricultural Landuse Pattern**

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## **CHAPTER-IV**

### **AGRICULTURAL LANDUSE PATTERN**

#### **4.1 Introduction**

After examining general landuse in Baramati tahsil, it is necessary to evaluate agricultural landuse. Agricultural landuse means the extent of the gross cropped area during the agricultural year under various crops. It is the result of the decision made by the farmers regarding the choice of crops and methods for production. Thus, this decision-making is based on not only the physical constraints and limitations but also on farmer's perception of the total environment. This is a result of socio-economic, physical as well as climatic conditions of the study region. The farmers' decision are generally associated with their socio-economic conditions, purchasing power and price fluctuations in markets both in local and regional. The present chapter focuses on spatial distribution of agricultural crops in the Baramati tahsil. The spatial distribution and their temporal variations have been studied for the period from 1991-2011. The data regarding crops have collected for 117 villages from concerned talukas from talathi, sarpanch and tahsil office. The collected data was then converted into percentage to net sown area. Later on, these crops percentages were arranged into different groups and finally spatial distribution was studied for nine crops in the study area.

Moreover, personal visits to these villages have helped to get additional information about landuse. Besides this, District Census Handbook, Socio-economic Abstract of Baramati tahsil and Agriculture Department Baramati were used to collect secondary data. The spatio-temporal variations in agricultural landuse pattern have been studied for Baramati tahsil. The study of temporal variation for crops in study region was computed for twenty years (1990-91 to 2010-11). Due to lack of data every year in study area the present study relies on the latest data available for 2010-2011 and therefore spatial distribution of nine crops have studied only for one time point i.e. 2010-2011. Kharif and rabbi are two major agricultural seasons in the study area. Kharif season begins in month of June or July and ends in September. Jowar, bajara, sunflower are major kharif crops in study area of Baramati tahsil. Rabbi season commences from September or October and ends in March or April. Wheat, jowar, gram, and maize are major rabbi crops grown in study region. Sugarcane and vegetables are sown both in kharif and rabbi seasons. Sugarcane is the main crop in the study area requires a long

duration for maturing (15 to 18 months). This crop needs hot and humid climate during the growing period.

#### 4.2 Temporal Variations in Agricultural Landuse Pattern

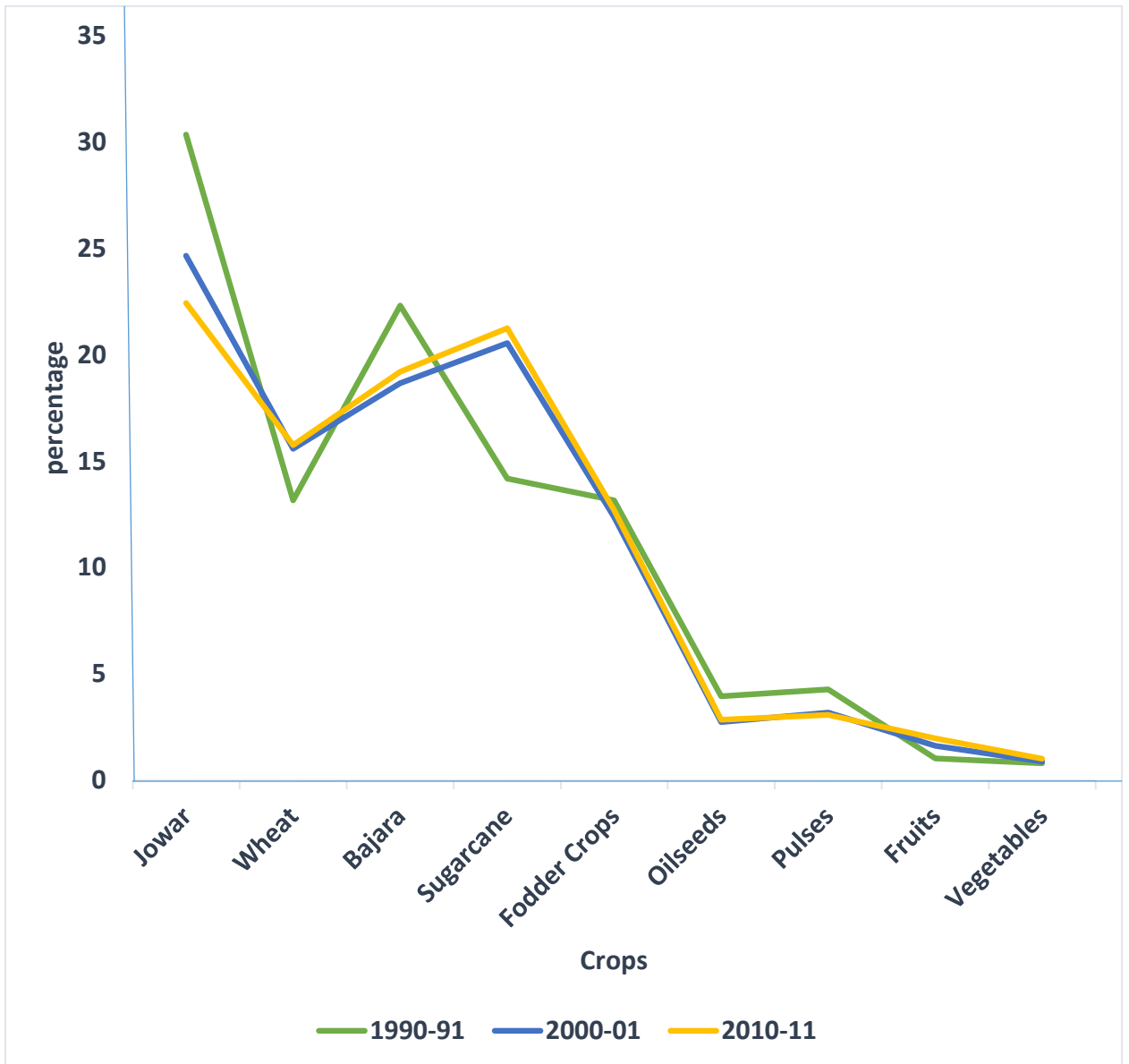
The croppattern in any region cannot remain static due to the variations in the rainfall amount and nature of inputs and environmental instability. Moreover, introduction of new high yielding varieties of seeds, irrigation facilities and technical knowledge are responsible for temporal changes. The factors for such changes in cropping patterns differ from village to village and region to region. Therefore, it is worthwhile to study isolated causes of changes occurring through space and time. Table-4.1 and Fig. 4.1 display temporal variations of nine crops in study region from 1990-91 to 2010-11. The cropping pattern undergoes changes in response to the changing physical and cultural environment. For an appreciation of temporal variations in study area twenty years have been taken into account and study was made with considering areal strength of individual crop. Table-4.1 displays the temporal variations in cropping pattern in the study area of Baramati tahsil from 1990-91 to 2010-11 (Fig.4.1). Jowar occupies 23359 hectares in 2010-11 accounting for 22.44 percent of net sown area in Baramati tahsil which is higher than the state as well as the district averages of the area under jowar to the net sown area (Pune district 13.27 percent and Maharashtra State 21.54 percent).

**Table-4.1: Temporal Variations in Agricultural Landuse Pattern**

Sr. No.	Name of the Crops	1990-91		2000-01		2010-11	
		Area (Hectares)	Percent to NSA	Area (Hectares)	Percent to NSA	Area (Hectares)	Percent to NSA
1	Jowar	29015	30.35	25669	24.66	23359	22.44
2	Wheat	12581	13.16	16215	15.58	16404	15.76
3	Bajara	21342	22.32	19440	18.67	19984	19.2
4	Sugarcane	13570	14.19	21397	20.55	22127	21.25
5	Fodder Crops	12580	13.16	12891	12.38	13229	12.71
6	Oilseeds	3788	3.96	2851	2.74	2964	2.85
7	Pulses	4090	4.28	3325	3.19	3209	3.08
8	Fruits	984	1.03	1695	1.63	2062	1.98
9	Vegetables	766	0.8	913	0.88	1067	1.02

Source: Revenue Record, Talathi Office, Baramati

**Temporal Variations of the Baramati tahsil of major crops  
(1990-91 to 2010-11)**



**Fig.4.1**



Jowar is staple food crop cultivating in kharif season in the study area. This crop can be used for the livestock as food. Jowar thrives well on clayey deep soil yielding higher production. This crop is generally cultivated in rotation with groundnut, pulses, and sugarcane in study region. The total area under jowar in 1990-91 was 30.35 percent to total cropped area (Fig. 4.1). In 2010-11, jowar accounted for 22.44 percent land total cropped area under jowar. The hectareage of to this crop during the study period (1990-91 to 2010-11) has steadily declined. Table 4.1 clearly indicate that jowar was widely cultivated in 1990-91 (30.35 percent to net sown area) in the area under review. But the hectareage under jowar has reduced further to 22.44 percent during the study period. The maximum hectareage of jowar declined in 2010-11 by 7.91 percent to total aerial extent of the study region. Wheat is cultivated in rabi season and it requires four months for its maturity. It could be raised on subsoil moisture. Traditionally, this crop is grown in study region. Fig. 4.1 reveals fluctuation of wheat crop in Baramati tahsil. Wheat occupies 15.76 percent net sown area in study region and it is increased by 2.6 percent in 2010-11. Increasing irrigation facility is the main cause of this change in the study region.

Bajra is known as perl millet or bulrush millet. It requires rainfall between 40 and 50 cms. and dry weather condition. Shallow, black, red and light soils are suitable for this crop. Bajra covers 19.2 percent to net sown area in this tahsil. The total reduced of bajra in Baramati tahsil is 3.12 percent from 1990-91 to 2010-11. Sugarcane the cash crop covers 21.25 percent to its net sown area which is greater than Pune district (5.44 percent) and Maharashtra state (4.36 percent). Due to irrigation, sugarcane is grown extensively in study region. This crop requires a long duration for maturity (15 to 18 months). It requires a hot and humid weather throughout the growing period. Total area under sugarcane cultivation in 1990-91 was 31.68 percent to total cropped area. The areal extent of sugarcane has recorded steady increase during the study period. The total increase in sugarcane is 7.06 percent from 1990-91 to 2010-11. Fig. 4.1 reveals that there is significant variation in the volume of change in sugarcane.

Fodder crop includes maize, kadwal and green grass. It occupies 12.71 percent in study area. Among these fodder crops, 6.85 percent land is under maize, 3.16 percent under kadwal and green grass accounts for 2.7 percent. Baramati tahsil witnesses reduced of area under fodder crops during 1990-91 to 2010-11 by 0.45 percent. Oilseeds comprises sunflower, safflower and groundnut in study region. These are intercrops and are cultivated with jowar and bajra. This crop accounts for 2.85 percent in study region which is less than Pune district (7.12 percent) and Maharashtra state (19.01 percent).

**Fig. 4.2**

**Fig. 4.3**

**Fig. 4.4**

Groundnut covers 1.82 percent, safflower 0.78 and sunflower 0.25 percent to net sown area. This crop shows decreasing trend during study period. The areal extent under pulses in the study region had successfully cultivated before 1990-91 on the area of 4.28 percent to total net sown area. The reduction of in area under pulses was registered for the following years. It has been reduced by 3.08 percent in 2010-11. The total decline of pulses from 1990-91 to 2010-11 is 1.2 percent respectively in the basin. Vegetables contributed 1.02 percent in study region. This crop is produced by farmers in order to fulfil their limited family requirements and very less percent products are sold in markets. Multiple cropping of vegetables is traditionally practiced where irrigation is available for a short period. Pune district has recorded 4.61 percent area in 2010 under vegetables whereas Maharashtra state shows 2.0 percent. The study region has shown increase under vegetable i.e. 0.22 percent. Horticulture crops like sweet lime, guava, pomegranate, chiku, grapes and bananas are grown. The farmers are less interested in fruit crops due to uncertainty of rainfall, water scarcity, unaffordable cost of saplings and being a labour intensive crop. There is less assurance in local market for fruits. The area under fruits increased by 1.98 percent in 2010-11 due to introduction of high yielding variety of fruits. Table-4.1 shows the temporal variations in the volume of change of fruits during the period of 1990-91 and 2010-11. The temporal variation reflects major changes with upward trend in the area under wheat, sugarcane, vegetables and fruits have increased their acreage in study region, but jowar, bajara, fodder crops, oilseeds and pulses have found decline area in this tahsil during study period (Appendix-F, G & H).

#### **4.3 Spatial Distribution of Agricultural Landuse**

The Baramati tehsil is an essentially agricultural dominant region involving 89 percent working force in agricultural practice. The crops namely, jowar, wheat, bajara, sugarcane, fodder crops, pulses, oilseeds and fruits are cultivated in the study region. The variations in areal extent under these crops are mostly depending on adaptation of improved varieties of seeds for sowing, local environment and traditional approach of farmers in the area under review. This study has attempted to assess the spatial distribution of agricultural crops in study area. Jowar, wheat, sugarcane, fodder crops, pulses, fruits, vegetables and other crops are mainly grown in study region on different soil types, amount of rainfall, irrigation and farmers decision (Appendix-H).

### 4.3.1 Distribution of Jowar

Jowar is a staple food in Baramati tahsil and it is widely grown throughout the region. The distribution of jowar is largely controlled by amount of rainfall and soil types. This crop is cultivated in Kharip and rabbi season occupying 23359 hectares (22.44 percent) area during 2010-2011. Fig. 4.6 reveals the spatial distribution of jowar in study area. The highest area under jowar is found at Morgaon (47.43 percent) lying in west part whereas lowest is observed at Kandaj (0.69) situated in south. From Fig. 4.6 40 to 60 percent net sown area is under jowar lying four villages, namely, Morgaon, Kololi, Jalgaon Kade Pathar and Rui located in west, north and central part of the Baramati tahsil. This part has inadequacy in irrigation. Sixty-five villages from this part has observed 20 to 40 percent of the net sown area under jowar. These villages consisting of two patches lying in north and central part in Baramati tahsil where soils are coarse shallow and medium deep soil. Less than 20 percent net sown area under jowar is identified in fifty-three villages distributed into south part of the study area (Fig. 4.5). These villages are identified in south part on deep black soil. Here concentration of sugarcane is supported by canal irrigation besides transport means.

**Table 4.2 Agricultural Landuse of the Baramati Tahsil (2010-11)**

Sr. No.	Crops	Area (Hectares)	Percent to NSA
1	Jowar	23359	22.44
2	Wheat	16404	15.76
3	Bajara	19984	19.2
4	Sugarcane	22127	21.25
5	Fodder Crops	13229	12.71
6	Oilseeds	2964	2.85
7	Pulses	3209	3.08
8	Fruits	2062	1.98
9	Vegetables	1067	1.02

Source: Revenue Record, Baramati Tahsil.

### 4.3.2 Distribution of Wheat

Wheat is cereal crop of rabbi season in Baramati tahsil. For maturity of this crop requires 110 to 140 days. This crop is grown on moisture retentive soil and moderate irrigation. Black fertile soil with fine loamy clay texture is suitable for high yield. 10° to

**Fig. 4.5 Distribution of Jowar& Wheat**

15° centigrade temperature is required in the beginning of growing period and 21° to 27° centigrade during the period of harvesting. This crop is cultivated in study area both on subsoil moisture and irrigation. It is generally sown in mid - November and it is harvested in the first week of March. Wheat covers 16404 hectares accounting for 15.76 percent to net sown area in study region. Fig. 4.5 displays wheat distribution in study region. The cultivation of wheat is carried in 117 villages. The highest percent of wheat is registered at Pawaimal with 46.3 percent to net sown area lying in south part near left Nira canal irrigation and lowest percentage of wheat is found at Baburdi (3.64 percent) located at north-west part of the study area. Wheat occupies fourth position after jowar sugarcane and bajara. Thirty to forty-five percent of net sown area under wheat is identified in eleven villages, namely, Nepat Valan, Malegaon Bk., Pandare, Yelewasti, Nirawaghaj, Khandobachiwadi, Waghalwadi, Murum, Sadobachiwadi, Kambleshawar and Shirasne located at south part of the study region. Fifty-one villages of wheat is registered 15 to 30 percent net sown area at south part and spread out northern part of the study region. Less than 15 percent of net sown area under wheat north and central part, where inferior soil and less irrigation facility are available (Fig. 4.5).

#### **4.3.3 Distribution of Bajra**

Bajra is cultivated in kharif season. It is drought resistant crop. This crop is grown on less amount of rainfall ranging between 25 and 45 cms. Bajra is confined to arid tract in study region on coarse shallow, black and lighter soil. For the growth of bajra, less amount of rainfall is required during its growing period. Bajra is sown on 19984 hectares accounting for 19.2 percent to net sown area in study region. The distribution of this crop is influenced by rainfall amount, terrain characteristics and soil types. The total growth period of this crop is three to four months. The spatial distribution of bajra is exhibited in Fig. 4.8. Sonakaswadi (47.55 percent) and Kololi (45 percent) has highest area under bajra in north and central part and lowest is wanewadi, Murum and Sadobachiwadi (0.00 percent) in south-west parts in study area. Fifteen villages has observed north and central part of 30 to 40 percent land under bajra. Twenty to thirty percent area under bajra have been registered in forty villages in study area (Fig. 4.6) in central and northern parts of the study region. Forty-four villages of Baramati tahsil having less than 10 percent area under bajra are spread into southern parts of the study area. The bajra cultivation in study region has wide spread and well distribution in all parts on medium and coarse shallow soil.



**Fig. 4.6 Distribution of Bajara & Sugarcane**

#### **4.3.4 Distribution of Sugarcane**

Sugarcane is a perennial crop. This crop requires clay to loamy soil containing high organic matter. It can tolerate moderate acidity and alkalinity. Soil rich in 'Phosphorus' and 'Calcium' are suitable for better juice quality (Das, 2000). The temperature between 20° and 26° centigrade is essential for its growth. The area under sugarcane is 22127 hectares in Baramati tahsil in 2010-2011. The highest area under this crop is registered at Shirasne lying in south (61.54 percent) whereas Sawal records lowest area (2.44 percent) locating in eastern part in the study area. Fig. 4.6 presents spatial distribution of sugarcane in study region. From this figure it is clear that more than 60 percent land under sugarcane is observed in three villages. These villages are identified lying in south on deep black soil. Here concentration of sugarcane is supported by canal irrigation besides transport means. Forty to sixty percent area under sugarcane has been witnessed in twenty-seven villages. These villages are located in south part of the Baramati tahsil (Fig. 4.6). Twenty-five villages have 20 to 40 percent area under sugarcane to net sown area. The distribution of these villages is found in south and northeast parts due to irrigation, both by canal and lift. Moreover, soil of this region is fertile. Less than 20 percent of net sown area under sugarcane is identified in 56 villages. These villages are spread into north and central part, where inferior soil and less irrigation facility are available.

#### **4.3.5 Distribution of Fodder Crops**

The fodder crops in Baramati tahsil include kadwal, green grass and maize. This crop is confined to north and southwest parts in study area having livestock dominance. These fodder crops are grown with jowar, barja, sugarcane or wheat. The highest percent under this crop is in Soratewadi village (32.89 percent) in south-west part and lowest is at Sonkaswadi (2.72 percent) in south-central part in study area. More than 20 percent area under fodder crop has been noticed in five villages and are in three patches. Among these, Supe, Pansarewadi and Karkhel villages are lying in north and Dhakale and Umbarwadi are in west part in Baramati tahsil (Fig. 4.7). Eighty-eight villages in study area have witnessed fodder between 10 and 20 percent to net sown area. This distribution is found in five patches. Out of these, five patches are located in west, north-west, southwest and two patch are in southeast and northeast part in the study region. Thirty villages in study region have less than 10 percent to net sown area under fodder crops. These villages are concentrated in dairy dominating area in this tahsil (Fig. 4.7).

**Fig. 4.7 Distribution of Fodder Crops & Oilseeds**

#### **4.3.6 Distribution of Oilseeds**

In 2010-11, Oilseeds have sown on 2964 hectares area accounting 2.64 percent of the total cropped area. Oilseeds consist of sunflower, safflower and groundnut. The highest percent area under oilseed is at Undvadisupe (10 percent) in north and lowest is in south in study area at shirasne (0.01 percent). More than 7.5 percent area under oilseeds is witnessed in four villages are located in northern part in study area. Thirty-seven villages have 2.5 to 5 percent oilseeds to net sown area. Seventy-six villages are widely grown in Baramati tahsil. The oilseeds are grown in Baramati tahsil are widespread (Fig. 4.7). These villages are Oilseed cultivation has less acreage due to larger area is under jowar, sugarcane, wheat and bajra in the study region. Oilseed are commonly grown as an inter-crop with jowar, bajara and wheat in study area.

#### **4.3.7 Distribution of Pulses**

Gram, tur, udid, moong, hulga, chavli, kulith are the major pulses in study area. These crops are not grown on a large scale in study region. It is cultivated on 3.08 percent to net sown area. The highest percent under pulses is found in Supe located in north (10.51 percent) and lowest having 0.01 percent at Nirawagaj. Supe, Undavadisupe and Palshiwadi villages in Baramati tahsil have observed greater than 5 percent land under pulses are distribution in north and central part of the study area (Fig. 4.8). Thirteen villages where pulses are grown on area of 6 to 9 percent. These villages located at north and central part of the study region. Less than three percent area under pulses are observed at hundred villages in widely spread out in study area. There is absence of this crop in south part in study area as sugarcane and wheat have larger acreage (Fig. 4.8).

#### **4.3.8 Distribution of Fruits**

Fruits include banana, grapes, chiku, guava, orange and mango are cultivated as a fruit crops in study area. Fruits cover 1.98 percent to net sown area in study region. The highest land occupied under fruit crop is registered at Dorlewadi in southeast (7.23 percent) and lowest of 0.42 percent at Morgaon in northwest. Eight villages having 4 to 6 percent land under fruit are in south part of the study area (Fig. 4.8). These fruit crops are taken by progressive farmers. Thirty-five villages have 2 to 4 percent area under fruit crop and these villages are all spread all over the region. Less than two percent land under fruits seventy-three villages are wide spread out in study area.

**Fig. 4.8 Distribution of Pulses & Fruits**

**Fig. 4.9 Distribution of Vegetables**

#### **4.3.9 Distribution of Vegetables**

Vegetable account for 1.02 percent of net sown area (1067 hectares) in study area. Brinjal, bhendi, (Lady's Finger), radish, cabbage, cauliflower, methi, spinach, onion and bitter-gourd capsicum, chilly, rich-gourd, peas, ghewada, tomato and cucumber etc. are grown in study region. The distributional pattern of vegetable cultivation in study region is influenced by market, irrigation and road accessibility in Baramati tahsil. Vegetables being perishable commodity is cultivated near market in study area (Fig. 4.9) accounting for 1.02 percent to net sown area. Khandobachiwadi village has highest percentage under vegetable is in southwest (4.08 percent). Sawal has observed lowest percent under this crop in eastern part (0.02 percent). Twenty-seven in Baramati tahsil cultivating vegetables 1.6 to 3 percent to net sown area, lie in south part (Fig. 4.9) Eighty-six villages less than 1.5 percent area under vegetables show patchy distribution in study area. These villages have been identified into seven patches in wide spread out of study area. Vegetable cultivation is mainly influenced by proximity of Baramati urban centres.

#### **4.4 Conclusion**

The spatio-temporal analysis of nine selected crops have been studied in this chapter. The study region, being the semiarid and drought prone, it does not show considerable fluctuation as far as the aerial extent of these crops are concerned. Among these crops, jowar shows during the study period (1990-91 to 2010-11) has steadily declined. The maximum hectarage of jowar declined in 2010-11 by 7.91 percent to total aerial extent of the study region. Towards north and central parts sugarcane percentage increases. Sugarcane wheat, fruits and vegetable crops shown increasing trend during study period. Increasing irrigation facility is the main cause of this change in the study region. Crops like Bajara, fodder crops, oilseeds and pulses are slightly decreasing in Baramati tahsil. The total reduced of bajra in Baramati tahsil is 3.12 percent from 1990-91 to 2010-11.

The variation in landuse relates with the extent of these nine crops with soil characteristics, irrigation, relief, proximity to the market places and accessibility. The relationship among these factors are well established through agricultural landuse analysis of the region. Jowar is identified as first ranking crop occupying 22.44 percent to net sown area. This crop is mainly concentrated in north and central part due to

inadequacy of irrigation, undulating topography and soil retentivity. Jowar acreage have been found decreasing trends towards north as sugarcane percentage increases. Sugarcane occupies second position after jowar is on 21.25 percent area. Wheat also has concentration in north on fertile, black and deep soil which favours the cultivation. Bajra is sown on 19984 hectares accounting for 19.2 percent to net sown area in study region. The distribution of this crop is influenced by rainfall amount, terrain characteristics and soil types. Fodder crop occupies 12.71 percent and its cultivation is found in areas of dairy farming and livestock raising activity developed in northwest, southwest and central parts in study region. Oilseed covers 2.85 percent. Fruits and vegetable contributes 1.98 and 1.02 percent in study region. It is grown close to Baramati urban market places both local as well as surrounding market centres. Crops like pulses occupy 3.08 percent in the study region. It has been noted that among all the factors, soil, irrigation facilities and proximity to the market centres, control the spatio-temporal distribution of crops in the study region.



**CHAPTER-V**  
**CROP COMBINATION AND DIVERSIFICATION REGIONS**

**5.1 Introduction**

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## CHAPTER – V

### CROP COMBINATION AND DIVERSIFICATION REGIONS

#### 5.1 Introduction

After unfolding the spatio-temporal study of general and crop landuse of study area in previous chapters- III and IV it is essential to assess the crop regions in study area. The geographical factors, namely, soils, irrigation, nature of relief, use of chemical fertilizers, pesticides, proximity to market, price fluctuation and attitude of farmers are influence the cropping pattern in the study area. Keeping these considerations in mind, it is necessary to make exhaustive study for forming regions. The crop cultivation within the region indicates strength and weakness of crop regions. Individual crop of the region gives a realistic picture. The relative strength of a real extent of crop can be studied by crop ranking, crop combination and crop diversification methods. This represents spatial variation in the pattern of distribution. For computing crop ranking, secondary data at village level was used. The data was obtained from Tahsil Revenue Office, Baramati and District Census Handbook of Pune District for the year 2010-2011. The primary data was based on farmer's interviews and spot visits. Data of ten crops has been converted into percentages to net sown area and this percent of crops was used for computing crop ranking to evaluate relative strength of individual crop in Baramati tahsil.

#### 5.2 Crop Ranking

Ranking of crop reveals the relative strength of ten crop percent at village level were taken into consideration for computing crop ranking. These nine crops are, namely, jowar, wheat, bajara, sugarcane, fodder crops, oilseeds, pulses, fruits and vegetables (Table-5.1). The cultivation of these crops is the result of soil types and irrigation besides farmer's decision in the study area. The ranking obtained for all these crops show the relative significance of individual crop in cropping pattern. The obtained ranking crops and number of village have shown in Table-5.1 (Appendix-J).

##### 5.2.1 First Ranking

Table- 5.2 and Fig. 5.1/A show the first ranking crops in the Baramati tahsil. Four crops have been identified as first ranking crops. These four crops are, namely, jowar, wheat bajra and sugarcane. Fig. 5.1/A displays the distribution of first ranking crops in the Baramati tahsil. Sugarcane is major crop and it stands as first rank and is found to have largest coverage in 54 villages occupying 46.15 percent area in the study region. Sugarcane belt is concentrated in south parts in study region (Fig. 5.1/A).

**Table- 5.1 Crop Rank Frequency**

Sr. No.	Crops	Crop Ranks and Number of Villages								
		1	2	3	4	5	6	7	8	9
1	Jowar	46	17	13	28	08	02	01	02	-
2	Wheat	01	51	15	35	12	01	01	01	-
3	Bajara	16	44	03	14	20	06	04	05	05
4	Sugarcane	54	02	09	14	23	12	03	-	-
5	Fodder Crops	-	03	76	14	23	-	-	01	-
6	Oilseeds	-	-	-	02	07	38	46	21	03
7	Pulses	-	-	-	04	11	31	26	17	28
8	Fruits	-	-	01	05	12	23	22	49	05
9	Vegetables	-	-	-	01	01	04	14	21	76

Source: Computed by Researcher.

Sugarcane appears in south part in the study region on deep soil along Nira and Karha rivers. The favorable environment in the region is responsible for growing sugarcane on fertile black soil. Jowar is another crops showing first rank in study region. Its cultivation is found in north central part (Fig. 5.1/A) in 46 villages on 39.32 percent of total area (Table- 5.2 and Fig. 5.1/A). This crop is grown in 46386 hectares. Bajara is identified as the third major crop standing in the area under study. Bajara is grown in 16 villages (13.68 percent to total villages) and is confined to the north, north-west and middle part in the study region. This crop is cultivated on 16754 hectares in less rainfall region on coarse shallow soil. Wheat has been identified as first ranking crop in one villages namely, Nepat Valan lies at central part in the study region. The wheat cultivation in Nepat Valan ranks first due to fertile soil and availability of irrigation by Nira Left bank canal. This crop is cultivated on 1018 hectares (0.79 percent of total area) in less rainfall region on coarse shallow soil.

**Table– 5.2: Crops, Villages and Area in First Ranking**

Crops	Number of villages	Percent to total villages	Area in hectares	Percent to total area
Jowar	46	39.32	46386	44.56
Wheat	01	0.85	437	0.42
Bajara	16	13.68	16754	16.09
Sugarcane	54	46.15	40530	38.93
Total	117	100	104107	100

Source: Compiled by Researcher

### 5.2.2 Second Ranking

In second ranking number of crops have increased than first rank (Table- 5.3). Fig. 5.1/B reveal distribution of second ranking crops in the Baramati tahsil. There are five crops namely jowar, wheat, bajara, sugarcane and fodder crops, are included in second ranking. Among these five crops, jowar cultivated in 17 villages in study region is included in second ranking. Its distribution in study area is patchy in nature, covering 17522 hectares. Wheat ranks second in 51 villages (43.59 percent to total area) in the study region. Wheat appears in south part in the study region on deep soil along Nira and Karha rivers. The favourable environment in the region is responsible for growing sugarcane on fertile black soil. Bajara is identified as second ranking crop in 44 villages occupying 45040 hectares (Table- 5.3 and Fig. 5.1/B). Three major patches of bajra are visible in the study area. One patch consisting of 20 villages is found in north-west on coarse shallow soil. Another patch of fourteen villages in central part. Remaining villages of bajra are concentrated in north-east part in study area. Here, bajra is cultivated on coarse shallow soil. In two villages, sugarcane has been identified as second ranking crop practiced on 1180 hectares (1.71 percent of total area) in study region. Sugarcane has been identified in two villages in south part in the study area on deep soil and availability of irrigation. Fodder includes maize, green grass and Kadwal and it ranks as second crop in five villages.

**Fig. 5.1 First Ranking & Second Ranking Crops**

These villages are concentrated in west part in study region (Fig. 5.1/B) hence these villages show livestock dominance and dairy farming. Fodder crops are cultivated in south and west part on irrigation.

**Table- 5.3: Crops, Villages and Areas in Second Ranking**

Crops	Number of villages	Percent to total villages	Area in hectares	Percent to total area
Jowar	17	14.53	17522	16.83
Wheat	51	43.59	38781	37.25
Bajara	44	37.61	45040	43.26
Sugarcane	02	1.71	1180	1.13
Fodder Crops	03	2.56	1584	1.53
Total	117	100	104107	100

Source: Computed by Researcher.

### 5.2.3 Third Ranking

Six crops have entered in third ranking in the Baramati tahsil (Fig. 5.2/A). These crops are namely, Jowar, wheat, Bajara, sugarcane, fodder crops and fruits. Among these crops, fodder crops is the dominant crop in rank. Fodder crop includes green grass, maize and kadwal, ranks as third and is found in 76 villages over 71397 hectares (64.96 percent of total area). Its areal extent sprawls over the north, central, south and eastern part in dairy dominating area. Wheat holds rank third in fifteen villages (12.82 percent of total villages). The distribution of wheat in study area is found in three patches. Five villages is found in north-west part in study region. Another patch consisting of five villages lies in east part and five villages lies in south part of the study area. Jowar is another crops showing third rank in study region. Its cultivation is found in south-west and south-east part in thirteen villages on 11.11 percent of total area (Table- 5.2 and Fig. 5.2/A). This crop is grown in 10173 hectares. Bajra is cultivated on coarse shallow soil. Another three villages of this crop are located in central part showing isolation (Fig. 5.2/A). Sugarcane ranks third in Baramati tahsil, in nine villages.

**Fig. 5.2 Third Ranking& Fourth Ranking**

These villages are not uniformly distribute within study region. Vadhane, Ambi Bk., and Jogawadi villages are found in north-west, Shirsuphal, paravadi, Nimbodi and Barhanpur lies on north east part in the study region (Fig.5.2/A). The sugarcane is cultivated in surrounding area of sugar factory located at Shirsuphal. Fruit are grown in Malegaon Bk. village located in south part of the study region. Fruits is associated with fertile soil and irrigation facilities.

**Table – 5.4: Crops, Villages and Areas in Third Ranking**

Crops	Number of villages	Percent to total villages	Area in hectares	Percent to total area
Jowar	13	11.11	10173	9.77
Wheat	15	12.82	10674	10.25
Bajara	03	2.56	1176	1.13
Sugarcane	09	7.69	9287	8.92
Fodder Crops	76	64.96	71397	68.58
Fruits	01	0.86	1400	1.35
Total	117	100	104107	100

Source: Computed by Researcher.

#### **5.2.4 Fourth Ranking**

Fourth ranking crops present a much varied distribution both in space and the number of crops involved fig. 5.2/B and table 5.5. There are nine crops namely, jowar, bajra, wheat, sugarcane, fodder crops, oilseeds, pulses and vegetable have entered in fourth ranking crops in study region (Table 5.5). Wheat holds largest coverage among fourth ranks position in thirty-five villages on 39010 hectares in study area (Fig. 5.2/B). The cultivation of wheat is spread into three patches lying in central, north-west and north-east part on deep black and medium black soils. Jowar ranks fourth and is confined to twenty-eight villages (23.93 percent to total village) in the south parts covering 19915 hectares (19.13 percent to total area). Waki, Kanadwadi, Chopdaj, Korhale, malshikharwadi, Hol sastewadi, Soratewadi, Karanjepul, Waghalwadi, Murum and



Sadobachiwadi are found in south-west, Malegaon Bk., Pawaimal, Dhupalwadi, Kurnewadi, Mannappavasti, pandharwadi, Kambleshawar, Nirawaghaj, Kanheri, Zargadwadi Songaon and Mekhali are found in south-east part of the Baramati tehsil. Jowar is associated with deep black soil and irrigation facilities. Bajara cultivation is found in the southern parts in patchy forms in 10171 hectares (9.77 percent to total area) in fourteen villages. Sugarcane ranks fourth position in fourteen villages on 13628 hectares in study area (Fig. 5.2/B). The cultivation of sugarcane is spread into three patches lying in east, north and north-east part on deep black and medium black soils. The sugarcane is cultivated in surrounding area of sugar factory located at Shirsuphal, Malegaon Bk. and Someshawarnagar. Fodder crops ranked as fourth in fourteen villages are distributed throughout the study region. Fodder crops are grown in fourteen villages (11.97 percent of total villages) on 10824 hectares. Five patches of fodder crops are found in south-east, south, central east and north parts in study area (Fig. 5.2/B). These crops support milk production. Oilseeds is grown on 1299 hectares (1.25 percent to total area) in Pimpalevasti and Sangvi village are located in south of the Baramati tehsil. Pulses is cultivated in the villages, namely, Supe, Ambi Kh., Murti and Vanzarvadi are found in north-west and east part. Fruits are fourth ranking in five villages in study area namely, Wanevadi, Khandaj, Gunavadi, Malad and Dorlewadi. These villages are found in isolation in south part. Five villages has typical location of irrigation facility. Vegetable as fourth ranking crops is found in Dandevadi village in north part in irrigated area having road accessibility.

### **5.2.5 Fifth Ranking**

There are nine crops in this ranking. The spatial distribution of these crops in Baramati tahsil is shown in Table- 5.6 and Fig. 5.3/A. These crops are, namely, jowar, bajara, wheat, sugarcane, fodder crop, oilseed, pulses, fruits and vegetable. Among these crops, fodder crop and sugarcane stands first in study region. Fodder crops covers 20093 hectares (19.30 percent to total area ) comprising twenty-three villages (19.66 percent of total villages) in the north-east east, south-west and south parts in the study region. Sugarcane is mostly grown in the central part covering 22022 hectares (21.15 percent to total area) on medium black soils and irrigation facilities. Bajra has been identified in third position crop in study area in 20 villages (Fig. 5.3/A). The cultivation of bajra is found in two patches in south-east and south-west parts in study region.

**Table-5.5: Crops, Villages and Areas in Fourth Ranking**

Crops	Number of villages	Percent to total villages	Area in hectares	Percent to total area
Jowar	28	23.93	19915	19.13
Wheat	35	29.91	39010	37.47
Bajara	14	11.97	10171	9.77
Sugarcane	14	11.97	13628	13.09
Fodder Crops	14	11.97	10824	10.40
Oilseeds	02	1.71	1299	1.25
Pulses	04	3.42	3117	2.99
Fruits	05	4.27	5243	5.04
Vegetables	01	0.85	900	0.86
Total	117	100	104107	100

Source: Computed by Researcher.

One big patch of fifteen villages is observed in south-west part (Fig. 5.3/A) and five villages in south-east part in study region. Bajra is grown on coarse shallow soils. Wheat stands at fourth in ranking in twelve villages in Baramati tahsil. Wheat distribution appears in patchy form. Four villages in the north have medium black soil. Four villages lie in north-west part have coarse shallow soil and irrigation facilities and four villages have isolated location in north-east part. Fruit are grown in twelve villages, namely, Hol, Khandobachiwadi, Karanjepul, Sadobachivadi, Pawaimal, Malwadi, Sangvi, Niravagaj, Zargadwadi, Mekhali and Ghadgewadi is cultivated in villages lying along river Nira. Fruits is cultivated in 8890 hectares on deep black soil of the study region. Pulses are cultivated in eleven villages, namely, Baburdi, Karkhel, Tardoli, Lonobhapkar, Syabachiwadi, Malwadi, Dhakale, Mudhale, Palshiwadi, Pimpalevasti, Pandharwadi in central parts in the study area. Jowar ranks fifth and is confined to eight

**Fig. 5.3 Fifth & Sixth Ranking**

villages (6.84 percent to total village) in the south and south-east parts covering 5599 hectares (5.38 percent to total area). Oilseeds are grown in seven villages in north and south. Vegetable cultivation is found in south-west parts in irrigated area wanewadi village of the Baramati tehsil.

**Table-5.6 : Crops, Villages and Areas in Fifth Ranking**

Crops	Number of villages	Percent to total villages	Area in hectares	Percent to total area
Jowar	08	6.84	5599	5.38
Wheat	12	10.26	12834	12.33
Bajara	20	17.09	14518	13.95
Sugarcane	23	19.66	22022	21.15
Fodder Crops	23	19.66	20093	19.30
Oilseeds	07	5.98	6250	6.00
Pulses	11	9.40	13070	12.55
Fruits	12	10.26	8890	8.54
Vegetables	01	0.85	831	0.80
Total	117	100	104107	100

Source: Compiled by Researcher

### 5.2.6 Sixth Ranking

The spatial distribution of sixth ranking crop is displayed in Table-5.7 and Fig. 5.3/B. Nine crops have been identified in this rank, namely jowar, bajara, wheat, sugarcane, fodder crop, oilseed, pulses, fruits and vegetable. Among the nine crops, oilseeds is principle crop found largest coverage on 36384 hectares ( 34.95 percent to total area ) in northern and southern parts in thirty-eight villages (32.48 percent to total villages). The largest coverage of oilseeds is found in the villages namely, Vadhane,

Pansarewadi, Kutwalwadi, Ambi Bk., Jogwadi, Chandgudewadi, Kalkhairewadi, Baburdi, Karhati, Sablewadi, Nimbodi, Karkhel, Medad, Mudhale, Masalwadi, Vadgaon Nimbalkar, Korhale Bk., Malshikharewadi, Sastewadi, Deulwadi, Karanje, Gaddarwadi, Nimbut, Sadobachwadi, Korhale Kh., Sonkaswadi, Malegaon Kh., Pandare, Pawaimal, Kurnewadi, Malwadi, Nirawaghaj, Sawal, Rui, Gunawadi, Baramati Rural, Dorlewadi and Zargadwadi. Pulses is cultivated in thirty-one villages (26.50 percent to total villages) covering 28495 hectares (27.37 percent to total area) in the north-eastern part is grown in the eighteen villages, five villages are found south part and six villages are found west part of the study region. Pulses are concentrated on coarse shallow soil in the study area. Fruits is associated with fertile black soil on 16075 hectares (15.44 percent to total area) in the four patches namely, south part of the study area is six villages, eight villages are found south-west part, five villages are found south-east and four villages are located in north eastern part of the Baramati tehsil. Sugarcane stand as sixth ranks in the study region covering 13884 hectares (13.34 percent to total area). It is mostly grown in the central and north-west part is cultivated in twelve villages (10.26 percent to total villages) of the study area.

**Table-5.7 : Crops, Villages and Areas in Sixth Ranking**

Crops	Number of villages	Percent to total villages	Area in hectares	Percent to total area
Jowar	2	1.71	1759	1.69
Wheat	1	0.85	571	0.55
Bajara	6	5.13	3487	3.35
Sugarcane	12	10.26	13884	13.34
Fodder Crop	0	0.00	0.00	0.00
Oilseeds	38	32.48	36384	34.95
Pulses	31	26.50	28495	27.37
Fruits	23	19.66	16075	15.44
Vegetables	4	3.42	3452	3.32
Total	117	100.00	104107	100.00

Source : Computed by Researcher.

Bajra in six villages (5.13 percent to total villages) are spread throughout study area (Fig. 5.3/B). This is drought resistant crop. The vegetable is dominant in four villages covering 3452 hectares (3.32 percent to total area) in Hol, Gaddarwadi, Murum

and Malegaon Bk. These villages are located in south part of the study area. Jowar is associated with deep black soils at Wanewadi and Malad covering 1759 hectares in the study region. Wheat are grown in one village, namely, Supe in north-west part of the Baramati tehsil covering 571 hectares ( 0.55 percent to total area ) on coarse shallow soils resulted low yield per hectare.

### 5.2.7 Seventh, Eight, and Nine Ranking

The crops namely, oilseeds, pulses, fruits and vegetable are major crops entered in seventh and eight ranking in 108 villages in Baramati tahsil (Fig. 5.4 and 5.5 and Table-5.8). These crops are distributed throughout the study area. Fig. 5.5 displays the distribution of ninth ranking crops in which pulses and vegetables are cultivated in 104 villages. Fruits and Bajara are cultivated each five villages as ninth ranking crop.

**Table-5.8: Crops, Villages and Areas in Seven, Eight and Nine Ranking**

Sr. No.	Name of the Crops	Seventh Rank		Eighth Rank		Ninth Rank	
		Number of villages	Percentage of total villages	Number of villages	Percentage of total villages	Number of villages	Percentage of total villages
1.	Jowar	01	0.85	02	1.71	0	0.00
2.	Wheat	01	0.85	01	0.85	0	0.00
3.	Bajara	04	3.42	05	4.27	05	4.27
4.	Sugarcane	03	2.56	0	0.00	0	0.00
5.	Fodder Crop	0	0.00	01	0.85	0	0.00
6.	Oil seed	46	39.32	21	17.95	03	2.56
7.	Pulses	26	22.22	17	14.53	28	23.93
8.	Fruits	22	18.80	49	41.88	05	4.27
9.	Vegetable	14	11.97	21	17.95	76	64.96
	Total	117	100.00	117	100.00	117	100.00

Source: Computed by Researcher.

**Fig. 5.4 Seventh & Eighth Ranking**

**Fig. 5.5Ninth Ranking**



### **5.3 Crop Combination Regions**

The study of crop combination regions constitute an important aspect of agricultural geography as it provides a good basis agricultural regionalization. Crops are generally grown in combinations (Weaver, 1954). The study of crop combination of any region has gained importance in geographical study. It gives us the relative position of crops on regional scale. Farmers grow crops in varied physical and cultural conditions. The pattern of crop combination gives rise to spatial predominance of certain crops or combination resulting the emergence of crop regions. Such analysis would ultimately minimize the change of oversimplified generalization (Ali, M. 1978). Crop combination study in geography is fruitful in many ways, firstly it provides an adequate understanding of an individual crop. Secondly, combination is in itself an integrative reality that demands definition and distribution analysis, and finally crop combination regions are essential for the construction of more complex structure of vivid agricultural region (Weaver, 1954). The study of crop combination thus forms an integral part of agricultural geography, and such study is greatly helpful for regional agricultural planning.

A number of quantitative and qualitative methods have been developed for determination of crop combination regions. In qualitative methods, crops are arranged or ranked in hierarchical order and then crop combinations are determined. The ease of these methods is the simplicity in calculation. Quantitative techniques are more precise, accurate and scientific than qualitative methods. First attempt for delineation of agricultural regions was made by Weaver in 1954. He studied crop combination for Middle East countries. Later on many more methods were introduced. Thomas (1963) modified Weaver's formula by including all crops with zero percent theoretical values in each step of the method, in the crop combination studies carried out in Wales but it did not yield different results than obtained by Weaver's method. Coppock (1964) also modified version of Weaver's method wherein he considered the rank in recognizing the leading crops. The Weaver's technique was subsequently modified by Doi (1959) where he supplied one sheet of table required only the summing up of actual percentages under different crops instead of finding differences between actual percentage and theoretical distribution. Looking at this weaknesses, Rafiullah (1965) modified Weaver's method and introduced a new method known as "Maximum Positive Deviation Method" by

applying same statistical procedure with altogether different format. The modified formula of Rafiullah is as below:

$$d = \sqrt{\frac{\Sigma D^2 p - D^2 n}{N^2}}$$

Where 'd' is the deviation,

Dp is the positive difference

Dn is negative difference from the medial value and

N is the number of crops.

The under root sign may be ignored to save laborious calculations and the formula may be used in the following form:

$$d = \frac{\Sigma D^2 p - D^2 n}{N^2}$$

The statistical technique adopted by Rafiulla is more accurate, and rational and therefore it is quite popular for delineation of crop combination regions. According to this method percentage area of all crops was arranged in descending order for 117 villages. The crops having area less than 5 percent were omitted from the calculation and maximum positive deviation of variance was calculated. For monoculture medial value was considered at 50 percent, for two crop-combination it is 25 percent, three crop-combination the value is 16.7 percent, for four it is 12.5 percent and for five crop it is 10 percent and so on. In present study area, 9 crops were used for computation of crop combination region. The obtained results of crop combination are shown in Fig. 5.6, Table 5.9 and 5.10. Three crop combination regions have been identified in the Baramati tahsil by applying Rafiullah's method (Appendix-K).

### 5.3.1 Monoculture

Jowar, sugarcane, Bajara and wheat crops have monoculture in the Baramati tahsil Fig. 5.7. These four crops are identified in eighty-nine villages (76.07 percent to total villages). Jowar is leading crop in study region showing highest coverage in forty-six villages (Fig. 5.7). It is grown on 47562 hectares area.

**Fig. 5.6 Crop Combination Region**

**Fig. 5.7 Monoculture Combination Region**

Sugarcane is identified as monoculture in twenty-nine villages in south and central parts in study region on deep soil and irrigation (Fig. 5.7).

**Table-5.9 : Crop Combination Regions in Baramati Tahsil**

Sr. No.	Types of Crop Combination	Number of Villages	Percent to total villages	Area in hectares	Percent of Area
1	Monoculture	89	76.07	83608	80.31
2	Two crop Combination	26	22.22	18985	18.24
3	Three crop Combination	02	1.71	1514	1.45
Total		117	100.00	104107	100.00

Source: Computed by Researcher.

Irrigation and fertile soil are major factors for growing sugarcane along the bank of Nira river and these villages are lying in east, central and south parts in study region on deep soil and Nira left canal irrigation in Baramati tahsil. Bajara is identified as monoculture occupying only 12.13 percent area in the study region, it is occurred in northwest and northeast part of coarse shallow soils. Napatvalan village is identified as monoculture in wheat crop in study region. Napatvalan is located on fertile soil (Fig. 5.7).

### 5.3.2 Two crop Combination Regions

Six crops, namely, sugarcane, wheat, jowar, bajara, fodder crops and pulses enter into two crop combination in different villages. Fig. 5.8/A reveals two crop combination twenty-six villages area is south part of the study region. Sugarcane has largest area entering in this combination with bajra, wheat, jowar, foddercrops and pulses. Twenty-one villages in study area have combination of sugarcane with wheat, bajra, jowar and foddercrops located in south and south-east parts in Baramati tahsil on deep black fertile soil. Three villages have found two crop combination of jowar and bajara lying in west, east and central parts on coarse shallow and medium black soil. Jowar and bajra crop combination appeared in Morgaon, Sonkaswadi and Rui. Sortewadi and Pimplewasti located in south part entered in combination of sugarcane with foddercrops and pulses. These villages are located on the bank of Nira river. Jowar entered with bajara as two crop combination in Morgaon and Rui on coarse shallow soil.

**Fig. 5.8 Two & Three Crop Combination Region**

**Table-5.10: Crop Combination Types and Crops**

Crop Combination Types	Crops in Combination	Number of villages	Percent of total village	Area in hectares	Percent to total area
Monoculture	Jowar	46	39.32	47562	45.68
	Bajara	13	11.11	12623	12.13
	Sugarcane	29	24.79	22986	22.08
	Wheat	01	0.85	437	0.42
Two Crop Combination	Sugarcane + Wheat	21	17.95	15401	14.79
	Jawar + Bajara	03	2.56	2955	2.84
	Sugarcane + Fodder Crops	01	0.85	456	0.44
	Sugarcane + Pulses	01	0.85	173	0.17
Three Crop Combination	Sugarcane +Wheat+ Fodder Crops	02	1.71	1514	1.45

Source: Author

### 5.3.3 Three Crop Combination Regions

Three crop combination covers 1514 hectares of area in Baramati tahsil (Fig. 5.8/B). In this combination following crops have entered i.e. sugarcane, wheat, and fodder crop (Table 5.10). Kurnewadi and Malad village have found three crop combination where sugarcane combined with wheat and fodder crop lie along the Nira and Karha river in south part in study region. The river Karha flows towards northwest to southeast and it joins Nira river in southeastern part in study area. Malad village located on the bank of Nira river, has found three crop combination of sugarcane, wheat and fodder crops in south part on fertile soil and irrigation facility in the study region.

### 5.4 Crop Diversification Regions

Crop Diversification is a concept which is opposite to crop specialization. The cultivation of crop depends on physical, socio-economic conditions and technological development in a region. This cultivation of crop shows contemporary competition.

Crops are diversified in the field due to erratic nature of rainfall and insufficient irrigation. Farmers grow many crops in order to sustain. The greater number of crops lead to greater competition, the higher is the magnitude of diversification. Many geographers and economist have applied diversification concept in different sense. Initially concept was applied in manufacturing field to obtain the degree of diversification by Cleann (1930), Tree (1938), Florence (1942) and Rainwald (1949). Gibbs Martin has applied diversification concept for computing measurement of diversification of employment in industry. Bhatia (1965) has computed crop diversification in India to understand crop combination in the region. The formula, later on has been modified by Jasbir Singh (1976) and Ayyer (1969). According to Bhatia crop diversification means the land occupying for variety of crops, which occupy at least one percent to gross cropped area. The study of crop diversification is essential to understand the competition of crops in any region. In order to identify the crop diversification, in present study, Gibb's Martin's Index has been applied and computed for 117 villages in Baramati tahsil. The formula is as below:

$$\text{Index of Diversification} = 1 - \frac{X}{n}$$

where X is the percentage of total cropped area occupied by each crop or hectareage under individual crop. If the total cultivated area in the region is devoted wholly to one crop showing specialization, the index value will be zero (Singh, 1984).

### **Crop Diversification Regions**

The obtained results have been displayed in Fig. 5.9 and Table 5.11 shows crops in number, villages and area in crop diversification in the Baramati tahsil. The maximum crop diversification appears in Dandewadi village (0.98) located in northern part and lowest at Sangvi (0.56) situated in south part of the study area. It is seen that whole study area is divided into four crop diversification regions, identified as:

- i) Area of very high crop diversification.
- ii) Area of high crop diversification
- iii) Area of moderate crop diversification and
- iv) Area of low crop diversification



**Fig. 5.9 Crop Diversification Region**

It is observed that largest area appears in the high crop diversification class covering 76.89 percent area in the Baramati tahsil, 25 villages has found the area of very high crop diversification is visible from Fig.5.9 maximum area and it appears in northern and south-central part covering 19859 hectares area (19.07 percent to total area) in study region.

**Table 5.11: Crop Diversification Pattern**

Types of Diversification	Value	Number of villages	Percentage of villages	Gross Cropped Area	Area in Percentage
VeryHigh Diversification	> 80	25	21.37	19859	19.07
High Diversification	0.60-0.80	88	75.21	80047	76.89
Moderate Diversification	0.40-0.60	04	3.42	4201	4.04
Low Diversification	0.20-0.40	00	0.00	0.00	0.00

Source: Computed by Researcher.

The area of high crop diversification is visible from Fig. 5.9 maximum area appears disintegrated in numerous patches throughout the study region. The largest patch eastern and south part covering 80047 hectares (76.89 percent to total area) in the Baramati tahsil. Eighty-eight villages come under this region and largest number of crops are found in high degree of diversification. There are nine crop, namely, jowar, wheat, bajara, sugarcane, fodder crops, oilseeds, pulses, fruits and vegetables enter in this diversification. The index value ranges between 0.60 and 0.80. Area of moderate crop diversification covers 4201 hectares (4.04 percent of total area) of study region. This area appears in southern and eastern part covering four villages. Crops in this diversification are less in number than the previous category. This soil gives high yield per hectare and irrigation facilities. The index value identifies here is 0.40 to 0.60.

### **5.5 Conclusion**

In order to attempt an exposition of agricultural land use pattern in Baramati tahsil, village has been considered as unit for studying crop ranking, and crop combination and crop diversification regions. Four crops have been identified as first ranking crops. These

four crops are, namely, jowar, wheat bajra and sugarcane. Sugarcane is major crop and it stands as first rank and is found to have largest coverage in 54 villages occupying 46.15 percent area in the study region. The application of Rafiullah's method shows the realistic picture of crop combination. Three crop combination regions has found in study area. Monoculture is in eighty-nine villages. Jowar, sugarcane, bajara and wheat entered in this combination. Jowar, sugarcane, bajara and wheat as monoculture crops. Jowar is cultivated in forty-six villages and sugarcane is cultivated in twenty-nine villages in study area. Two-crop combination region has observed in twenty-six villages and three crop combination has observed two villages. Sugarcane, wheat and fodder crops is grown in this region on irrigation. The crop combination has been computed by applying Gibb's Martin's Index formula. The result of crop diversification established relationship with physical and socio-economic conditions. The largest area under cover high crop diversification in eighty-eight villages, twenty-five villages very high crop diversification. The high diversification of crops covering almost 75.21 percent of gross cropped area is an indication of agricultural development in the study region.

**CHAPTER – VI**  
**AGRICULTURAL PRODUCTIVITY**

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## CHAPTER – VI

### AGRICULTURAL PRODUCTIVITY

#### 6.1 Introduction

The preceding chapter "Crop Combination and Diversification" delineates crop regions with considering area under crops in Baramati tahsil. This present chapter is fully devoted to focus on the production aspect in the study region. The understanding of existing levels of productivity is essential for better planning and management to bring up the backward areas. The population is rapidly increasing and this rapidly increasing population needs to feed properly. So, it is imperative to make comprehensive study of each crop and production. Here an attempt has been made to identify crop productivity regions and the factors involved in it. The term 'Productivity' is regarded as the measurement of production and inputs required for the production of that output is known as agricultural productivity. Agricultural productivity is the interplay of a multitude of many factors, such as environmental, socio-economic and technological factors.

The agricultural productivity is closely related to the per hectare yields, whereas the agricultural efficiency is much more than agricultural productivity and conveys a more comprehensive meaning. Agricultural productivity is the actual performance of the land in terms of per hectare yield, whereas agricultural efficiency is a ratio between the achievement in terms of agricultural production and the actual potential of the land productivity is a physical rather than a value concept and describes the changing relation between output and one of the major inputs like land, labor, and capital. "A ratio of the output to input in relation to land, labour, capital and overall resources employed in agriculture." Rao and Jasbir Singh (1981) considered "Productivity as the degree at which the economic, cultural, technical and organizational variables are able to exploit the biotic resources of the area for agricultural production". Bhatia (1967) defined agricultural efficiency as, "The aggregate performance of various crops in regard to their output per acre". Singh (1979) defined agricultural productivity as, "The quantity of returns from arable land". He argued that quantity of produce denotes its intensity and the spatial expansion. The term agricultural productivity is both a dynamic and relative concept. The study of agricultural productivity is essential for differentiating and delimiting the areas whose performance and accomplishments are diversified. The studies on agricultural productivity are helpful in involving a future oriented strategy for

agricultural planning. Agricultural Productivity is a multidimensional concept, which includes technological advancement, effective management of available resources and organizational set-up for the agricultural production. These factors in turn affect the relative production in any region.

Singh and Dhillon (2000) suggested that the “*yield per unit*” should be considered to indicate agricultural productivity. Which may be defined as the “ratio of index of local agricultural output to the index of total input used in farm production” (Shafi, 1984). It is, therefore, a measure of efficiency with which inputs are utilized in production, if other things being equal. Agricultural productivity here refers to the returns from arable land or cultivable land unit. Productivity of labour is important as a determinant of the income of the population engaged in agriculture. In general, it may be expressed by the man hours or days of work needed to produce a unit of production. Productivity is generally considered from two directions; (a) productivity of land and (b) productivity of infrastructure engaged in agriculture. Productivity of land is closely linked with the productivity of infrastructure. So, attempts have been made to examine the spatial differences through the present approach. A study of various approaches to the measurement of agricultural productivity shows that none of the criteria is perfect. The seven parameters are given below:

**i. Computation of Agricultural Productivity based on Kendall’s Ranking Coefficient**

It is concerned only with the ranking of the yields in weight per unit of land but is not in any way weighted according to the volume of production.

**ii. Bhatia’s Productivity Evaluation Index**

It is an equation involving yield and magnitude of area in the component areal unit of study in relation to the entire region.

**iii. Computation of Agricultural Productivity based on Standard Nutrition Unit’s (availability of calories per hectare of Cropped land)**

This method of productivity measurement is suggested by Stamp. According to this method the total production of crops per hectare is converted into calories and is then related to its capability of nutritional support for its people per hectare.

**iv. Computation of Agricultural Productivity based on Enyedi’s Productivity Index**

This index is concerned with the ratio of production and cropped area divided by ratio of total production and total cropped area in the region.

**v. Shafi's Modified Productivity Coefficient Index**

In this type of computation calorie values relating to each crop have been incorporated in the yield. This is done to eliminate the value difference of yields of different crops.

**vi. Computation of Agricultural Productivity based on the total number of calories available per person**

The availability of calories value is computed per person instead of per hectare of land. This shows the existing capability of agricultural production to support the population. This parameter becomes important especially in densely populated countries of the world like India.

**vii. Computation of Agricultural Productivity based on the Sapre and Deshpande's Productivity Index**

Sapre and Deshpande multiplied the rank value of all crops in an areal unit by the percentage of cropland share and divided the percentage share of the total cropped area.

The present study aims at computing of crop productivity for Baramati tahsil having diversity in soil, local relief and irrigation. The region exhibits rolling plain with local undulations sloping at north-west to south-east. The physiography has direct influence on the soil types and its spatial distribution. The productivity data, at village level is not available. To overcome this difficulty of yield data of each crop was collected during fieldwork both on yield and acreage for the selected villages. This data has been utilized to obtain crop productivity for these six villages. These six villages are representative to entire tahsil. These villages are 1) Supe, 2) Undavadi Supe, 3) Loni Bhapkar, 4) Vadgaon Nimbalkar, 5) Malegaon Bk. and 6) Baramati Rural. Enyedi's method was chosen to compute crop productivity for Baramati tahsil because of its accuracy.

**6.2 Enyedi's Productivity Index**

Enyedi, G.Y. (1964) while describing geographical types of agriculture in Hungary refers to a formula for determining agricultural productivity. Shafi (1972 and 1974) also adopted this approach to determine the productivity indices in respect of twelve food crops in India. His formula for assessing productivity coefficient is, the

spatial distribution of productivity for major crops was computed, mapped and interpreted by Enyedi's Index.

$$\text{Productivity index} = \frac{Y}{Y_n} \div \frac{T}{T_n} * 100$$

Where,

- Y = Production of the selected crop in unit area i.e. villages  
Y<sub>n</sub> = Total Production of the selected crop at regional level  
(Entire study region)  
T = Area under Selected Crop in unit area (Village level)  
T<sub>n</sub> = Total cropped area in entire study region.

Using this formula the productivity index values were calculated for six sample villages for the year 2010-11 and demarcated the productivity regions as very high, high, medium, low and very low productivity regions. Enyedi's productivity index values were calculated for sample villages are representative to entire tahsil for the year 2010-11 and the productivity regions were demarcated by using the same method for fixing the class intervals as shown in a Map is prepared with the help of productivity Indices.

### **6.3 Productivity of Jowar**

The spatial distribution of productivity of jowar is shown in Table 6.1 and Fig. 6.1. It is observed that local topography, soil type and rainfall distribution influence the productivity of jowar. Least productivity is recorded in the South part in the village Malegaon Bk. (59.70) where maximum area is sugarcane cultivation belt and fodder crops and jowar mix crop cultivation this area. Supe village soil is coarse shallow to medium black. Jowar is rabbi crop which requires less amount of water. It is a drought resistant crop. This village situated in the northwest and east shows high productivity i.e. 109.15 and 107.68 respectively. Highest productivity of Jowar is observed in Vadgaon Nimbalkar (149.27) in the south-west part of the study region. The productivity of Jowar is increasing south-west part due to plane topography, medium to deep black soil and irrigation. The productivity pattern of Jowar has increasing trend toward east and west from central pocket of low productivity (Fig. 6.1). Variation of soil type, local relief and rainfall changes in productivity in the west and east part.



**Fig. 6.1 Productivity of Jowar**

**Table-6.1 Index Productivity of Jowar in Baramati Tahsil**

Name of the Village	Area Hectare	Total Production Quintal	Production Quintal/Hect.	Index of Productivity
Supe	140	5600	40	119.41
Undavadi Supe	160	4800	30	89.56
Loni Bhapkar	600	15000	25	74.63
Vadgaon Nimbalkar	230	11500	50	149.27
Malegaon Bk.	50	1000	20	59.70
Baramati Rural	250	10000	40	119.41
			Average	-
Total	1430	47900	34.16	

Source: Computed by Researcher.

#### 6.4 Productivity of Wheat

Wheat as a rabbi crop is cultivated over medium to deep black soil with subsoil moisture and hence hardly requires irrigation facility. The spatial distribution pattern of wheat productivity is displayed in Fig. 6.2. Highest productivity of wheat is observed in Baramati Rural (120.48) in the south-east followed by Vadgaon Nimbalkar (108.18) in south-west (Table-6.2). The lowest productivity is recorded in Loni Bhapkar (49.17) followed by Undavadi Supe (73.86) situated in central and north respectively. The productivity of wheat is increasing towards south-west and south-eastern part due to plane topography, medium to deep black soil and irrigation. Central and northern part have low productivity of wheat due to high relief, coarse shallow soil with low moisture retentive capacity and lack of irrigation facility. Moderate productivity (98.35) is observed in Malegaon Bk. south part due to medium to deep black soil having high moisture retentivity. Vadgaon Nimbalkar, Malegaon Bk. and Baramati Rural have found the three administrative region villages high productivity index (Fig. 6.2). There is potentiality to large hectarage under wheat by sowing improved varieties of seeds. Irrigation is also a source of high productivity patch well existed in these villages can be utilized for irrigating crops.

#### 6.5 Productivity of Bajra

Bajra, a drought resistant crop of kharif season, is grown on inferior quality soil having less commercial value. The spatial distribution of bajra is depicted in Fig.6.3.

**Fig. 6.2 Productivity of Wheat**

**Table-6.2 Index of Productivity of wheat in Baramati Tahsil**

Name of the Village	Area Hectare	Total Production Quintal	Production Quintal/Hect.	Index of Productivity
Supe	30	1350	45	88.51
Undvadi Supe	60	2250	37.5	73.76
Loni Bhapkar	175	4375	25	49.17
Vadgaon Nimbalkar	290	15950	55	108.18
Malegaon Bk.	470	23500	50	98.35
Baramati Rural	450	27563	61.25	120.48
			Average	-
Total	1475	74988	45.62	

Source: Computed by Researcher.

The lowest productivity is three administrative region observed in at Undavadi Supe lies in northern part, Malegaon Bk. and Vadgaon Nimbalkar (83.82) in the south part of the Baramati tahsil. The highest productivity of bajra is recorded at Baramati Rural (127.91) in the south-east part, followed by Supe (125.73) situated in north-west respectively (Table 6.3 and Fig. 6.3). The general productivity pattern of bajra shows increasing trend towards north-west and eastern part of the tahsil. The productivity trend of bajra, does not signify any correlation with soil, water and physiography since poorer soils are available at each and every village levels which are generally brought under bajra cultivation. Productivity index of bajra for six selected villages is shown in Table 6.3.

**Table-6.3 Index of Productivity of Bajra in Baramati Tahsil**

Name of the Village	Area Hectare	Total Production Quintal	Production Quintal/Hect.	Index of Productivity
Supe	130	4875	37.5	125.73
Undvadi Supe	140	3500	25	83.82
Loni Bhapkar	700	21000	30	100.58
Vadagaon Nimbalkar	220	5500	25	83.82
Malegaon Bk.	10	250	25	83.82
Baramati Rural	80	3052	38.15	127.91
			Average	-
Total	1280	38177	30.11	

Source: Computed by Researcher.

**Fig. 6.3 Productivity of Bajara**

**Fig. 6.4 Productivity of Sugarcane**

## 6.6 Productivity of Sugarcane

Sugarcane is a long duration crop grown in medium black and deep black soil with assured supply of irrigation. The spatial distribution of sugarcane productivity is shown in Fig. 6.4. The highest productivity of sugarcane is in Baramati Rural (118.38) situated in the south-east part along the bank of river Nira and Karha, followed by Vadgaon Nimbalkar (112.15) situated in south part along the left Nira canal of the study region (Table 6.4 and Fig. 6.4). Lowest productivity of sugarcane is observed in north-west and northern part in Supe (56.07), Loni Bhapkar (49.84) and Undavadi Supe i.e. 62.30. Northern and north-west parts have extensive coverage of high relief, rugged and stony surface of these villages found inferior soil and less productivity of expansion of net sown area. The rugged topography, coarse shallow soil and unavailability of irrigation in the northern part makes less productivity of sugarcane. Towards southern part of the tahsil productivity increases due to change in soil type i.e. medium black to deep black, introduction of canal, well and river irrigation where region has plain topography gently sloping towards Nira and Karha basin.

**Table-6.4 Index of Productivity of Sugarcane in Baramati Tahsil**

Name of the Village	Area Hectare	Total Production Quintal	Production Quintal/Hect.	Index of Productivity
Supe	30	3375	112.5	56.07
Undvadi Supe	70	8750	125	62.30
Loni Bhapkar	75	7500	100	49.84
Vadgaon Nimbalkar	310	69750	225	112.15
Malegaon Bk.	800	150000	187.5	93.45
Baramati Rural	500	118750	237.5	118.38
			Average	-
Total	1785	358125	164.58	

Source: Computed by Researcher.

The productivity of sugarcane is increasing in south to north-east direction. This region, physiographically lies in the Nira left canal and the bank of river Nira and Karha. Moreover, it is observed that south and north-eastern part of the villages yield very high productivity of sugarcane than south part due to high fertility of soils. The region included in Vadagaon Nimbalkar, Malegaon Bk. and Baramati Rural of the study area (Fig. 6.4).

## **6.7 Quantitative Evaluation of Landuse**

This study is based on the data and information have used to uncover the relationship between crop landuse and environmental variables in Baramati tahsil. This established relationship was evaluated by quantitative methods for strengthening the results. The quantitative evaluation of agricultural and general landuse of Baramati tahsil. Shows the correlation co-efficient among agricultural landuse and environmental variables and identification of unique variance among selected variables. The data have been collected from secondary sources for the year 2010-11 for nine crops for 117 villages from Revenue Department, Baramati have search out and studied which was later on converted into percentage to net sown area. Nineteen variables were carefully selected to compute the correlation co-efficient for study area. The significant variables in correlation coefficient were further used for finding multiple regression.

## **6.8 Correlation Analysis**

In order to establish relationship between crop landuse variables the correlation coefficient has been computed. The data have been collected from secondary sources for the year 2010-11, Talathi Revenue Office Baramati. Nineteen variables were carefully selected to assess the relationship for correlation coefficient in the study area. These variables are, namely, percent of net sown area to total geographical area, percent of Jowar to net sown area, percent of wheat to net sown area, percent of Bajara to net sown area, percent of sugarcane to net sown area, percent of fodder crops to net sown area, percent of oilseeds to net sown area, percent of pulses to net sown area, percent of fruits to net sown area, percent of vegetables to net sown area, percent of land not available for cultivation to total geographical area, percent of follow land to total geographical area, percent of population density per square kilometre, percent of irrigated area to net sown area, percent of agriculture density per square kilometre, yield of Jowar, yield of bajara, yield of wheat and yield of sugarcane. The selected variables, symbols and formula for obtaining values are shown in Table- 6.5.

## **6.9 Result of Correlation Co-efficient**

The relationships between landuse and environmental variables correlation has been computed by applying quantitative technique, namely correlation coefficient for 117 x 19 data matrix. Pearson product movement correlation was applied. Student 't' test was later on adopted to ascertain the significance of 'p' value at 0.05 significant level.



The obtained results are shown in Table-6.6. The relationship between variables is summarized as follows:

### **6.9.1 Net Sown Area**

The net sown area exhibits positive correlation with jowar, Bajara, wheat, sugarcane, irrigated land and population density. The strong positive correlation of net sown area has found with jowar 0.74 and positive correlation of irrigated area 0.33, yield of wheat, yield of sugarcane. It implies increasing net sown area under jowar and irrigated area in study region. The net sown area shows a moderate correlation with fallow land (0.42) and moderate with area not available for cultivation (0.47). This indicates increasing areal extent under net sown area with decreasing area under fallow land and area not available for cultivation and vice versa. The positive correlation is found in case of net sown area with yield of jowar (0.26), yield of wheat (0.23), yield of bajara (0.26) and yield of sugarcane (0.20) in the study region.

### **6.9.2 Area under Jowar**

Jowar crop has relationship with fodder crops, pulses, oilseeds, yield of bajra, sugarcane, area not available for cultivation and fallow land. Area under jowar has moderate positive correlation with fodder crops (0.68), oilseeds (0.55), pulses (0.66), yield of bajra (0.21) showing jowar crop has proportionate increase with yield of bajra because jowar being a rabi crop followed bajra as a kharif. Jowar has negative correlation with sugarcane (-0.34), total irrigation area (-0.28), and yield of sugarcane (-0.01), because rest of the crops have more market value. The moderate negative correlation is found with irrigated area (-0.28). This fact explains that jowar has isolated position in the study region.

### **6.9.3 Area under Wheat**

The spatial distribution of wheat is largely associated with irrigated area, population density and agricultural density. Wheat crop has found strong positive correlation with sugarcane (0.83), irrigated area (0.84), population density (0.73) and agricultural density (0.73). Area under wheat has moderate correlation with fruits (0.51), vegetables (0.45), yield of wheat (0.41), and yield of sugarcane (0.44). Wheat has found positive correlation with fodder crops, yield of jowar, and yield of Bajra. Wheat is mostly cultivated on medium to deep black soil. Hence negative correlation has exhibited with Bajra (-0.12) and area under pulses (-0.10).

**Table 6.5 The variables used in Landuse Analysis**

Variables	Formula
Percent of net sown area	$\% \text{ N.S.A.} = \frac{\text{N.S.A.}}{\text{Total Geographical Area}} \times 100$
Percent of Jowar	$\% \text{ Jowar} = \frac{\text{Area under Jowar}}{\text{N.S.A.}} \times 100$
Percent of Wheat	$\% \text{ Wheat} = \frac{\text{Area under Wheat}}{\text{N.S.A.}} \times 100$
Percent of Bajara	$\% \text{ Bajara} = \frac{\text{Area under Bajara}}{\text{N.S.A.}} \times 100$
Percent of Sugarcane	$\% \text{ Sugarcane} = \frac{\text{Area under Sugarcane}}{\text{N.S.A.}} \times 100$
Percent of Fodder Crop	$\% \text{ Fodder crop} = \frac{\text{Area under Fodder crop}}{\text{N.S.A.}} \times 100$
Percent of Oilseed	$\% \text{ Oilseed} = \frac{\text{Area under Oilseed}}{\text{N.S.A.}} \times 100$
Percent of Pulses	$\% \text{ Pulses} = \frac{\text{Area under pulses}}{\text{N.S.A.}} \times 100$
Percent of Fruits	$\% \text{ Fruits} = \frac{\text{Area under Fruits}}{\text{N.S.A.}} \times 100$
Percent of vegetable	$\% \text{ Vegetable} = \frac{\text{Area under vegetable}}{\text{N.S.A.}} \times 100$
Percent of Area not available for cultivation	$\% \text{ A.N.C.} = \frac{\text{Area under A.N.C.}}{\text{Total geographical area}} \times 100$
Percent of Fallow land	$\% \text{ F.L.} = \frac{\text{Area under fallow}}{\text{Total geographical area}} \times 100$
Population density	$\text{Population Density} = \frac{\text{Population}}{\text{Area (Sq. Km.)}} \times 100$
Percent of irrigated area	$\% \text{ Irrigated area} = \frac{\text{Total irrigated area}}{\text{N.S.A.}} \times 100$
Agricultural density	$\text{Agricultural Density} = \frac{\text{Rural Population}}{\text{N.S.A.}} \times 100$
Yield of Jowar	$\text{Yield of Jowar} = \frac{\text{Total production of jowar (Kg)}}{\text{Area under jowar}}$
Yield of Bajra	$\text{Yield of Bajra} = \frac{\text{Total production of bajra (Kg)}}{\text{Area under bajra}}$
Yield of Wheat	$\text{Yield of Wheat} = \frac{\text{Total production of wheat}}{\text{Area under wheat}}$
Yield of Sugarcane	$\text{Yield of Sugarcane} = \frac{\text{Total production of sugarcane}}{\text{Area under sugarcane}}$

#### **6.9.4 Area under Sugarcane**

Sugarcane has strong positive correlation with total irrigation area (0.92), population density (0.74) and agricultural density (0.73) and moderate positive correlation with fruits (0.51) and vegetables (0.40). The area under sugarcane increases with increasing yield of sugarcane and wheat in the study region. The negative correlation has established with yield of bajra (-0.04), oilseeds (-0.05) and moderate negative correlation with pulses (-0.35). The sugarcane crop is cultivated in study area and it has independent position, therefore, the sugarcane shows negative correlation with fallow land, oilseeds, pulses, and yield of bajara.

#### **6.9.5 Irrigated Area**

The availability of irrigation facility plays a vital role in the socio-economic and agricultural development area. Irrigated area has established strong positive correlation with area under agricultural density (0.71). Moderate positive correlation shows the yield of wheat (0.30), area under sugarcane (0.31) and positive correlation depicts yield of Jowar (0.04). The low negative relation has found yield of bajara (-0.05) in Baramati tahsil.

#### **6.9.6 Population Density**

Population is an important factor for regional development influencing economic activity and it determines the level of consumption and agriculture force. The spatial distribution of population density is largely associated with agricultural density, total irrigated area, yield of wheat and yield of sugarcane. The strong positive correlation has established with agricultural density (1.00), yield of sugarcane (0.71) and total irrigated area (0.71). Moderate positive correlation with yield of wheat (0.68), yield of Jowar (0.30) and yield of Bajara (0.13) in the study region.

#### **6.9.7 Agricultural Density**

Agricultural density (Ferenczi, 1938 and Triwartha, 1953) provides one with means to make a comparison between agricultural population and cultivated area. Agricultural density distribution exhibits positive correlation with yield of Jowar, yield of wheat, yield of Bajara and yield of sugarcane. Strong positive correlation with yield of sugarcane (0.71) and yield of wheat (0.68). Moderate positive correlation shows the yield of jowar (0.30) and yield of bajara (0.13) in Baramati tahsil.

**Table 6.6: Correlation Matrix**

Variables	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12	X13	X14	X15	X16	X17	X18	X19
X1	1.000																		
X2	0.748	1.000																	
X3	0.528	-0.066	1.000																
X4	0.711	-0.236	-0.122	1.000															
X5	0.279	-0.345	0.838	-0.384	1.000														
X6	0.809	0.682	0.263	0.674	0.012	1.000													
X7	0.632	0.557	0.111	0.558	-0.058	0.585	1.000												
X8	0.566	0.667	-0.105	0.694	-0.361	0.635	0.783	1.000											
X9	0.458	0.042	0.516	0.033	0.510	0.352	0.325	0.190	1.000										
X10	0.255	-0.023	0.452	-0.131	0.406	0.155	0.244	0.000	0.528	1.000									
X11	0.424	0.306	0.293	0.273	0.165	0.351	0.229	0.271	0.246	0.333	1.000								
X12	0.475	0.518	0.063	0.481	-0.049	0.294	0.270	0.290	0.085	0.086	0.405	1.000							
X13	0.424	-0.056	0.738	-0.117	0.739	0.130	0.155	-0.059	0.515	0.461	0.401	0.182	1.000						
X14	0.335	-0.281	0.849	-0.360	0.929	0.044	-0.007	-0.333	0.489	0.388	0.202	-0.040	0.714	1.000					
X15	0.424	-0.056	0.738	-0.117	0.739	0.130	0.154	-0.059	0.515	0.461	0.401	0.182	1.000	0.714	1.000				
X16	0.261	0.173	0.169	0.204	0.039	0.312	0.289	0.140	0.168	0.211	0.188	0.160	0.300	0.040	0.300	1.000			
X17	0.230	0.021	0.438	-0.031	0.324	0.063	0.185	0.015	0.310	0.477	0.290	0.085	0.681	0.304	0.681	0.587	1.000		
X18	0.266	0.213	0.065	0.290	-0.046	0.394	0.243	0.184	0.161	0.048	0.096	0.156	0.139	-0.058	0.139	0.265	0.301	1.000	
X19	0.206	-0.010	0.444	-0.061	0.354	0.014	0.142	-0.021	0.319	0.482	0.288	0.060	0.710	0.315	0.710	0.478	0.979	0.205	1.000

(Values significant at 0.05 level)

Note:

X1=Percent of N.S.A. to T.G.A.

X8=Percent of Pulses to N.S.A.

X15= Agriculture Density / Square Km.

X2= Percent of Jowar to N.S.A.

X9= Percent of Fruits to N.S. A.

X16= Yield of Jowar per Hectare

X3= Percent of Wheat to N.S.A.

X10= Percent of vegetables to N.S. A.

X17= Yield of Wheat per Hectare

X4= Percent of Bajra to N.S.A.

X11= Percent of Land not Avail. for culti.to T.G.A

X18= Yield of Bajara per Hectare

X5= Percent of Sugarcane to N.S.A.

X12= Percent of Follow Land to T.G.A.

X19= Yield of Sugarcane per Hectare

X6= Percent of fodder crops to N.S.A.

X13= Percent of Irrigated area to N.S.A.

X7= Percent of Oil seed to N.S.A.

X14= Population Density / Square Kilometre

## 6.10 Conclusion

Crop productivity is a combined effect of physio-socio-economic factors. The physiography has direct influence on the soil types and its spatial distribution. Among all crops, the productivity shows increasing trend toward south to north in the study area. It is an indication of development in agriculture sector. In northern part due to adverse relief condition, coarse shallow soil and non-availability of irrigation leads to low productivity. So there is need to get financial support and integrated efforts for development of agriculture to reduce regional disparities in Baramati tahsil.

Nineteen landuse variables have been identified to show the correlation. The net sown area exhibits positive correlation with jowar, bajara, wheat, sugarcane, irrigated land and population density. The strong positive correlation of net sown area has found with jowar 0.74 and positive correlation of irrigated area 0.33, yield of wheat, yield of sugarcane. The net sown area shows a moderate correlation with fallow land (0.42) and moderate with area not available for cultivation (0.47). Net sown area exhibits area under jowar has moderate positive correlation with fodder crops (0.68), oilseeds (0.55), pulses (0.66), yield of bajra (0.21) showing jowar crop has proportionate increase with yield of bajra because jowar being a rabi crop followed bajra as a kharif. Wheat crop has found strong positive correlation with sugarcane (0.83), irrigated area (0.84), population density (0.73) and agricultural density (0.73). Area under wheat has moderate correlation with fruits (0.51), vegetables (0.45), yield of wheat (0.41), and yield of sugarcane (0.44). Wheat is mostly cultivated on medium to deep black soil. Hence negative correlation has exhibited with Bajra (-0.12) and area under pulses (-0.10). Sugarcane has strong positive correlation with total irrigation area (0.92), population density (0.74) and agricultural density (0.73) and moderate positive correlation with fruits (0.51), vegetables (0.40). The negative correlation has established with yield of bajra (-0.04), oilseeds (-0.05) and moderate negative correlation with pulses (-0.35). Irrigated area has established strong positive correlation with area under agricultural density (0.71). The spatial distribution of population density is largely associated with agricultural density, total irrigated area, yield of wheat and yield of sugarcane. The strong positive correlation has established with agricultural density (1.00), yield of sugarcane (0.71) and total irrigated area (0.71). Moderate positive correlation with yield of wheat (0.68), yield of Jowar (0.30 and yield

of Bajara (0.13) in the study region. Agricultural density distribution exhibits positive correlation with yield of jowar, yield of wheat, yield of bajara and yield of sugarcane. Strong positive correlation is exhibited with the yield of sugarcane (0.71) and yield of wheat (0.68) of Baramati tahsil.

**CHAPTER – VII**  
**SUMMARY AND CONCLUSION**

**7.1 Summary**

**7.2 Problems and Strategy**

**7.2.1 Northern part of the Baramati tahsil**

**7.2.1 Southern part of the Baramati tahsil**

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## CHAPTER – VII

### SUMMARY AND CONCLUSION

#### 7.1 Summary

Agriculture in a way is the result of human efforts applied in the exploitation of land resources towards the satisfaction of one of man's basic needs, food. In spite of the rapid growth of industries and service sectors in India, agriculture still is an important economic activity, employing 62 percent of total workers in 2001 (Maharashtra 64 percent in 2001). As compared to India, Maharashtra occupies 9.4 percent of the area, 9.3 percent population, 12.6 percent NSA, 11.4 percent GCA and only 4.6 percent of the gross irrigated area. Among the major crops grown, Maharashtra accounts for about half of the acreage under Jowar and 1/3rd under cotton. Bajara is another important crop, which accounts 18 percent of area while sugarcane occupies 12.7 percent of the harvested area under that crop in India. Agriculture being an important occupation in India a lot of research has been carried out at national and at state level to find out cropland use, general land use, crop productivity, problems and prospects of agriculture. Baramati tahsil is selected for the present research work. On the basis of the study, following observations have been made for its planning and development of agriculture in Baramati tahsil of Pune district.

The Baramati tahsil lies in the eastern part of Pune district of Maharashtra. The river Nira flows west to east forming the southern boundary of the tahsil and the district. The river Karha flows northwest to south-east Baramati tahsil is bounded by Indapur tahsil towards the east, Satara district towards the south, Purandar tahsil towards the west and Daund Tahsil towards the north. Climatologically, it lies in the rain shadow zone of the Western ghats and geomorphologically, it is located in the Karha and Nira basin, a part of middle Bhima basin. There are three types of soil structures: deep black, medium black and coarse shallow which are identified in the study region. The region receives rainfall from the south-west monsoon. Monsoon sets in the month of June and lasts up to October. The average annual rainfall ranges between 400 and 500 mms. The study area receives average annual rainfall of 364 mm. The mean annual maximum temperature is



recorded in May (34.6o centigrades) while the mean annual minimum temperature is in January (18.5o centigrades).

The road transport support for collecting and distributing agricultural products. The major district roads and village roads link with Baramati-Nira and Baramati-Phaltan state highways. The total length of Baramati-Nira State highway No.66 in the study area is 45 kilometres. Baramati-Phaltan state highway No.68 runs in the southeast direction in the study region having the length of 22 kilometres. The study region is also served by a broad gauge railway line connecting Baramati-Daund. However, the railway track of only 40 km. length comes in the study area. In Baramati tahsil, out of 117 villages 38 villages that is 1/3 area gets the benefit of Nira Left canal and the remaining 79 villages, that is 2/3 of the area, depend on uneven rainfall. All these villages fall under the drought-prone area. Nira and Karha rivers are the main sources of water for these regions. The study area, like other area has witnessed a steady growth of population with its upwards trend. The growth rate of population from 1991 to 2001 was 40.65 percent, due to the agro-industrial development.

The study region consists of 117 villages and has 372919 populations in 2001 and provisional 2011 census has 479690 populations. The average density of population is 270 persons per sq.km.in the region (2001). From spatial point of view, the population density increases towards south-east. Weekly market centres in Baramati tahsil mobilize rural local resources. There are eighteen weekly market centers in the study area which provide an opportunity to consumers, sellers, traders and mediators for exchanging goods. The market centres of Murti, Karanje, Vadgaon Nimbalkar, Pandare and Wanewadi lie on State Highway No. 66 and are easily accessible market centres throughout the year. Morgaon market centre has a slender connection with other market centres in the study area owing to its isolated location. Korhale Bk., Loni Bhapkar and Supe lie on State Highway No.62. Market centers, namely, Shirsuphal, Karhati, Katewadi, Songaon, Karkhel and Mekhali are linked with state highways and major district roads. Among these market centres, Baramati town is the largest market centre and is well known for cattle marketing in the study area. Of the total population, 84.89 percent working force is engaged in agricultural pursuits. The total working force accounts cultivators is 44.41 percent and agricultural laborers are 30.52 percent.

However, the other workers increased by 5.17 percent from 1991 to 2001 in the Baramati tahsil, due to the establishment of small scale industries and the introduction of new industries in Baramati M.I.D.C. The newly established service sector also contributed in the increase.

The temporal variation in landuse pattern of study area has been studied for the period of forty years (1960-61 to 2000-01) to find out the trend in general landuse. It is found that net sown area is steadily increasing from 1960-61 to 2000-01. In 1960-61 the total net sown area was registered as 98000 hectares accounting for 70.91 percent. After forty years i.e. in 2000-01 it was recorded as 104106 hectares (i.e. 75.30 percent). The highest net sown area in Baramati tahsil was recorded in 2000-01 as 104106 hectares accounting for 75.30 percent. This increase may be attributed to increasing awareness of improved agricultural techniques and introduction of the use of new improved seeds by farmers. From 1970-71 to 1990-91 and later decades, net sown area shows decline trend. There is an average 6.13 percent increase except for the decade 1990-91 to 2000-01. This significant increase in net sown area might have been registered due to the efforts of cultivation in which more land under trees and shrubs etc. was brought subsequently under cultivation. Other types of land previously considered cultivable waste is being used by the farmers for cultivation for growing crops. Moreover, increasing awareness, and mounting pressure of population on landuse pattern has brought this land under cultivation.

The land which is not available for cultivation has steadily declined from 1960-61 to 2000-01 in the study region. The total decline during the study period is 1.33 percent. There is a slight decline during the last decade. The land not available for cultivation has been decreasing due to the increase in the land under cultivation. The temporal variations are observed in land out of non-agricultural uses and barren and uncultivated land. Non-agricultural land has been substantially decreased for the period 1960-61 to 2000-01 (1.33 percent). The land that was put under non-agricultural use has been brought under cultivation in the study area whereas barren and uncultivated land has not been brought under cultivation due to the 'barad' soil. This soil is very poor in humus and naturally it is less fertile. This indicates that there is a tendency of farmers to bring more land under cultivation hence; cultivable waste has been increased in the study region. The cultivable

waste includes sub-types such as permanent pasture and other grazing land, miscellaneous tree crops and groves not included in net sown area and cultivable waste. The trend of increase in the cultivable waste has been marked in this region. The fallow land includes permanent fallow, current fallow and other fallow. The permanent fallow means the land kept uncultivated for the period of more than five years. It includes land under permanent pasture, other fodder land, miscellaneous trees and bushes. Current fallow land includes the land, which is kept uncultivated during one agricultural year or even less than that. This might have been caused due to the lack of capital, natural calamity like drought or to regain the soil fertility by keeping it uncultivated. Other fallow includes the land kept uncultivated for the period of 2 to 5 years due to various reasons like non-availability of capital, lack of agricultural knowledge, indebtedness of farmers etc.

Fallow land in Baramati tahsil covers 9783 hectares having 7.08 percent (2000-01). In 1960-61, this land was 16100 hectares accounting for 11.65 percent. During the study period, from 1960-61 to 2000-01 the fallow land shows fluctuations. It reveals up and down trends. Initially, fallow land was 11.65 percent in 1960-61 and it has been steadily decreased in the later two decades. It was decreased upto 2.89 percent in 1980-81. Between 1980-81 and 1990-91, this land has increased by 11.72 percent in 1990-91 then fell down to 7.54 percent in 2000-01. This indicates the change in the area under this category as; farmers want to use every piece of land for growing crops in the study region. Baramati tahsil has 4929 hectares land under forest accounting for 3.56 percent to total geographical area (2000-01). Forest shows decreasing trend from 1960-61 to 2000-01 (1.57 percent).

The spatial variation in general land use of the study area is the result of socio-economic, physical and cultural environment, amount of rainfall and its distribution. The net sown area is steadily increasing since 1990-91 to 2000-01. It is observed that 69.18 percent (95600 hectares) area was under cultivation in 1990-91 and it has been stepped to 75.30 percent (104106 hectares) area under cultivation in 2000-01, registering an increase by 6.12 percent. This increase may be attributed to increasing awareness of improved agricultural techniques and introduction of the use of new improved seeds by farmers. The highest net sown area is recorded at Ghadgewadi (more than 94 percent) in south-

east part in study region due to deep black soil and irrigation facility, whereas the lowest has been identified at Vadhane village (39 percent). Non-agricultural land has been substantially decreased for the period 1961 to 2001(1.33 percent). More land that in the past has been put to non-agricultural use brought under cultivation in the study area whereas barren and uncultivated land could not be brought under cultivation due to the 'barad' soils. This soil is very poor in humus and naturally it is less fertile. Cultivable waste has been remarkably increased in the study region. The general trend of declining fallow land towards north is observed due to the existence of fertile soil rising for cultivation. Thus, it has been marked that the forest cover is declining slowly (0.41percent).

Kharif and rabbi are two major agricultural seasons in the study area. Kharif season begins in the month of June or July and ends in September. Jowar, Bajara and sunflower are the major kharif crops in the study area of Baramati tahsil. Rabbi season commences from September or October and ends in March or April. Wheat, jowar, gram, and maize are the major rabbi crops grown in the study region. Sugarcane and vegetables are sown both in kharif and rabbi seasons. Sugarcane is the main crop in the study area which requires a long duration for maturing (15 to 18 months). The temporal variations in cropping pattern in the study area of Baramati tahsil is also studied from 1990-91 to 2010-11. Among these crops, jowar shows during the study period (1990-91 to 2010-11) has steadily declined. The maximum hectarage of jowar is declined in 2010-11 by 7.91 percent to total aerial extent of the study region while towards the north and central parts sugarcane percentage is increased. Sugarcane wheat, fruits and vegetable crops shown increasing trend during study period. Increasing irrigation facility is the main cause of this change in the study region. Crops like Bajara, fodder crops, oilseeds and pulses are slightly decreasing in Baramati tahsil. The total reduction of Bajra crop in Baramati tahsil is 3.12 percent from 1990-91 to 2010-11. The variation in landuse relates to the extent of these nine crops with soil characteristics, irrigation, relief, proximity to the market places and accessibility. The relationship among these factors is well established through agricultural landuse analysis of the region.

Jowar is identified as first ranking crop occupying 22.44 percent to net sown area. This crop is mainly concentrated in north and central part due to inadequacy of irrigation,

undulating topography and soil retentivity. Jowar acreage has been found decreasing trends towards north as sugarcane percentage increases. Sugarcane occupies the second position after Jowar which is cultivated on 21.25 percent area. Wheat also has concentration in north on fertile, black and deep soil which favours the cultivation. Bajra is sown on 19984 hectares accounting for 19.2 percent to net sown area in the study region. The distribution of this crop is influenced by rainfall amount, terrain characteristics and soil types. Fodder crop occupies 12.71 percent and its cultivation is found in the areas of dairy farming and livestock raising activity developed in northwest, southwest and central parts in the study region. Oilseed covers 2.85 percent, fruits and vegetable contribute 1.98 and 1.02 percent respectively in the study region. It is grown close to Baramati urban market places both local as well as surrounding market centres. Crops like pulses occupy 3.08 percent in the study region. It has been noted that among all the factors, soil, irrigation facilities and proximity to the market centres, control the spatio-temporal distribution of crops in the study region.

Ranking of crop reveals the relative strength of nine crop percentage at village level which were taken into consideration for computing crop ranking. These nine crops are, namely, jowar, wheat, bajara, sugarcane, fodder crops, oilseeds, pulses, fruits and vegetables. The cultivation of these crops is the result of soil types and irrigation besides farmers' decision in the study area. The ranking obtained for all these crops show the relative significance of individual crop in cropping pattern. Four crops have been identified as the first ranking crops. These four crops are jowar, wheat, bajra and sugarcane. Sugarcane is the major crop which stands as the first rank and is found to have largest coverage in 54 villages occupying 46.15 percent area in the study region. The application of Rafiullah's method shows the realistic picture of crop combination. Three crop combination regions have been found in the study area. Monoculture is observed in eighty-nine villages. Jowar, sugarcane, bajara and wheat entered in this combination. Jowar, sugarcane, bajara and wheat are the monoculture crops. Jowar is cultivated in forty-six villages and sugarcane is cultivated in twenty-nine villages in the study area. Two-crop combination regions have been observed in twenty-six villages and three crop combinations have been observed in two villages. Sugarcane, wheat and fodder crops are grown in this region on irrigation. The crop combination has been computed by applying

Gibbs and Martin's Index formula. The result of crop diversification established relationship with physical and socio-economic conditions. The largest area under cover is observed as high crop diversification in eighty-eight villages, and twenty-five villages have very high crop diversification. The high diversification of crops covering almost 75.21 percent of gross cropped area is an indication of agricultural development in the study region.

The population is rapidly increasing and this rapidly increasing population needs to feed properly. So, it is imperative to make comprehensive study of each crop and production. Here an attempt has been made to identify crop productivity regions and the factors involved in it. The term 'Productivity' is regarded as the measurement of production and inputs required for the production of that output is known as agricultural productivity. Agricultural productivity is the interplay of a multitude of many factors, such as environmental, socio-economic and technological factors. The agricultural productivity is closely related to the per hectare yields, whereas the agricultural efficiency is much more than agricultural productivity and conveys a more comprehensive meaning. Among all crops, the productivity shows increasing trend towards south to north in the study area. It is an indication of development in agriculture sector. In the northern part due to adverse relief condition, coarse shallow soil and non-availability of irrigation leads to low productivity. So there is need to get financial support and integrated efforts for development of agriculture to reduce regional disparities in Baramati tahsil.

However, some difficulties have been encountered during the collection of data such as unavailability of the productivity data at the village level etc. To overcome this difficulty of yield data, the data of each crop was collected during the fieldwork both on yield and acreage for the selected villages. This data has been utilized to obtain crop productivity for the following six villages: 1) Supe, 2) Undavadi Supe, 3) Loni Bhapkar, 4) Vadgaon Nimbalkar, 5) Malegaon Bk. and 6) Baramati Rural.

These six villages are representative of the entire tahsil. Enyedi's method was chosen to compute crop productivity for Baramati tahsil because of its accuracy. Least productivity is recorded in the South part in the village Malegaon Bk. (59.70) where maximum area is

sugarcane cultivation belt and fodder crops and jowar mix crop cultivation in this area. Among the villages mentioned above the soil of Supe village is coarse shallow to medium black suitable to Jowar crop. Jowar is rabbi crop which requires less amount of water. It is a drought resistant crop. This village is situated in the northwest and east and shows high productivity i.e. 109.15 and 107.68 respectively. Highest productivity of Jowar is observed in Vadgaon Nimbalkar (149.27) in the south-west part of the study region. The productivity of Jowar is increasing south-west part due to plain topography, medium to deep black soil and irrigation.

Highest productivity of wheat is observed in Baramati Rural (120.48) in the south-east followed by Vadgaon Nimbalkar (108.18) in the south-west (Table-6.2). The lowest productivity is recorded in Loni Bhapkar (49.17) followed by Undavadi Supe (73.86) situated in the central and north respectively. The productivity of wheat is increasing towards south-west and south-eastern part due to plain topography, medium to deep black soil and irrigation. The central and northern parts have low productivity of wheat due to high relief, coarse shallow soil with low moisture retentive capacity and lack of irrigation facility. Moderate productivity (98.35) is observed in the southern part village, Malegaon Bk. due to the irrigation facility and also the availability of medium to deep black soil. The three revenue circles viz. Vadgaon Nimbalkar, Malegaon Bk. and Baramati Rural have found high productivity index.

Bajra, a drought resistant crop of kharif season, is grown on inferior quality soil having less commercial value. The lowest productivity is observed at Undavadi Supe which lies in northern part, Malegaon Bk. and Vadgaon Nimbalkar (83.82) in the south part of Baramati tahsil. The highest productivity of bajra is recorded at Baramati Rural (127.91) in the south-east part, followed by Supe (125.73) situated in the north-west respectively (Table 6.3 and Fig. 6.3). The general productivity pattern of bajra shows increasing trend towards north-west and eastern part of the tahsil. Sugarcane is a long duration crop grown in medium black and deep black soil with assured supply of irrigation. The highest productivity of sugarcane is in Baramati Rural (118.38) situated in the south-east part along with the bank of river Nira and Karha, followed by Vadgaon Nimbalkar (112.15) situated in the south part along the left Nira canal of the study region (Table 6.4 and Fig. 6.4). Lowest productivity of sugarcane is observed in the north-west

and northern part in Supe (56.07), Loni Bhapkar (49.84) and Undavadi Supe (62.30). Northern and north-west parts have extensive coverage of high relief, rugged and stony surface of these villages found inferior soil and less productivity of expansion of net sown area. The rugged topography, coarse shallow soil and unavailability of irrigation in the northern part makes less productivity of sugarcane.

The quantitative evaluation of agricultural and general landuse of Baramati tahsil shows the correlation co-efficient among agricultural landuse and environmental variables and identification of unique variance among selected variables. Nineteen landuse variables have been identified to show the correlation. The net sown area exhibits positive correlation with jowar, bajara, wheat, sugarcane, irrigated land and population density. The strong positive correlation of net sown area has found with jowar 0.74 and positive correlation of irrigated area 0.33, yield of wheat, yield of sugarcane. The net sown area shows a moderate correlation with fallow land (0.42) and moderate with area not available for cultivation (0.47). Net sown area exhibits area under jowar has moderate positive correlation with fodder crops (0.68), oilseeds (0.55), pulses (0.66), yield of bajra (0.21) showing jowar crop's proportionate increase with yield of bajra because jowar being a rabi crop followed by bajra as a kharif. Wheat crop has found a strong positive correlation with sugarcane (0.83), irrigated area (0.84), population density (0.73) and agricultural density (0.73). Area under wheat has moderate correlation with fruits (0.51), vegetables (0.45), yield of wheat (0.41), and yield of sugarcane (0.44). Wheat is mostly cultivated on medium to deep black soil. Hence negative correlation has exhibited with Bajra (-0.12) and area under pulses (-0.10). Sugarcane has also a strong positive correlation with total irrigation area (0.92), population density (0.74) and agricultural density (0.73) and moderate positive correlation with fruits (0.51) and vegetables (0.40). The negative correlation has established with yield of bajra (-0.04), oilseeds (-0.05) and moderate negative correlation with pulses (-0.35). Irrigated area has established strong positive correlation with area under agricultural density (0.71). The spatial distribution of population density is largely associated with agricultural density, total irrigated area, yield of wheat and yield of sugarcane. The strong positive correlation has established with agricultural density (1.00), yield of sugarcane (0.71) and total irrigated area (0.71). Moderate positive is observed correlation with yield of wheat (0.68), yield of Jowar (0.30



and yield of Bajara (0.13) in the study region. Agricultural density distribution exhibits positive correlation with yield of jowar, yield of wheat, yield of bajara and yield of sugarcane. Strong positive correlation is exhibited with the yield of sugarcane (0.71) and yield of wheat (0.68) of Baramati tahsil.

## **7.2 Problems and Strategy**

The geographical variations of the total area was divided into northern part and south part regions and these regions were studied to find out the problems and the solutions are suggested for better planning at the micro level. On the basis of physiography, soil types, irrigational facility, transport and population density the two regions have been identified as:

- 1) Northern part of the Baramati tahsil
- 2) Southern part of the Baramati tahsil

### **7.2.1 Northern part of the Baramati tahsil**

Northern part of the Baramati tahsil covers three revenue circles i.e. Supe, Undavadi Supe and Loni Bhapkar. This region occupied 57 villages having low density of population and it has maximum fallow land in the study region. The Northern region has rugged topography and it extends from west to east having the steep slope towards north. It has a coarse shallow soil having low moisture retentivity. Irrigation facilities are least and hence the productivity is also less.

#### **Problems**

- i) The coarse soil affects the yields which are observed as low.
- ii) Jowar and Bajara are the only food crops which dominate the area creating monoculture cropping in the study region.
- iii) The lack of irrigation has made the farmers depend on receiving rainfall.
- iv) The road network is very low and hence the development is restricted.
- v) Lack of market centers is another problem that restricts setting of agricultural product.

- vi) Shortage of drinking water is problem of this region as this region belongs to the scarcity region.

### **Strategy**

- i) In this scarcity zone, the watershed management works like minor irrigation schemes, percolation tanks, contour bunding etc. should be taken up.
- ii) Modern irrigation facilities like Drip system, Sprinkler system etc. should be installed. The Government should provide enough subsidy to the farmers in this region.
- iii) Agricultural water tanks should be constructed so as to facilitate new crop systems in this region.
- iv) Rain harvesting projects should be encouraged and implemented with the help of the Panchayat system and the schemes of the Government.
- v) Due to steep slopes and rugged topography the soils are getting eroded so the conservation of the soil should be carried out by planting trees along the slopes.
- vi) The maximum fallow land should be converted into social forestry region which could support agro-based allied industries like dairy, poultry, piggery, goat and sheep rearing, organic farming, etc. to help the region to develop economically.
- vii) Priority should be given to construct all weathered roads to increase easy access to the surrounding region.
- viii) New market centers should be established in the north part of the tahsil so that farmers may purchase the agricultural raw material like seeds, fertilizers, equipment etc. and which will also provide market facility to the agriculture commodity.
- ix) Agricultural Counselling Centres should be opened in these areas to facilitate scientific approach among farmers.

### **7.2.2 Southern part of Baramati tahsil**

Southern part of Baramati tahsil is mainly agrarian having 40 percent net sown area of the total geographical area. This region occupied three revenue circles viz.

Vadgaon Nimbalkar, Malegaon Bk. and Baramati Rural. This region occupied 61 villages having high density of population and plain topography with deep fertile soil and high agricultural productivity. This region is drained by Nira River and its tributaries. Nira River lies in the south part of Baramati tahsil. Nira and Karha rivers are non-perennial. The River Karha in Baramati tahsil demarcates the east boundary. The River Karha flows towards northwest to southeast and it joins Nira River in south-eastern part of Baramati tahsil. This area exhibits a rolling plain and its slope in south, northwest and southeast direction. The Southern part of Baramati tahsil has almost riverine plain topography with sugarcane region.

### **Problems**

- i) Though the region is fully irrigated, the over irrigation to the land resulted into the salination of soil.
- ii) The revenue circle of Malegaon Bk. observed that over irrigation and salinization affected the crop productivity badly.
- iii) The process of salination is increasing in a greater pace; however, the farmers are seen to be reluctant to take any measures.
- iv) This has resulted into another severe problem i.e. the drinking water is being polluted in this region.

### **Strategy**

- i) Salinity of soil could be solved by preparing deep trenches in the agricultural fields to save the fertility of soil and the water.
- ii) The rotation of crop will allow regaining soil fertility. This is mainly applicable for sugarcane belt in this zone. The sugarcane may be replaced by wheat.
- iii) The agriculture produce needs better road network for speedy movement of agricultural activity.
- iv) The proper use and management of water through irrigation can reduce the salination of soil.

- v) The existence of sugarcane cultivation has reduced the soil fertility. If this cropping pattern is slowly shifted from sugarcane to wheat, vegetables and fruit crops, it could help to regain the soil fertility.
- vi) The application of multiple cropping for short duration crops like, sunflower, safflower, pulses and vegetables will reduce the pressure on the soil.
- vii) To support the agriculture, the subsidiary activities like dairy and poultry can make the region prosperous one.
- viii) In the eastern part new market centres should be developed at M.I.D.C. in the east of Baramati tahsil on the basis of population criteria.

### **7.3 Suggestions**

- i) The process of soil salinization should be ceased through controlled irrigation. Saline agricultural fields should be drained by fresh water by cutting the deep trenches.
- ii) Moreover, to conserve and reclaim the clean and marshy soil, water loving plants like castor and eucalyptus should be planted in this region.
- iii) The cultivation of sugarcane crop should slowly be changed or replaced by vegetables and fruits as there is large scope for grapes, mango, and pomegranate in the study area.
- iv) In the northern and southern regions, there is acute need to construct the village roads to mobilize agricultural resources from rural villages to market places and urban settlements in the study area.
- v) Sub centers should be developed to link small villages for purchasing agricultural inputs like implements, seeds, fertilizers, insecticides and pesticides in the north and south regions for speedy development.
- vi) Agro-based activities like dairy, poultry and along with household activities should be introduced. This activity should be started in the south part of the study area which would help to provide jobs for youth of rural area.

- vii) Watershed management works namely, minor irrigation projects, contour bunding, nalla bunding, continuous contour trenches (C.C.T.) etc. should be introduced in northern region for conserving water and soil properly. This would help to increase ground water table.
- viii) The fallow land lying in the north should be utilized for planting trees under social forestry programmes.
- ix) Chilling milk plants should be installed in the interior parts of the north and south regions.
- x) Floriculture activity should be introduced in the study region due to increasing demand of flowers throughout the year to Baramati city and Pune metropolitan region.
- xi) The village roads should be constructed in north and south part in the study region for mobilizing agricultural products. Baramati is emerging as an industrial area as well. Therefore, grapes cultivation is the best option for sugarcane and it has certainly a great scope for providing raw material to the newly developing wine park industry at Baramati.

#### **7.4 Concluding Remark**

Baramati tahsil belongs to rain shadow region in Pune district where rainfall ranges between 400 to 500 mm. The study region has varied topography covering 60 percent area where land is fertile. The agricultural product of sugar is of prime importance in Baramati region where sugarcane is treated as a raw material ranking the first crop in the study region. The fertile soil and irrigation have added for higher production of sugarcane. This has resulted into cultivating sugarcane with highest acreages besides jowar and wheat. Due to the proximity to Pune, a metropolitan centre, the study region benefits in many folds and tries to improve the variety of seeds and production too. The region by its proximity to Pune improves agricultural practice and cultivates maximum area under crops. This has resulted into new planning strategy to improve and increase the yield from the land. Newly industries like Wine Park, Dairy products etc. would be proved as the additional dimension in the study region. The

farmer's innovative ideas and availability of capital for better landuse resulted into rational landuse. With considering one industry at the center may come out with typical landuse pattern in the study area. Such study may attract the attentions of planners, agriculturists, farmers and administrators to look into this sector by planning rationally for its proper development of agriculture and yield. Thus, there is ample scope for research, exploration, expansion and intensification.

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**Appendix- A**  
**1991 General Landuse**

Sr. No.	VILL_NAME	TOT_IRR	UN_IRR	CULT_WASTE	AREA_NA_CU	LAND_FORES
1	Vadhane	0.39	1.02	3.78	4.15	6.09
2	Dandwadi	0.50	1.49	2.41	0.82	5.17
3	Naroli	0.16	1.04	0.44	1.14	1.85
4	Kololi	0.16	1.56	0.52	0.71	0.31
5	Pansarewadi	0.16	2.06	0.50	0.20	0.00
6	Supe	0.32	0.54	1.50	0.54	6.94
7	Kutwalwadi	0.65	0.90	1.70	1.90	4.55
8	Bhondvewadi	0.40	1.45	0.68	0.19	0.00
9	Ambi Kh	0.22	0.97	0.81	0.66	0.49
10	Ambi Bk	0.98	0.62	0.44	0.58	0.00
11	Jogwadi	0.26	0.98	1.72	1.30	2.39
12	Morgaon	1.50	2.05	0.80	1.88	0.00
13	Chandgude Wadi	0.42	1.54	0.30	0.79	0.00
14	Kalkhairewadi	0.36	2.15	0.30	0.75	0.72
15	Sherechiwadi	0.14	0.30	0.24	0.13	0.00
16	Baburdi	0.68	1.15	0.74	1.42	1.05
17	Karhati	0.20	2.53	0.44	2.20	0.00
18	Deulgaon Rasal	0.31	2.27	0.81	1.23	0.00
19	Jalgaon Supe	0.22	2.04	2.16	1.22	0.45
20	Kharade Wadi	0.64	0.50	0.37	0.72	0.16
21	Shirsuphal	0.79	1.70	4.31	7.71	8.73
22	Sabalewadi	0.00	0.00	0.00	0.00	0.00
23	Parwadi	0.18	1.89	6.99	5.82	6.28
24	Nimbodi	0.49	1.37	2.24	2.10	0.00
25	Gadikhelwadi	0.00	0.00	0.00	0.00	0.00
26	Jaradwadi	0.76	0.90	0.80	1.36	1.21
27	Undavadisupe	0.25	1.05	0.59	0.31	1.42
28	Karkhel	0.34	1.23	0.67	2.32	0.31
29	Sonvadisupe	0.34	1.49	0.70	0.64	1.89
30	Undavadi Kade Pathar	0.33	1.38	0.15	0.62	4.47
31	Gojubavi	0.68	1.16	1.02	3.22	1.56
32	Katphal	0.76	2.41	1.08	0.64	0.27
33	Jainakwadi	0.38	0.84	1.66	0.63	0.02
34	Sawantwadi	0.16	0.79	0.44	0.40	0.47
35	Barhanpur	0.19	1.15	0.93	0.82	0.64
36	Nepat Valan	0.38	0.56	0.10	0.39	0.00
37	Medad	0.48	2.10	0.22	1.03	0.00
38	Tandulwadi	0.97	1.42	2.71	2.51	2.88
39	Murti	0.41	1.74	1.32	2.42	0.00
40	Tardoli	0.31	1.91	2.86	0.42	0.76
41	Loni Bhapkar	0.79	2.91	0.68	1.43	1.79
42	Sayambachiwadi	0.38	1.64	0.90	0.46	0.00
43	Malwadi	0.29	1.93	0.41	0.71	0.00
44	Jalgaon Kade Pathar	0.29	1.20	0.19	0.57	0.00

45	Anjangaon	0.58	1.65	0.65	0.52	0.23
46	Karhavagaj	0.78	1.81	1.27	0.94	0.68
47	Bhilarwadi	0.23	1.00	0.30	0.67	0.00
48	Dhakale	0.26	2.53	4.56	2.10	0.00
49	Mudhale	0.33	2.91	7.92	2.78	2.20
50	Palshiwadi	0.33	2.64	0.98	0.68	0.00
51	Moralwadi	0.15	1.27	0.33	0.17	0.00
52	Modhave	0.18	0.84	0.31	3.55	3.23
53	Umbarwadi	0.16	0.62	0.15	0.92	0.00
54	Chaudhar Wadi	0.29	0.72	0.00	0.00	3.50
55	Waki	0.48	0.96	0.22	0.87	0.00
56	Kanadwadi	0.13	0.58	0.44	0.84	0.86
57	Chopadaj	0.77	0.51	0.65	0.70	0.00
58	Vadgaon Nimbalkar	2.11	0.82	0.00	2.27	0.00
59	Korhale Bk	2.28	1.05	0.76	0.04	7.35
60	Thopatewadi	0.65	0.26	0.00	0.21	0.00
61	Malshikare Wadi	0.39	0.08	0.07	0.03	0.00
62	Hol	1.65	0.35	0.15	0.08	0.08
63	Sastewadi	0.59	0.44	0.49	0.24	1.28
64	Magarwadi	0.29	1.43	0.00	0.00	0.00
65	Deulwadi	0.28	0.58	0.00	0.00	4.78
66	Karanje	0.29	0.57	0.00	0.00	0.00
67	Khandobachiwadi	0.00	0.00	0.00	0.00	0.00
68	Gadadarwadi	0.00	0.00	0.00	0.00	0.00
69	Nimbut	2.65	0.70	0.49	0.19	0.00
70	Soratewadi	1.09	0.27	0.00	0.00	0.00
71	Karanjepul	0.41	0.43	0.00	0.00	0.00
72	Waghalwadi	0.95	0.15	1.36	0.28	0.00
73	Wanewadi	2.04	0.11	1.10	0.07	0.00
74	Murum	2.59	0.15	1.50	0.18	0.76
75	Sadobachiwadi	1.45	0.03	0.59	0.25	1.15
76	Korhale Kh	1.66	0.42	1.18	0.82	0.14
77	Sonkaswadi	0.35	0.75	2.67	0.70	2.31
78	Malegaon Kh.	1.16	0.83	0.81	0.42	0.00
79	Malegaon Bk	2.48	0.92	2.81	1.03	0.00
80	Pawnewadi	1.04	0.19	0.22	0.08	0.00
81	Yelewasti	1.18	0.03	0.46	0.19	0.00
82	Pandare	2.41	0.43	4.15	1.65	0.00
83	Dhumalwadi	1.19	0.21	0.46	0.36	0.00
84	Manappawasti	0.63	0.52	0.21	0.92	1.77
85	Kurnewadi	0.68	0.29	2.78	0.21	0.00
86	Sirshane	0.33	0.02	0.07	0.13	0.00
87	Pimpalewasti	0.28	0.08	0.13	0.19	0.25
88	Malwadi	0.62	0.01	0.15	0.17	0.00
89	Bajrangwadi	0.55	0.02	0.07	0.49	0.00
90	Late	1.01	0.00	0.00	0.44	0.58
91	Pandharwadi	0.56	0.02	0.06	0.21	0.00
92	Kambleshwar	1.80	0.06	0.10	0.60	0.43



93	Sangavi	3.16	0.00	0.15	0.51	0.00
94	Shirawali	2.56	0.00	0.00	0.89	0.00
95	Khandaj	3.87	0.03	0.03	0.43	0.33
96	Nirvagaj	3.37	0.45	1.72	0.75	0.00
97	Vanjarwadi	0.20	0.45	0.00	0.43	0.12
98	Sawal	0.28	2.24	0.00	0.53	1.28
99	Rui	0.13	0.44	0.00	0.54	0.00
100	Jalochi	0.56	1.41	0.00	0.84	0.00
101	Kanheri	1.31	0.81	0.00	1.38	1.71
102	Katewadi	1.74	0.64	0.00	1.31	0.95
103	Pimpali	0.93	0.50	0.00	0.70	1.13
104	Gunwadi	2.51	0.71	0.00	0.81	0.00
105	Baramati Rural	3.21	0.59	5.83	1.11	0.00
106	Malad (baramati)	1.77	0.51	0.00	0.43	0.00
107	Dorlewadi	1.99	0.24	0.00	0.73	0.00
108	Zaragadwadi	0.00	0.00	0.00	0.00	0.00
109	Dhekalwadi	0.00	0.00	0.00	0.00	0.00
110	Songaon	8.41	0.14	0.00	2.21	0.00
111	Mekhali	2.13	0.67	0.00	0.00	0.00
112	Ghadagewadi	0.99	0.04	0.00	0.17	0.00

**Appendix- B**  
**General Landuse-2001**

Sr. No.	VILL_NAME	AREA	TOT_IRR	UN_IRR	CULT_WASTE	AREA_NA_CU	LAND_FORES
1	Vadhane	1.48	0.67	1.38	4.09	1.63	5.97
2	Dandwadi	1.27	0.17	1.62	3.59	1.04	5.17
3	Naroli	0.77	0.22	1.22	1.38	0.36	1.86
4	Kololi	0.93	0.31	1.78	0.56	0.46	0.31
5	Pansarewadi	1.11	0.31	2.32	0.42	0.36	0.00
6	Supe	0.73	0.17	0.88	0.41	0.60	6.02
7	Kutwalwadi	1.08	0.77	1.08	1.99	1.07	3.06
8	Bhondvewadi	0.88	0.30	1.73	0.39	0.46	0.00
9	Ambi Kh	0.67	0.21	1.17	0.57	0.58	0.48
10	Ambi Bk	0.66	0.47	1.02	0.68	0.27	0.00
11	Jogwadi	0.87	0.60	0.98	2.11	0.36	2.38
12	Morgaon	1.67	1.41	2.24	0.96	1.69	0.00
13	Chandgude Wadi	0.42	0.18	0.73	0.14	0.41	0.00
14	Khadukhairewadi	0.56	0.22	0.96	0.31	0.32	0.00
15	Kalkhairewadi	1.29	0.29	2.61	0.78	0.71	0.00
16	Sherechiwadi	0.21	0.10	0.40	0.00	0.12	0.00
17	Baburdi	0.98	0.24	1.89	0.25	0.79	0.83
18	Karhati	1.58	0.51	2.55	2.48	1.62	0.00
19	Deulgaon Rasal	1.39	0.53	2.16	3.30	0.91	0.00
20	Jalgaon Supe	1.33	0.59	2.42	0.69	0.87	0.04
21	Kharade Wadi	0.52	0.49	0.50	0.71	0.77	0.14
22	Shirsuphal	2.44	1.07	2.40	7.80	4.04	1.80
23	Sabalewadi	1.49	0.50	1.80	2.60	1.67	5.93
24	Parwadi	2.21	1.56	2.28	0.53	3.16	8.79
25	Nimbodi	1.16	0.92	0.93	2.06	2.60	0.00
26	Gadikhelwadi	1.78	0.46	2.14	5.41	1.79	4.71
27	Jaradwadi	0.88	0.36	1.34	0.49	1.15	1.22
28	Undavadisupe	0.70	0.28	0.91	1.25	0.83	1.43
29	Karkhel	1.00	0.19	1.25	4.15	1.15	0.31
30	Sonvadisupe	1.00	0.24	1.61	2.26	0.41	1.90
31	Undavadi Kade Pathar	1.01	0.26	1.49	0.68	0.90	4.47
32	Gojubavi	1.22	0.40	2.16	0.33	1.16	1.57
33	Katphal	1.53	0.30	1.54	0.00	6.40	0.25
34	Jainakwadi	0.67	0.41	1.00	0.00	4.23	0.04
35	Sawantwadi	0.52	0.27	0.91	0.00	0.31	0.45
36	Barhanpur	0.78	0.41	0.92	1.35	1.38	0.06
37	Nepat Valan	0.43	0.46	0.57	0.19	0.23	0.00
38	Medad	1.30	1.63	0.99	1.52	1.81	0.00
39	Tandulwadi	1.48	0.40	1.61	2.05	3.62	2.89
40	Murti	1.67	0.00	0.00	0.00	0.00	0.00
41	Tardoli	1.24	0.17	2.43	0.00	1.50	0.76
42	Loni Bhapkar	1.96	0.31	3.61	2.87	0.94	1.01
43	Sayambachiwadi	1.02	0.15	2.07	1.12	0.42	0.00

44	Malwadi	1.13	0.18	2.31	0.98	0.64	0.00
45	Jalgaon Kade Pathar	0.78	0.35	1.50	0.01	0.54	0.00
46	Anjangaon	1.07	0.60	1.77	0.90	0.66	0.23
47	Karhavagaj	1.29	0.50	1.96	3.10	0.79	0.68
48	Bhilarwadi	0.61	0.37	1.12	0.00	0.25	0.00
49	Dhakale	1.26	0.30	2.54	0.18	0.96	0.00
50	Kamagalwadi (N.V.)	0.53	0.23	0.83	0.14	0.82	0.00
51	Mudhale	1.99	0.31	3.74	0.45	2.22	2.21
52	Jalakewadi Mudhale (N.V.)	0.31	0.22	0.52	0.00	0.23	0.00
53	Palshiwadi	0.86	0.15	1.32	2.51	0.76	0.00
54	Masalwadi (N.V.)	0.67	0.19	1.25	0.43	0.54	0.00
55	Moralwadi	0.35	0.25	0.47	0.49	0.29	0.00
56	Modhave	0.99	0.00	0.00	0.00	0.00	0.00
57	Umbarwadi	0.46	0.00	0.00	0.00	0.00	0.00
58	Chaudhar Wadi	0.56	0.56	0.52	0.00	0.09	3.39
59	Waki	0.71	1.12	0.57	0.18	0.66	0.00
60	Kanadwadi	0.47	0.81	0.17	0.14	0.64	0.87
61	Chopadaj	0.57	0.60	0.44	0.08	0.59	3.10
62	Vadgaon Nimbalkar	1.22	1.11	1.52	0.12	1.81	0.00
63	Korhale Bk	1.42	2.23	0.77	0.06	0.63	7.38
64	Thopatewadi	0.32	0.29	0.47	0.35	0.09	0.00
65	Malshikare Wadi	0.15	0.39	0.03	0.00	0.03	0.00
66	Hol	0.63	1.58	0.01	0.03	0.57	0.00
67	Sastewadi	0.47	0.81	0.20	0.00	0.48	1.32
68	Magarwadi	0.79	0.79	0.73	0.61	1.41	0.00
69	Deulwadi	0.53	0.31	0.61	0.10	0.00	4.80
70	Karanje	0.36	0.56	0.24	0.20	0.43	0.00
71	Khandobachiwadi	0.22	0.43	0.07	0.00	0.31	0.00
72	Gadadarwadi	0.58	0.93	0.41	0.32	0.55	0.00
73	Nimbut	1.10	2.25	0.27	0.12	1.60	0.00
74	Soratewadi	0.42	0.95	0.00	0.00	0.71	0.00
75	Karanjepul	0.32	0.51	0.23	0.01	0.37	0.00
76	Waghalwadi	0.43	0.60	0.20	0.03	0.88	0.74
77	Wanewadi	0.66	1.67	0.05	0.02	0.50	0.00
78	Murum	0.88	2.08	0.08	0.24	0.79	0.00
79	Sadobachiwadi	0.50	1.14	0.09	0.00	0.19	1.16
80	Korhale Kh	0.72	1.53	0.15	0.68	1.77	0.12
81	Sonkaswadi	0.75	0.39	0.99	2.05	0.03	2.29
82	Malegaon Kh.	0.81	1.40	0.47	1.02	0.50	0.00
83	Malegaon Bk	1.34	2.71	0.22	1.20	1.84	0.00
84	Pawnewadi	0.40	0.94	0.09	0.26	0.20	0.00
85	Yelewasti	0.39	0.94	0.04	0.19	0.22	0.00
86	Pandare	0.92	2.51	0.36	1.22	1.91	0.00
87	Pawaimal (N.V.)	0.42	1.21	0.00	0.16	0.05	0.00
88	Dhumalwadi	0.48	1.18	0.05	0.72	0.03	0.00
89	Manappawasti	0.60	1.09	0.00	1.23	0.58	1.78

90	Kurnewadi	0.47	1.22	0.00	0.51	0.08	0.00
91	Sirshane	0.12	0.29	0.00	0.00	0.16	0.00
92	Pimpalewasti	0.15	0.36	0.00	0.08	0.08	0.25
93	Malwadi	0.19	0.43	0.00	0.29	0.18	0.00
94	Bajrangwadi	0.21	0.54	0.01	0.28	0.06	0.00
95	Late	0.34	0.71	0.02	0.21	0.38	0.56
96	Pandharwadi	0.21	0.52	0.01	0.00	0.17	0.04
97	Kambleshwar	0.59	1.45	0.00	0.00	0.71	0.02
98	Sangavi	0.90	2.35	0.00	0.89	0.24	0.00
99	Shirawali	0.78	1.97	0.00	0.41	0.54	0.00
100	Khandaj	1.11	2.97	0.05	0.19	0.35	0.00
101	Nirvagaj	1.29	3.48	0.09	0.22	0.19	0.00
102	Vanjarwadi	0.33	0.54	0.20	0.00	0.41	0.12
103	Sawal	1.29	1.74	1.46	0.00	0.49	1.26
104	Rui	0.31	0.43	0.16	0.00	0.73	0.00
105	Jalochi	0.94	1.45	0.70	0.00	1.25	0.00
106	Kanheri	0.96	1.34	0.50	2.57	0.49	1.72
107	Katewadi	0.96	1.45	0.41	3.07	0.38	0.95
108	Pimpali	0.61	0.79	0.34	1.79	0.31	1.14
109	Gunwadi	1.11	2.41	0.04	0.00	2.05	0.00
110	Baramati Rural	1.56	2.72	0.57	1.27	2.38	0.00
111	Malad (baramati)	0.77	1.86	0.07	0.80	0.37	0.00
112	Dorlewadi	0.73	1.67	0.05	0.00	1.07	0.00
113	Zaragadwadi	0.84	1.46	0.01	3.71	0.58	0.00
114	Dhekalwadi	0.70	1.78	0.01	0.59	0.27	0.00
115	Songaon	1.02	2.32	0.13	0.00	1.31	0.00
116	Mekhali	0.90	2.20	0.18	0.04	0.43	0.00
117	Ghadagewadi	0.30	0.82	0.03	0.07	0.03	0.00

## Appendix-C Population Density

1991			2001		
Sr. No.	VILL_NAME	Total Pop. Density	Sr. No.	VILL_NAME	Total Pop. Density
	<b>Baramati Tahshil</b>	<b>226</b>		<b>Baramati Tahshil</b>	<b>270</b>
1	Vadhane	52	1	Vadhane	52
2	Dandwadi	88	2	Dandwadi	110
3	Naroli	88	3	Naroli	108
4	Kololi	63	4	Kololi	67
5	Pansarewadi	72	5	Pansarewadi	96
6	Supe	372	6	Supe	441
7	Kutwalwadi	114	7	Kutwalwadi	116
8	Bhondvewadi	108	8	Bhondvewadi	136
9	Ambi Kh	97	9	Ambi Kh	114
10	Ambi Bk	122	10	Ambi Bk	130
11	Jogwadi	88	11	Jogwadi	97
12	Morgaon	173	12	Morgaon	201
13	Chandgude Wadi	244	13	Chandgude Wadi	169
14	Kalkhairewadi	91	14	Khadukhairewadi (N.V.)	90
15	Sherechiwadi	314	15	Kalkhairewadi	87
16	Baburdi	108	16	Sherechiwadi	353
17	Karhati	128	17	Baburdi	131
18	Deulgaon Rasal	110	18	Karhati	149
19	Jalgaon Supe	130	19	Deulgaon Rasal	127
20	Kharade Wadi	139	20	Jalgaon Supe	142
21	Shirsuphal	119	21	Kharade Wadi	150
22	Sabalewadi	59	22	Shirsuphal	142
23	Parwadi	133	23	Sabalewadi	75
24	Nimbodi	99	24	Parwadi	162
25	Gadikhelwadi	31	25	Nimbodi	136
26	Jaradwadi	111	26	Gadikhelwadi	39
27	Undavadisupe	117	27	Jaradwadi	123
28	Karkhel	163	28	Undavadisupe	138
29	Sonvadisupe	81	29	Karkhel	175
30	Undavadi Kade		30	Sonvadisupe	98
31	Pathar	109	31	Undavadi Kade Pathar	140
32	Gojubavi	97	32	Gojubavi	113
33	Katphal	83	33	Katphal	104
34	Jainakwadi	94	34	Jainakwadi	126
35	Sawantwadi	78	35	Sawantwadi	83
35	Barhanpur	120			

36	Nepat Valan	28	36	Barhanpur	144
37	Medad	168	37	Nepat Valan	43
38	Tandulwadi	126	38	Medad	207
39	Murti	122	39	Tandulwadi	247
40	Tardoli	115	40	Murti	141
41	Loni Bhapkar	121	41	Tardoli	143
42	Sayambachiwadi	73	42	Loni Bhapkar	132
43	Malwadi	67	43	Sayambachiwadi	90
44	Jalgaon Kade Pathar	90	44	Malwadi	79
45	Anjangaon	103	45	Jalgaon Kade Pathar	108
46	Karhavagaj	129	46	Anjangaon	131
47	Bhilarwadi	105	47	Karhavagaj	149
48	Dhakale	85	48	Bhilarwadi	127
49	Mudhale	106	49	Dhakale	80
50	Palshiwadi	123	50	Kamagalwadi (N.V.)	145
51	Moralwadi	98	51	Mudhale	130
52	Modhave	102	52	Jalakewadi Mudhale	152
53	Umbarwadi	159	53	Palshiwadi	152
54	Chaudhar Wadi	80	54	Masalwadi (N.V.)	113
55	Waki	134	55	Moralwadi	215
56	Kanadwadi	49	56	Modhave	138
57	Chopadaj Vadgaon	241	57	Umbarwadi	112
58	Nimbalkar	427	58	Chaudhar Wadi	85
59	Korhale Bk	210	59	Waki	152
60	Thopatewadi	318	60	Kanadwadi	96
61	Malshikare Wadi	356	61	Chopadaj	279
62	Hol	322	62	Vadgaon Nimbalkar	432
63	Sastewadi	222	63	Korhale Bk	253
64	Magarwadi	60	64	Thopatewadi	421
65	Deulwadi	74	65	Malshikare Wadi	372
66	Karanje	264	66	Hol	360
67	Khandobachiwadi	418	67	Sastewadi	308
68	Gadadarwadi	104	68	Magarwadi	81
69	Nimbut	1176	69	Deulwadi	100
70	Soratewadi	240	70	Karanje	291
71	Karanjepul	488	71	Khandobachiwadi	482
72	Waghalwadi	960	72	Gadadarwadi	129
73	Wanewadi	536	73	Nimbut	374
74	Murum	370	74	Soratewadi	245
75	Sadobachiwadi	316	75	Karanjepul	598
76	Korhale Kh	184	76	Waghalwadi	990
77	Sonkaswadi	164	77	Wanewadi	608

78	Malegaon Kh.	141	78	Murum	418
79	Malegaon Bk	774	79	Sadobachiwadi	305
80	Pawnewadi	458	80	Korhale Kh	269
81	Yelewasti	501	81	Sonkaswadi	186
82	Pandare	411	82	Malegaon Kh.	189
83	Dhumalwadi	377	83	Malegaon Bk	1011
84	Manappawasti	375	84	Pawnewadi	534
85	Kurnewadi	203	85	Yelewasti	499
86	Sirshane	244	86	Pandare	543
87	Pimpalewasti	336	87	Pawaimal (N.V.)	292
88	Malwadi	393	88	Dhumalwadi	405
89	Bajrangwadi	327	89	Manappawasti	443
90	Late	224	90	Kurnewadi	227
91	Pandharwadi	215	91	Sirshane	277
92	Kambleshwar	412	92	Pimpalewasti	416
93	Sangavi	492	93	Malwadi	463
94	Shirawali	337	94	Bajrangwadi	356
95	Khandaj	346	95	Late	221
96	Nirvagaj	329	96	Pandharwadi	249
97	Vanjarwadi	125	97	Kambleshwar	431
98	Sawal	77	98	Sangavi	636
99	Rui	306	99	Shirawali	274
100	Jalochi	278	100	Khandaj	379
101	Kanheri	74	101	Nirvagaj	400
102	Katewadi	394	102	Vanjarwadi	300
103	Pimpali	345	103	Sawal	103
104	Gunwadi	383	104	Rui	746
105	Baramati Rural	371	105	Jalochi	589
106	Malad (baramati)	393	106	Kanheri	96
107	Dorlewadi	509	107	Katewadi	456
108	Zaragadwadi	405	108	Pimpali	433
109	Dhekalwadi	438	109	Gunwadi	477
110	Songaon	144	110	Baramati Rural	590
111	Mekhali	217	111	Malad (baramati)	450
112	Ghadagewadi	323	112	Dorlewadi	572
			113	Zaragadwadi	448
			114	Dhekalwadi	388
			115	Songaon	270
			116	Mekhali	263
			117	Ghadagewadi	382

**Appendix-D and E**  
**Occupational Structure 1991 & 2001 and Volume of Change**  
**Cultivators (percentage)**

Sr. No.	VILL_NAME	1991	2001	volume of change
1	Vadhane	80	79	-1
2	Dandwadi	63	78	15
3	Naroli	70	70	0
4	Kololi	58	70	12
5	Pansarewadi	39	86	47
6	Supe	18	23	5
7	Kutwalwadi	77	88	11
8	Bhondvewadi	57	72	15
9	AmbiKh	40	53	13
10	AmbiBk	77	72	-5
11	Jogwadi	78	64	-14
12	Morgaon	49	56	7
13	ChandgudeWadi	67	90	23
14	Khadukhairewadi (N.V.)	0	77	77
15	Kalkhairewadi	86	80	-6
16	Sherechiwadi	77	73	-4
17	Baburdi	55	61	6
18	Karhati	53	43	-10
19	DeulgaonRasal	70	81	11
20	JalgaonSupe	59	63	4
21	KharadeWadi	58	71	13
22	Shirsuphal	50	62	12
23	Sabalewadi	60	81	21
24	Parwadi	55	72	17
25	Nimbodi	39	48	9
26	Gadikhelwadi	63	90	27
27	Jaradwadi	88	90	2
28	Undavadisupe	58	70	12
29	Karkhel	71	64	-7
30	Sonvadisupe	81	78	-3
31	UndavadiKadePathar	50	56	6
32	Gojubavi	36	49	13
33	Katphal	45	42	-3
34	Jainakwadi	28	53	25
35	Sawantwadi	59	47	-12
36	Barhanpur	52	51	-1



37	NepatValan	39	35	-4
38	Medad	37	47	10
39	Tandulwadi	12	14	2
40	Murti	48	46	-2
41	Tardoli	86	74	-12
42	LoniBhapkar	55	60	5
43	Sayambachiwadi	55	75	20
44	Malwadi	65	62	-3
45	JalgaonKadePathar	48	52	4
46	Anjangaon	62	61	-1
47	Karhavagaj	53	60	7
48	Bhilarwadi	74	74	0
49	Dhakale	56	59	3
50	Kamagalwadi (N.V.)	0	59	59
51	Mudhale	52	46	-6
52	JalakewadiMudhale	0	65	65
53	Palshiwadi	71	65	-6
54	Masalwadi (N.V.)	0	84	84
55	Moralwadi	76	72	-4
56	Modhave	36	62	26
57	Umbarwadi	73	60	-13
58	ChaudharWadi	84	70	-14
59	Waki	57	61	4
60	Kanadwadi	59	76	17
61	Chopadaj	58	66	8
62	VadgaonNimbalkar	20	26	6
63	KorhaleBk	35	31	-4
64	Thopatewadi	46	50	4
65	MalshikareWadi	38	40	2
66	Hol	51	31	-20
67	Sastewadi	49	42	-7
68	Magarwadi	79	62	-17
69	Deulwadi	70	66	-4
70	Karanje	16	23	7
71	Khandobachiwadi	59	67	8
72	Gadarwadi	63	59	-4
73	Nimbut	28	27	-1
74	Soratewadi	48	48	0
75	Karanjepul	35	39	4
76	Waghalwadi	15	16	1
77	Wanewadi	28	33	5

78	Murum	42	36	-6
79	Sadobachiwadi	38	51	13
80	KorhaleKh	54	51	-3
81	Sonkaswadi	44	55	11
82	Malegaon Kh.	25	35	10
83	Malegaon Bk	15	11	-4
84	Pawnewadi	23	29	6
85	Yelewasti	27	29	2
86	Pandare	24	25	1
87	Pawaimal (N.V.)	0	25	25
88	Dhumalwadi	32	58	26
89	Manappawasti	38	40	2
90	Kurnewadi	36	48	12
91	Sirshane	21	18	-3
92	Pimpalewasti	41	46	5
93	Malwadi	32	40	8
94	Bajrangwadi	52	54	2
95	Late	20	43	23
96	Pandharwadi	57	59	2
97	Kambleshwar	27	35	8
98	Sangavi	38	33	-5
99	Shirawali	38	42	4
100	Khandaj	40	39	-1
101	Nirvagaj	44	49	5
102	Vanjarwadi	38	49	11
103	Sawal	70	68	-2
104	Rui	28	14	-14
105	Jalochi	30	13	-17
106	Kanheri	33	45	12
107	Katewadi	39	40	1
108	Pimpali	31	35	4
109	Gunwadi	29	29	0
110	Baramati Rural	16	10	-6
111	Malad (baramati)	15	21	6
112	Dorlewadi	28	26	-2
113	Zaragadwadi	35	37	2
114	Dhekalwadi	50	41	-9
115	Songaon	30	45	15
116	Mekhali	57	65	8
117	Ghadagewadi	59	51	-8

## Agricultural Labours

Sr. No.	VILL_NAME	1991	2001	volume of change
1	Vadhane	9	7	-2
2	Dandwadi	27	13	-14
3	Naroli	21	22	1
4	Kololi	18	20	2
5	Pansarewadi	5	6	1
6	Supe	25	20	-5
7	Kutwalwadi	17	8	-9
8	Bhondviewadi	35	18	-17
9	Ambi Kh	50	29	-21
10	Ambi Bk	8	13	5
11	Jogwadi	10	21	11
12	Morgaon	20	13	-7
13	Chandgude Wadi	17	2	-15
14	Khadukhairewadi (N.V.)	0	11	11
15	Kalkhairewadi	4	13	9
16	Sherechiwadi	0	10	10
17	Baburdi	35	26	-9
18	Karhati	26	34	8
19	Deulgaon Rasal	18	11	-7
20	Jalgaon Supe	29	26	-3
21	Kharade Wadi	27	18	-9
22	Shirsuphal	41	20	-21
23	Sabalewadi	34	10	-24
24	Parwadi	34	22	-12
25	Nimbodi	39	28	-11
26	Gadikhelwadi	33	5	-28
27	Jaradwadi	5	5	0
28	Undavadisupe	29	16	-13
29	Karkhel	18	23	5
30	Sonvadisupe	8	10	2
31	Undavadi Kade Pathar	21	17	-4
32	Gojubavi	33	23	-10
33	Katphal	31	28	-3
34	Jainakwadi	30	10	-20
35	Sawantwadi	10	15	5
36	Barhanpur	31	31	0
37	Nepat Valan	28	28	0

38	Medad	34	30	-4
39	Tandulwadi	34	21	-13
40	Murti	28	26	-2
41	Tardoli	0	14	14
42	Loni Bhapkar	30	21	-9
43	Sayambachiwadi	28	11	-17
44	Malwadi	26	30	4
45	Jalgaon Kade Pathar	28	23	-5
46	Anjangaon	24	22	-2
47	Karhavagaj	31	32	1
48	Bhilarwadi	14	16	2
49	Dhakale	32	16	-16
50	Kamagalwadi (N.V.)	0	20	20
51	Mudhale	32	36	4
52	Jalakewadi Mudhale (N.V.)	0	30	30
53	Palshiwadi	15	24	9
54	Masalwadi (N.V.)	0	12	12
55	Moralwadi	16	16	0
56	Modhave	15	7	-8
57	Umbarwadi	6	14	8
58	Chaudhar Wadi	8	18	10
59	Waki	22	20	-2
60	Kanadwadi	19	9	-10
61	Chopadaj	33	23	-10
62	Vadgaon Nimbalkar	46	44	-2
63	Korhale Bk	45	48	3
64	Thopatewadi	42	41	-1
65	Malshikare Wadi	50	46	-4
66	Hol	37	48	11
67	Sastewadi	35	43	8
68	Magarwadi	13	22	9
69	Deulwadi	20	10	-10
70	Karanje	73	60	-13
71	Khandobachiwadi	23	15	-8
72	Gadadarwadi	16	22	6
73	Nimbut	40	48	8
74	Soratewadi	38	27	-11
75	Karanjepul	39	16	-23
76	Waghalwadi	31	22	-9
77	Wanewadi	52	38	-14
78	Murum	40	48	8

79	Sadobachiwadi	45	29	-16
80	Korhale Kh	38	41	3
81	Sonkaswadi	41	26	-15
82	Malegaon Kh.	62	51	-11
83	Malegaon Bk	44	44	0
84	Pawnewadi	49	38	-11
85	Yelewasti	54	47	-7
86	Pandare	51	44	-7
87	Pawaimal (N.V.)	0	53	53
88	Dhumalwadi	48	25	-23
89	Manappawasti	49	46	-3
90	Kurnewadi	53	42	-11
91	Sirshane	67	59	-8
92	Pimpalewasti	35	22	-13
93	Malwadi	56	54	-2
94	Bajrangwadi	26	17	-9
95	Late	56	20	-36
96	Pandharwadi	29	26	-3
97	Kambleshwar	48	49	1
98	Sangavi	34	35	1
99	Shirawali	41	41	0
100	Khandaj	44	37	-7
101	Nirvagaj	38	31	-7
102	Vanjarwadi	9	13	4
103	Sawal	18	22	4
104	Rui	29	10	-19
105	Jalochi	29	6	-23
106	Kanheri	51	34	-17
107	Katewadi	43	41	-2
108	Pimpali	49	42	-7
109	Gunwadi	53	50	-3
110	Baramati Rural	44	23	-21
111	Malad (baramati)	61	47	-14
112	Dorlewadi	46	35	-11
113	Zaragadwadi	43	47	4
114	Dhekalwadi	36	34	-2
115	Songaon	54	38	-16
116	Mekhali	32	26	-6
117	Ghadagewadi	30	34	4

## Other workers

Sr. No.	VILL_NAME	1991	2001	volume of change
1	Vadhane	12	14	2
2	Dandwadi	7	9	2
3	Naroli	9	7	-2
4	Kololi	12	9	-3
5	Pansarewadi	7	8	1
6	Supe	44	55	11
7	Kutwalwadi	3	4	1
8	Bhondvewadi	8	9	1
9	Ambi Kh	10	14	4
10	Ambi Bk	13	14	1
11	Jogwadi	12	15	3
12	Morgaon	30	30	0
13	Chandgude Wadi	3	7	4
14	Khadukhairewadi (N.V.)	0	12	12
15	Kalkhairewadi	8	5	-3
16	Sherechiwadi	14	16	2
17	Baburdi	9	11	2
18	Karhati	20	20	0
19	Deulgaon Rasal	9	7	-2
20	Jalgaon Supe	12	10	-2
21	Kharade Wadi	10	11	1
22	Shirsuphal	10	15	5
23	Sabalewadi	6	7	1
24	Parwadi	7	6	-1
25	Nimbodi	24	21	-3
26	Gadikhelwadi	4	4	0
27	Jaradwadi	5	5	0
28	Undavadisupe	13	13	0
29	Karkhel	10	13	3
30	Sonvadisupe	11	11	0
31	Undavadi Kade Pathar	28	26	-2
32	Gojubavi	31	28	-3
33	Katphal	24	28	4
34	Jainakwadi	42	37	-5
35	Sawantwadi	32	37	5
36	Barhanpur	17	18	1
37	Nepat Valan	32	36	4
38	Medad	21	20	-1

39	Tandulwadi	54	63	9
40	Murti	24	27	3
41	Tardoli	14	12	-2
42	Loni Bhapkar	12	16	4
43	Sayambachiwadi	13	12	-1
44	Malwadi	7	8	1
45	Jalgaon Kade Pathar	24	24	0
46	Anjangaon	13	14	1
47	Karhavagaj	7	5	-2
48	Bhilarwadi	12	9	-3
49	Dhakale	8	24	16
50	Kamagalwadi (N.V.)	0	21	21
51	Mudhale	16	18	2
52	Jalakewadi Mudhale (N.V.)	0	5	5
53	Palshiwadi	6	11	5
54	Masalwadi (N.V.)	0	4	4
55	Moralwadi	6	10	4
56	Modhave	29	30	1
57	Umbarwadi	21	26	5
58	Chaudhar Wadi	4	10	6
59	Waki	17	18	1
60	Kanadwadi	22	13	-9
61	Chopadaj	10	11	1
62	Vadgaon Nimbalkar	16	23	7
63	Korhale Bk	19	19	0
64	Thopatewadi	9	7	-2
65	Malshikare Wadi	12	11	-1
66	Hol	12	18	6
67	Sastewadi	9	14	5
68	Magarwadi	9	16	7
69	Deulwadi	7	12	5
70	Karanje	11	14	3
71	Khandobachiwadi	15	17	2
72	Gadadarwadi	19	18	-1
73	Nimbut	15	22	7
74	Soratewadi	12	24	12
75	Karanjepul	26	38	12
76	Waghalwadi	39	59	20
77	Wanewadi	20	27	7
78	Murum	12	15	3
79	Sadobachiwadi	10	13	3

80	Korhale Kh	8	8	0
81	Sonkaswadi	15	19	4
82	Malegaon Kh.	13	11	-2
83	Malegaon Bk	30	42	12
84	Pawnewadi	28	30	2
85	Yelewasti	18	20	2
86	Pandare	20	27	7
87	Pawaimal (N.V.)	0	14	14
88	Dhumalwadi	20	16	-4
89	Manappawasti	9	11	2
90	Kurnewadi	10	10	0
91	Sirshane	13	19	6
92	Pimpalewasti	23	28	5
93	Malwadi	5	6	1
94	Bajrangwadi	22	28	6
95	Late	23	32	9
96	Pandharwadi	10	14	4
97	Kambleshwar	12	16	4
98	Sangavi	28	29	1
99	Shirawali	11	17	6
100	Khandaj	17	22	5
101	Nirvagaj	14	19	5
102	Vanjarwadi	40	36	-4
103	Sawal	12	10	-2
104	Rui	43	73	30
105	Jalochi	41	80	39
106	Kanheri	12	15	3
107	Katewadi	9	16	7
108	Pimpali	20	23	3
109	Gunwadi	18	19	1
110	Baramati Rural	39	64	25
111	Malad (baramati)	21	28	7
112	Dorlewadi	26	31	5
113	Zaragadwadi	9	12	3
114	Dhekalwadi	14	24	10
115	Songaon	15	10	-5
116	Mekhali	6	9	3
117	Ghadagewadi	9	15	6



## Appendix-F Agriculture Cropping Pattern-1991

Code No.	Name of the Villages	NSA	Jawar	Wheat	Bajara	Sugarcane	Corn	Oilseeds	Pulses	Fruits
1	Vadhane	804	43.53	12.44	37.31	12.44	18.66	2.49	0.25	0.25
2	Dandwadi	1108	27.08	3.61	31.59	1.81	18.05	1.81	1.81	0.18
3	Naroli	750	33.33	10.67	26.67	2.67	13.33	4.00	6.67	0.67
4	Kololi	1000	57.00	4.20	45.00	1.50	5.70	0.70	2.20	1.70
5	Pansarewadi	1200	52.50	8.33	33.33	4.17	16.67	1.67	1.67	1.33
6	Supe	405	37.04	12.35	49.38	7.41	24.69	4.94	3.70	1.23
7	Kutwalwadi	809	24.72	12.36	30.90	18.54	12.36	7.42	9.89	2.47
8	Bhondvewadi	800	43.75	10.00	37.50	7.50	25.00	7.50	6.25	0.25
9	Ambi Kh	700	30.00	8.57	28.57	5.71	21.43	5.71	4.29	1.43
10	Ambi Bk	700	34.29	14.29	28.57	17.86	7.14	2.86	5.71	1.43
11	Jogwadi	750	28.00	13.33	26.67	20.00	13.33	5.33	4.00	0.80
12	Morgaon	1600	50.63	7.50	26.56	5.00	0.94	0.63	1.56	0.31
13	Chandgude Wadi	404	37.13	9.90	37.13	11.88	19.80	4.95	1.98	0.25
14	Kalkhairewadi	1400	38.57	7.14	34.29	2.86	14.29	5.71	7.14	0.71
15	Sherechiwadi	208	38.46	14.42	28.85	9.62	28.85	4.81	4.81	0.96
16	Baburdi	900	44.44	6.67	45.56	5.56	16.67	3.33	5.56	0.22
17	Karhati	1708	32.79	5.85	23.42	5.85	14.64	4.68	4.68	0.59
18	Deulgaon Rasal	1300	61.54	15.38	15.38	3.85	7.69	3.85	1.54	2.31
19	Jalgaon Supe	1200	40.83	11.67	32.92	8.33	23.33	6.67	7.50	1.67
20	Kharade Wadi	506	21.74	15.81	17.79	13.83	16.80	7.91	7.91	1.98
21	Shirsuphal	1400	42.86	14.29	28.57	20.00	20.00	1.43	2.86	1.43
22	Sabalewadi	1200	34.2	8.3	29.2	11.7	16.7	0.8	1.7	1.1
23	Parwadi	1300	41.5	19.2	36.9	26.9	15.4	6.2	6.2	1.5
24	Nimbodi	1000	35.0	10.5	21.5	17.5	10.0	4.0	6.0	1.0
25	Gadikhelwadi	1308	26.4	16.1	22.7	1.1	1.8	3.5	1.1	0.9
26	Jaradwadi	850	35.3	24.9	34.9	1.8	2.8	5.4	1.8	1.4

27	Undavadisupe	700	25.0	12.9	24.3	5.7	14.3	3.6	4.3	1.1
28	Karkhel	900	26.7	6.7	23.3	2.2	16.7	4.4	6.7	0.6
29	Sonvadisupe	1049	36.2	5.7	24.8	1.9	14.3	5.7	6.7	1.0
30	Undavadi Kade Pathar	1000	40.0	4.0	30.0	2.0	10.0	2.0	6.0	1.4
31	Gojubavi	1000	60.0	8.0	37.5	4.0	13.0	6.0	10.0	1.0
32	Katphal	1500	20.33	5.33	18.33	2.67	13.33	2.67	3.33	0.60
33	Jainakwadi	614	32.57	16.29	28.50	8.14	16.29	6.51	10.10	0.81
34	Sawantwadi	550	36.36	16.36	25.45	0.91	18.18	3.64	13.64	1.45
35	Barhanpur	800	37.50	11.25	18.75	8.75	8.75	0.63	1.88	1.25
36	Nepat Valan	450	26.67	31.11	16.67	13.33	15.56	4.44	10.00	1.56
37	Medad	1216	20.56	32.89	24.67	12.34	8.22	1.64	6.58	0.82
38	Tandulwadi	1200	31.25	10.83	29.17	5.00	8.33	1.67	3.33	0.92
39	Murti	1345	37.92	7.43	31.23	3.72	11.15	2.97	5.20	0.37
40	Tardoli	1325	45.28	4.53	31.32	1.51	15.09	4.53	5.28	0.75
41	Loni Bhapkar	2000	37.50	6.00	33.75	2.00	17.50	4.00	5.00	1.00
42	Sayambachiwadi	1000	30.00	7.00	45.00	3.00	20.00	6.00	8.00	2.00
43	Malwadi	1250	38.00	4.80	33.60	3.20	14.80	5.60	7.20	0.80
44	Jalgaon Kade Pathar	830	37.35	12.05	33.13	4.82	18.07	4.82	9.64	0.60
45	Anjangaon	1042	38.39	9.60	33.59	3.84	19.19	6.72	7.68	1.63
46	Karhavagaj	1200	31.25	11.67	31.67	6.25	20.83	3.33	5.00	0.50
47	Bhilarwadi	653	32.16	15.31	26.80	10.72	22.97	4.59	9.19	0.77
48	Dhakale	1800	26.67	8.33	21.67	1.11	16.67	4.44	5.56	0.56
49	Mudhale	2000	39.00	4.00	28.75	1.00	19.00	8.75	9.00	1.00
50	Palshiwadi	1600	13.13	2.50	16.25	0.63	9.38	2.50	4.69	0.94
51	Moralwadi	826	10.90	9.69	7.26	4.84	6.05	1.82	3.63	1.82
52	Modhave	642	46.73	12.46	23.36	3.12	9.35	1.56	3.12	0.31
53	Umbarwadi	400	33.75	10.00	30.00	7.50	21.25	6.25	7.50	0.50
54	Chaudhar Wadi	500	29.00	16.00	26.00	21.00	17.00	1.00	0.40	1.60
55	Waki	800	15.63	26.25	15.00	28.13	12.50	2.50	3.75	1.25

56	Kanadwadi	400	15.00	30.00	10.00	46.25	11.25	2.50	1.25	2.50
57	Chopadaj	600	16.67	20.00	18.33	24.50	5.00	0.83	1.17	0.83
58	Vadgaon Nimbalkar	1338	25.04	14.95	22.42	16.82	11.96	4.48	1.49	1.12
59	Korhale Bk	1555	15.43	25.72	11.58	28.30	12.86	0.64	0.26	0.96
60	Thopatewadi	350	31.43	17.14	17.14	22.86	11.43	5.71	2.86	1.43
61	Malshikare Wadi	159	12.58	31.45	6.29	37.74	25.16	6.29	6.29	1.89
62	Hol	600	8.33	40.00	3.33	50.00	16.67	3.33	3.33	1.67
63	Sastewadi	500	12.00	22.00	10.00	40.00	8.00	4.00	2.00	1.00
64	Magarwadi	900	23.33	12.22	16.67	20.00	10.00	2.22	1.11	0.56
65	Deulwadi	501	29.94	11.98	31.94	15.97	3.99	1.00	1.00	1.00
66	Karanje	350	31.43	17.14	22.86	28.57	5.71	1.43	2.86	1.71
67	Khandobachiwadi	200	40.00	10.00	30.00	20.00	10.00	5.00	5.00	1.00
68	Gadadarwadi	673	26.75	17.83	22.29	11.89	11.89	5.94	2.97	0.45
69	Nimbut	305	95.08	49.18	65.57	108.20	49.18	13.11	13.11	3.28
70	Soratewadi	500	32.00	8.00	12.00	24.00	8.00	3.00	3.00	1.20
71	Karanjepul	200	40.00	20.00	30.00	40.00	25.00	12.50	10.00	5.00
72	Waghalwadi	400	25.00	19.50	12.00	25.00	10.00	2.50	2.50	2.50
73	Wanewadi	800	17.50	20.00	5.00	45.00	10.00	2.50	1.25	1.25
74	Murum	1000	18.00	25.00	10.00	36.00	12.00	1.00	1.00	1.00
75	Sadobachiwadi	500	28.00	20.00	12.00	40.00	16.00	2.00	1.00	1.00
76	Korhale Kh	800	25.00	14.25	12.50	37.50	5.00	2.50	2.50	1.25
77	Sonkaswadi	644	54.35	9.32	31.06	6.21	12.42	0.31	0.31	0.31
78	Malegaon Kh.	943	31.81	15.91	10.60	2.12	7.95	2.12	4.24	0.00
79	Malegaon Bk	1540	25.97	22.73	3.25	19.48	9.74	3.90	1.30	0.65
80	Pawnewadi	500	20.00	14.00	4.00	40.00	4.00	0.00	0.00	1.00
81	Yelewasti	452	16.59	22.12	4.42	44.25	13.27	1.11	0.88	0.44
82	Pandare	1379	7.25	14.50	3.63	32.63	10.88	2.90	3.63	0.73
83	Dhumalwadi	500	15.00	12.00	4.00	40.00	24.00	2.00	1.00	1.00
84	Manappawasti	500	20.00	16.00	10.00	40.00	24.00	4.00	2.00	1.00
85	Kurnewadi	400	18.75	15.00	25.00	50.00	10.00	1.25	1.25	0.50

86	Sirshane	100	50.00	10.00	20.00	10.00	40.00	5.00	2.00	0.00
87	Pimpalewasti	100	40.00	20.00	40.00	40.00	30.00	1.00	1.00	1.00
88	Malwadi	200	30.00	5.00	10.00	20.00	25.00	5.00	10.00	0.00
89	Bajrangwadi	166	48.19	24.10	30.12	24.10	12.05	6.02	12.05	1.81
90	Late	300	40.00	13.33	3.33	13.33	16.67	3.33	2.67	0.67
91	Pandharwadi	224	8.93	17.86	17.86	22.32	31.25	1.79	3.57	0.89
92	Kambleshwar	600	6.67	10.00	3.33	10.00	3.33	1.67	0.67	0.33
93	Sangavi	1000	10.00	20.00	10.00	40.00	20.00	2.00	1.00	6.00
94	Shirawali	900	18.89	11.11	14.44	33.33	11.11	4.44	4.44	1.11
95	Khandaj	1345	3.72	22.30	14.87	29.74	11.15	4.46	2.97	1.49
96	Nirvagaj	1445	8.30	20.76	10.38	48.44	5.54	2.77	1.38	0.14
97	Vanjarwadi	300	40.00	13.33	16.67	3.33	16.67	13.33	3.33	0.00
98	Sawal	1441	27.76	13.88	24.29	3.47	10.41	4.86	5.55	0.14
99	Rui	300	46.67	20.00	6.67	3.33	13.33	3.33	3.33	0.00
100	Jalochi	1000	30.00	21.00	25.00	5.00	20.00	8.00	6.00	1.00
101	Kanheri	1000	30.00	10.00	20.00	10.00	8.00	6.00	8.00	0.80
102	Katewadi	1000	30.00	10.00	20.00	10.00	6.00	4.00	5.00	0.20
103	Pimpali	400	50.00	25.00	5.00	12.50	25.00	10.00	5.00	1.25
104	Gunwadi	1109	27.05	18.03	22.54	18.03	9.02	5.41	3.61	0.90
105	Baramati Rural	1585	22.08	6.31	12.62	9.46	12.62	5.05	3.79	0.63
106	Malad (baramati)	901	22.20	11.10	5.55	22.20	6.66	7.77	8.88	2.22
107	Dorlewadi	800	25.00	12.50	6.25	12.50	18.75	10.00	5.00	1.25
108	Zaragadwadi	901	33.30	11.10	5.55	22.20	6.66	0.22	0.44	0.55
109	Dhekalwadi	800	25.00	15.00	12.50	25.00	6.25	5.00	7.50	1.25
110	Songaon	1200	25.00	12.50	8.33	16.67	8.33	6.67	1.67	0.83
111	Mekhali	1100	18.18	18.18	9.09	22.73	13.64	4.55	1.82	0.91
112	Ghadagewadi	392	25.51	20.41	20.41	25.51	12.76	5.10	5.10	2.55

### Appendix-G Agricultural Pattern (2001)

Code No.	Name of the Villages	Jawar	Wheat	Bajara	Sugarcane	Corn	Oilseeds	Pulses	Fruits	vegetables
1	Vadhane	40.00	20.00	30.00	10.00	6.00	1.00	1.00	1.00	2.00
2	Dandwadi	27.78	5.56	22.22	4.44	27.78	5.56	6.67	1.11	2.22
3	Naroli	28.57	8.57	35.71	5.71	14.29	2.86	11.43	1.43	3.57
4	Kololi	50.00	6.00	35.00	5.00	10.00	4.00	2.00	2.00	1.00
5	Pansarewadi	38.92	5.61	26.20	5.24	18.71	4.49	3.74	1.50	1.50
6	Supe	22.77	7.01	26.27	7.01	26.27	1.75	7.01	1.75	0.88
7	Kutwalwadi	25.83	12.40	24.79	10.33	12.40	5.17	5.17	3.10	0.83
8	Bhondwewadi	40.00	6.00	35.00	8.00	15.00	3.00	3.00	0.80	0.20
9	Ambi Kh	34.81	8.03	20.08	6.69	14.32	6.69	8.03	1.34	0.67
10	Ambi Bk	30.00	16.43	25.00	20.00	14.29	1.43	4.29	2.14	0.29
11	Jogwadi	28.71	13.16	20.93	19.14	8.37	3.59	4.78	1.44	0.24
12	Morgaon	47.32	6.50	17.42	0.78	5.72	0.62	1.20	0.36	0.26
13	Chandgude Wadi	27.50	12.50	30.00	10.00	17.50	10.00	10.00	2.50	2.50
14	Khadukhairewadi	33.33	8.33	33.33	8.33	8.33	6.67	5.83	0.67	0.00
15	Kalkhairewadi	40.67	5.33	26.67	4.67	20.00	2.67	4.00	1.33	0.13
16	Sherechiwadi	28.00	8.00	36.00	12.00	20.00	3.20	3.20	0.80	0.40
17	Baburdi	34.09	5.45	35.45	5.45	12.73	3.64	5.45	1.82	0.45
18	Karhati	37.50	7.50	34.38	7.50	10.94	3.75	1.56	0.75	0.31
19	Deulgaon Rasal	41.29	8.60	27.53	9.64	10.32	1.03	1.38	0.69	0.14
20	Jalgaon Supe	33.91	8.01	25.28	9.25	9.25	5.55	6.78	1.85	0.31
21	Kharade Wadi	17.54	19.49	21.44	19.49	11.70	2.92	1.95	3.90	1.95
22	Shirsuphal	29.54	12.20	24.39	14.91	13.55	1.63	3.25	0.54	0.27
23	Sabalewadi	32.18	8.85	24.14	10.46	14.08	3.22	3.22	1.61	0.80
24	Parwadi	29.78	13.65	22.33	18.36	9.93	1.99	2.48	0.99	0.50
25	Nimbodi	28.83	18.34	27.25	10.48	10.48	1.05	3.14	0.52	0.52
26	Gadikhelwadi	39.06	0.00	22.73	0.00	12.43	0.00	0.00	0.00	0.00
27	Jaradwadi	29.92	19.04	28.29	2.72	10.88	3.26	4.35	1.63	0.00
28	Undavadisupe	31.67	11.67	21.67	6.67	13.33	6.67	13.33	1.67	0.83

29	Karkhel	25.58	6.39	22.38	3.84	23.02	5.12	10.23	2.56	0.90
30	Sonvadisupe	37.78	8.89	30.56	4.44	13.33	5.56	8.89	1.11	1.11
31	Undavadi Kade Pathar	36.69	5.24	28.83	4.19	12.58	4.19	6.29	1.05	1.05
32	Gojubavi	44.61	7.76	34.91	4.65	11.64	0.78	2.33	0.54	0.54
33	Katphal	37.54	9.01	25.03	5.01	17.52	2.00	2.00	1.00	0.80
34	Jainakwadi	30.00	15.71	27.14	10.00	20.00	2.86	1.43	0.71	0.29
35	Sawantwadi	37.50	15.63	23.44	5.00	11.72	1.56	4.69	0.78	0.78
36	Barhanpur	33.76	12.66	25.32	12.66	12.66	1.41	1.41	0.28	0.28
37	Nepat Valan	32.04	34.32	18.31	11.44	13.73	4.58	6.86	1.14	1.14
38	Medad	22.51	28.13	20.26	13.50	11.25	1.88	0.75	1.50	0.38
39	Tandulwadi	29.51	10.12	28.67	6.75	10.12	0.84	4.22	0.84	0.51
40	Murti	35.09	6.32	24.56	2.81	15.09	4.21	4.21	1.05	0.70
41	Tardoli	35.01	3.14	31.38	2.09	19.18	2.79	4.18	1.39	0.84
42	Loni Bhapkar	32.47	6.96	34.79	2.32	18.55	0.93	2.32	1.39	0.28
43	Sayambachiwadi	30.61	6.53	30.20	3.27	14.29	5.71	6.53	2.04	0.82
44	Malwadi	35.84	5.85	32.92	3.66	14.63	2.19	2.93	1.46	0.51
45	Jalgaon Kade Pathar	38.89	10.00	33.33	5.56	16.67	2.22	3.33	0.56	0.56
46	Anjangaon	27.62	11.05	33.15	3.95	12.63	3.95	4.74	1.58	0.79
47	Karhavagaj	24.51	12.07	22.62	7.54	20.74	4.52	6.03	1.51	0.45
48	Bhilarwadi	30.00	15.00	23.75	7.50	15.00	2.50	5.00	0.63	0.63
49	Dhakale	36.13	9.03	22.58	2.58	17.74	3.87	5.16	1.61	0.65
50	Kamagalwadi (N.V.)	34.90	10.47	17.45	5.24	17.45	5.24	6.98	1.75	0.52
51	Mudhale	30.14	4.50	26.09	2.25	17.54	4.72	9.00	1.35	0.90
52	Jalakewadi Mudhale	35.35	15.15	22.73	10.10	10.10	2.02	2.53	2.02	0.51
53	Palshiwadi	29.78	7.44	24.81	3.72	21.09	3.72	7.44	1.24	0.74
54	Masalwadi (N.V.)	38.85	6.37	25.48	5.10	10.19	3.82	7.64	1.27	1.27
55	Moralwadi	26.32	18.42	18.42	13.16	15.79	2.63	2.63	1.32	1.32
56	Modhave	49.84	9.35	17.13	4.67	10.90	0.78	4.67	0.78	1.87
57	Umbarwadi	25.88	9.32	22.77	6.21	22.77	4.14	8.28	0.62	0.00

58	Chaudhar Wadi	21.43	20.54	16.07	19.64	15.18	0.89	0.71	1.79	1.79
59	Waki	14.04	25.15	12.87	27.49	10.53	2.34	2.34	2.34	2.34
60	Kanadwadi	8.30	25.93	6.22	35.27	16.60	1.66	1.24	2.49	2.07
61	Chopadaj	16.98	23.58	16.98	28.30	9.43	1.89	0.94	0.94	0.94
62	Vadgaon Nimbalkar	26.12	16.33	18.14	18.87	11.61	3.63	2.90	1.45	1.45
63	Korhale Bk	14.71	27.41	10.03	32.75	10.70	0.33	0.33	1.34	1.34
64	Thopatewadi	35.00	12.50	10.00	15.00	15.00	3.75	3.75	2.50	2.50
65	Malshikare Wadi	14.78	19.70	5.91	34.48	14.78	4.93	2.46	2.46	0.00
66	Hol	10.46	30.07	3.92	36.60	7.84	1.31	1.31	2.61	1.96
67	Sastewadi	16.01	20.02	6.00	36.03	12.01	4.00	1.00	2.00	2.00
68	Magarwadi	22.44	15.38	17.95	21.79	10.26	5.13	2.56	2.56	1.28
69	Deulwadi	26.53	12.24	28.57	18.37	8.16	2.04	1.02	2.04	1.02
70	Karanje	15.04	22.56	13.78	30.08	10.03	2.51	1.25	2.51	2.51
71	Khandobachiwadi	18.37	14.29	12.24	30.61	12.24	6.12	2.04	2.04	2.04
72	Gadadarwadi	20.80	20.80	16.34	26.75	7.43	2.97	1.49	1.78	1.49
73	Nimbut	9.76	24.39	8.94	36.59	16.26	1.63	0.81	1.22	0.41
74	Soratewadi	13.16	24.12	8.77	39.47	8.77	2.19	1.10	1.10	1.32
75	Karanjepul	13.33	16.00	10.67	32.00	10.67	5.33	1.33	4.00	1.33
76	Waghalwadi	20.10	26.38	7.54	32.66	6.28	2.51	2.01	1.26	1.26
77	Wanewadi	12.03	24.07	2.41	48.13	7.22	2.41	1.20	1.20	1.20
78	Murum	12.48	28.79	4.80	38.39	7.68	2.88	1.92	0.96	1.92
79	Sadobachiwadi	18.43	20.10	6.70	35.51	10.05	3.35	1.68	2.51	1.68
80	Korhale Kh	23.34	17.20	9.83	36.86	7.37	1.23	0.98	1.23	1.23
81	Sonkaswadi	40.76	13.59	33.97	16.30	6.79	0.27	0.54	0.68	0.27
82	Malegaon Kh.	10.73	26.82	16.09	37.55	7.51	1.07	1.07	0.54	0.21
83	Malegaon Bk	7.14	32.14	1.64	59.29	7.14	0.71	0.14	3.57	1.43
84	Pawnewadi	10.02	20.04	2.00	70.14	10.02	2.00	1.60	4.01	2.00
85	Yelewasti	2.12	42.37	2.12	52.97	12.71	0.42	0.42	0.42	0.42
86	Pandare	19.51	54.88	4.88	91.46	6.10	2.44	1.22	1.83	0.61
87	Pawaimal (N.V.)	11.11	37.04	3.70	46.30	9.26	1.85	0.00	0.93	0.93

88	Dhumalwadi	8.45	30.41	6.76	42.23	13.51	0.84	0.84	1.69	0.84
89	Manappawasti	9.62	42.31	7.69	48.08	19.23	0.96	0.96	1.92	0.38
90	Kurnewadi	8.53	13.65	6.83	42.66	10.24	0.34	1.71	1.71	0.85
91	Sirshane	15.38	30.77	7.69	38.46	7.69	0.77	1.54	0.00	0.00
92	Pimpalewasti	5.78	28.90	11.56	34.68	5.78	2.89	1.16	1.16	0.00
93	Malwadi	4.78	28.71	14.35	38.28	9.57	0.96	1.91	0.96	0.00
94	Bajrangwadi	19.23	26.92	7.69	38.46	3.85	0.77	2.31	0.77	0.77
95	Late	28.41	14.20	5.68	42.61	5.68	1.14	2.27	0.57	0.57
96	Pandharwadi	1.97	39.37	0.79	43.31	7.87	3.94	1.57	0.79	0.00
97	Kambleshwar	1.43	21.52	1.43	28.69	14.35	1.43	2.87	0.72	0.72
98	Sangavi	1.78	23.09	0.89	62.17	8.88	2.66	0.18	1.78	0.71
99	Shirawali	5.30	31.78	2.12	42.37	10.59	2.12	2.12	4.24	1.06
100	Khandaj	0.69	30.95	0.69	44.70	13.76	1.38	2.75	3.44	0.83
101	Nirvagaj	1.16	23.20	1.74	55.10	5.80	2.32	0.58	0.58	0.58
102	Vanjarwadi	31.02	16.58	29.14	3.21	4.01	0.00	4.81	0.80	0.00
103	Sawal	18.27	6.09	12.18	0.97	7.25	2.44	3.05	0.24	0.00
104	Rui	35.81	7.77	25.00	6.76	27.03	6.76	2.03	0.68	0.00
105	Jalochi	9.20	18.40	11.04	32.20	12.88	3.68	5.52	1.84	0.00
106	Kanheri	10.87	21.74	13.59	43.48	10.87	1.09	0.00	1.09	1.09
107	Katewadi	10.82	21.65	10.82	48.70	5.41	2.16	1.08	1.08	1.08
108	Pimpali	17.67	26.50	8.83	35.34	8.83	1.77	1.77	3.53	1.77
109	Gunwadi	8.33	25.00	1.67	41.67	8.33	5.00	0.83	2.08	0.83
110	Baramati Rural	12.34	24.68	6.17	37.01	12.34	3.70	2.47	1.23	0.62
111	Malad (baramati)	4.31	10.78	1.08	48.49	10.78	4.31	2.16	3.23	2.16
112	Dorlewadi	6.02	18.07	1.20	54.22	12.05	2.41	2.41	7.23	2.41
113	Zaragadwadi	9.89	28.25	1.41	56.50	7.06	2.82	1.41	2.82	1.41
114	Dhekalwadi	4.71	11.76	2.35	47.06	11.76	2.35	2.35	7.06	2.35
115	Songaon	7.63	22.88	3.81	34.32	7.63	0.76	0.76	3.81	1.53
116	Mekhali	8.70	26.09	1.74	39.13	8.70	1.74	0.87	3.48	1.74
117	Ghadagewadi	4.89	24.45	2.44	48.90	12.22	4.89	4.89	9.78	2.44



### Appendix-H Agricultural Pattern (2011)

Code No.	Name of the Villages	NSA	Jawar	Wheat	Bajara	Sugarcane	Corn	Oilseeds	Pulses	Fruits	vegetables
1	Vadhane	1000	30.00	15.00	25.00	15.00	15.00	2.00	2.00	2.00	1.00
2	Dandwadi	900	38.89	6.67	16.67	6.67	16.67	6.67	5.56	2.22	3.33
3	Naroli	700	34.29	5.71	28.57	8.57	17.14	8.57	8.57	2.86	3.57
4	Kololi	1000	45.00	4.00	45.00	6.00	10.00	1.00	1.00	2.00	1.00
5	Pansarewadi	1336	37.43	5.24	33.68	5.24	22.46	1.50	1.50	0.75	0.37
6	Supe	571	24.52	5.25	22.77	5.25	21.02	7.01	10.51	3.50	0.88
7	Kutwalwadi	968	20.66	18.60	25.83	14.46	15.50	2.07	2.07	0.83	0.41
8	Bhondvewadi	1000	30.00	8.00	40.00	6.40	10.00	8.00	6.00	1.80	0.50
9	Ambi Kh	747	26.77	6.69	26.77	6.69	16.06	5.35	8.03	2.68	0.94
10	Ambi Bk	700	35.71	15.71	21.43	17.14	10.71	5.71	5.71	1.43	0.71
11	Jogwadi	836	23.92	16.75	28.71	17.94	8.97	1.20	1.20	1.20	0.60
12	Morgaon	1923	47.43	7.80	26.00	5.15	11.44	0.52	1.04	0.42	0.52
13	Chandgude Wadi	400	31.25	11.25	40.00	10.00	12.50	7.50	7.50	3.00	2.50
14	Khadukhairewadi (N.V.)	600	35.00	6.67	30.83	10.00	11.67	5.00	6.67	0.83	0.33
15	Kalkhairewadi	1500	38.33	4.67	33.33	4.67	16.67	4.00	4.00	0.67	0.33
16	Sherechiwadi	250	24.00	16.00	24.00	8.00	24.00	4.00	4.80	4.00	0.80
17	Baburdi	1100	31.82	3.64	36.36	6.36	10.91	5.45	6.36	0.91	0.91
18	Karhati	1600	35.94	6.88	33.75	8.75	9.38	1.88	0.94	0.50	0.31
19	Deulgaon Rasal	1453	35.10	12.04	30.97	5.16	8.60	2.75	4.13	1.38	0.69
20	Jalgaon Supe	1622	30.83	8.63	27.74	8.63	12.95	4.32	5.55	1.23	0.12
21	Kharade Wadi	513	19.49	21.44	15.59	23.39	11.70	1.95	3.90	3.90	1.95
22	Shirsuphal	1845	26.56	11.38	27.10	14.63	10.84	3.25	4.34	1.63	0.27
23	Sabalewadi	1243	30.17	9.65	32.18	9.65	12.07	2.41	2.41	1.61	0.40
24	Parwadi	2015	28.54	11.41	23.82	22.33	8.68	0.99	1.99	1.99	0.25
25	Nimbodi	954	22.01	20.96	26.21	20.96	5.24	2.10	2.10	1.05	0.52
26	Gadikhelwadi	1408	33.74	7.10	24.86	8.52	17.76	2.84	4.26	1.07	0.36
27	Jaradwadi	919	27.20	10.88	27.20	8.16	13.06	4.35	6.53	2.18	0.54

28	Undavadisupe	600	26.67	10.00	23.33	11.67	12.50	10.00	10.00	0.83	1.33
29	Karkhel	782	23.66	8.95	25.58	5.12	20.46	6.39	8.95	1.28	0.64
30	Sonvadisupe	900	34.44	7.78	33.33	6.67	11.11	7.78	6.67	2.22	1.11
31	Undavadi Kade Pathar	954	31.45	6.29	32.49	6.29	11.53	4.40	5.24	1.57	0.73
32	Gojubavi	1289	39.57	8.53	36.85	5.82	9.31	2.33	3.10	1.55	0.70
33	Katphal	999	32.03	7.01	30.53	6.01	17.52	1.00	2.80	2.00	1.00
34	Jainakwadi	700	32.86	17.14	28.57	8.57	17.14	1.43	1.43	1.43	0.71
35	Sawantwadi	640	32.81	12.50	27.34	8.13	10.94	3.13	4.69	0.78	0.78
36	Barhanpur	711	31.65	11.25	26.72	12.66	10.13	2.11	3.52	1.41	0.70
37	Nepat Valan	437	25.17	32.04	20.59	16.02	16.02	2.29	4.58	2.29	1.60
38	Medad	1333	30.01	18.75	26.26	15.00	6.00	2.25	1.50	0.38	0.38
39	Tandulwadi	1186	25.30	8.43	24.87	8.43	12.65	3.37	6.75	1.69	0.84
40	Murti	1425	33.33	5.26	22.46	5.26	14.04	4.91	5.61	2.11	0.70
41	Tardoli	1434	33.12	11.51	28.59	4.18	12.20	2.09	4.88	2.09	1.05
42	Loni Bhapkar	2156	27.83	8.12	32.47	3.48	19.48	2.78	3.71	1.86	0.28
43	Sayambachiwadi	1225	34.69	8.16	28.57	4.08	15.10	3.27	4.90	0.82	0.41
44	Malwadi	1367	29.26	7.32	34.75	2.93	16.09	2.93	5.12	1.10	0.73
45	Jalgaon Kade Pathar	900	41.11	11.11	25.56	7.78	15.56	3.33	4.44	1.11	1.11
46	Anjangaon	1267	29.60	14.21	27.62	7.89	13.81	2.37	3.16	0.79	0.55
47	Karhavagaj	1326	25.64	13.57	20.74	9.80	18.85	3.77	5.28	1.51	0.75
48	Bhilarwadi	800	25.00	13.75	18.75	12.50	13.75	3.75	8.75	2.50	1.25
49	Dhakale	1550	25.81	10.32	26.45	3.87	22.58	2.58	5.81	1.29	0.65
50	Kamagalwadi (N.V.)	573	26.53	13.96	24.43	8.73	18.32	2.62	1.75	0.87	0.87
51	Mudhale	2223	29.24	10.12	26.99	3.37	15.74	4.05	7.87	2.25	0.45
52	Jalakewadi Mudhale (N.V.)	396	25.25	17.68	20.20	12.63	15.15	3.03	3.79	1.26	1.26
53	Palshiwadi	806	24.81	9.93	22.95	6.20	19.35	2.48	9.93	2.48	1.24
54	Masalwadi (N.V.)	785	26.75	15.29	23.57	7.64	12.74	5.10	5.10	1.91	1.91
55	Moralwadi	380	22.37	15.79	23.68	13.16	18.42	1.32	2.63	1.32	1.32
56	Modhave	642	38.94	10.90	19.47	4.67	14.02	3.12	4.67	0.78	3.12

57	Umbarwadi	483	17.60	8.28	30.02	8.28	23.81	2.07	6.21	1.04	2.07
58	Chaudhar Wadi	560	18.75	22.32	14.29	25.00	12.50	0.71	0.36	2.68	2.68
59	Waki	855	11.70	23.39	10.53	30.99	14.62	1.17	1.17	2.92	2.92
60	Kanadwadi	482	10.37	28.01	7.26	34.23	14.52	1.04	0.00	3.11	2.07
61	Chopadaj	530	16.04	21.70	17.92	24.53	12.26	1.89	0.38	1.89	1.89
62	Vadgaon Nimbalkar	1378	22.50	16.69	21.04	20.32	13.06	3.63	0.73	1.45	1.45
63	Korhale Bk	1496	13.37	24.06	7.35	30.08	14.71	4.01	0.67	2.67	2.01
64	Thopatewadi	400	36.25	15.00	7.50	17.50	13.75	2.50	2.50	2.50	2.50
65	Malshikare Wadi	203	15.76	22.17	4.93	32.02	17.24	3.94	0.00	2.46	1.48
66	Hol	765	7.84	28.10	0.65	40.52	13.07	2.61	1.31	3.27	2.61
67	Sastewadi	500	14.00	27.00	4.00	35.00	16.00	2.00	0.00	1.00	0.80
68	Magarwadi	780	30.77	16.67	12.82	19.23	11.54	2.56	1.28	3.21	1.92
69	Deulwadi	490	31.63	14.29	22.45	16.33	8.16	2.04	1.02	2.04	2.04
70	Karanje	399	17.54	20.05	5.01	35.09	12.53	3.76	1.25	2.51	2.51
71	Khandobachiwadi	245	6.12	32.65	2.04	40.82	8.16	2.04	0.00	4.08	4.08
72	Gadadarwadi	673	17.83	14.86	14.86	29.72	8.92	1.49	0.45	1.49	1.49
73	Nimbut	1230	11.38	27.64	11.38	32.52	14.63	0.81	0.41	0.81	0.81
74	Soratewadi	456	8.77	17.54	4.39	52.63	32.89	0.44	0.00	2.19	1.10
75	Karanjepul	375	8.00	21.33	2.67	40.00	16.00	2.67	1.33	5.33	2.67
76	Waghalwadi	398	10.05	33.67	2.51	38.69	11.31	1.26	0.50	2.01	0.00
77	Wanewadi	831	0.00	25.27	0.00	57.76	13.24	0.60	0.00	1.81	1.20
78	Murum	1042	7.68	30.71	0.00	47.02	10.56	0.96	0.00	1.92	1.15
79	Sadobachiwadi	597	3.35	33.50	0.00	46.90	13.40	0.84	0.00	1.68	0.34
80	Korhale Kh	814	22.11	13.51	8.60	39.31	12.29	2.46	0.00	1.23	0.61
81	Sonkaswadi	736	27.17	10.87	47.55	13.59	2.72	0.68	0.27	0.54	0.27
82	Malegaon Kh.	932	16.09	21.46	10.73	42.92	5.36	2.15	1.61	1.07	0.54
83	Malegaon Bk	1400	3.57	33.57	0.71	57.14	3.57	1.43	0.14	4.29	2.14
84	Pawnewadi	499	8.02	16.03	10.02	60.12	14.03	1.60	0.40	4.01	2.00
85	Yelewasti	472	2.12	31.78	4.24	42.37	4.24	0.85	1.27	2.12	1.06
86	Pandare	820	7.32	30.49	9.76	79.27	12.20	4.88	2.44	2.44	0.61

87	Pawaimal (N.V.)	540	7.41	46.30	0.00	37.04	18.52	0.93	0.37	1.85	0.93
88	Dhumalwadi	592	6.76	20.27	3.38	40.54	8.45	0.84	1.69	1.69	0.34
89	Manappawasti	520	3.85	28.85	3.85	57.69	3.85	0.38	0.77	1.92	0.96
90	Kurnewadi	586	10.24	20.48	8.53	42.66	17.06	1.71	0.85	1.71	0.85
91	Sirshane	130	7.69	23.08	30.77	61.54	3.85	0.00	1.54	0.00	0.00
92	Pimpalewasti	173	4.62	11.56	5.78	46.24	23.12	5.78	5.78	28.90	1.16
93	Malwadi	209	4.78	33.49	9.57	47.85	0.96	2.39	0.96	0.96	1.44
94	Bajrangwadi	260	3.85	19.23	3.85	46.15	11.54	1.92	3.08	1.15	0.77
95	Late	352	14.20	22.73	2.84	48.30	5.68	0.00	0.00	1.42	1.42
96	Pandharwadi	254	3.94	31.50	1.97	47.24	11.81	0.79	0.79	1.57	0.79
97	Kambleshwar	697	2.87	15.78	0.72	24.39	5.74	1.43	1.43	0.72	0.72
98	Sangavi	1126	0.89	17.76	1.78	53.29	4.44	3.55	0.44	1.78	1.33
99	Shirawali	944	4.24	21.19	5.30	44.49	10.59	2.12	1.06	3.18	1.06
100	Khandaj	1454	0.69	27.51	0.69	41.27	14.44	2.75	1.38	4.13	0.69
101	Nirvagaj	1724	2.32	31.90	0.58	52.20	11.60	1.16	0.00	1.16	0.58
102	Vanjarwadi	374	37.43	17.38	29.95	3.74	4.55	0.00	5.88	1.07	0.00
103	Sawal	1642	24.36	6.09	18.27	2.44	9.14	4.87	4.87	0.24	0.00
104	Rui	296	47.30	21.96	37.84	4.73	5.74	3.38	7.43	1.35	0.68
105	Jalochi	1087	13.80	19.32	9.20	27.60	13.80	0.92	1.84	0.92	0.46
106	Kanheri	920	6.52	27.17	2.72	48.91	13.04	2.17	0.22	2.17	2.17
107	Katewadi	924	6.49	27.06	7.58	43.29	10.82	1.08	2.16	2.16	2.16
108	Pimpali	566	10.60	17.67	7.07	53.00	3.53	1.77	0.35	3.53	1.77
109	Gunwadi	1200	10.00	29.17	0.83	37.50	5.00	3.33	1.67	2.92	1.67
110	Baramati Rural	1621	15.42	27.76	4.94	30.85	9.25	4.01	3.08	2.47	1.85
111	Malad (baramati)	928	2.16	12.93	1.08	43.10	16.16	6.47	1.08	4.31	2.16
112	Dorlewadi	830	2.41	24.10	1.20	48.19	12.05	1.20	1.20	7.23	2.41
113	Zaragadwadi	708	7.06	21.19	1.41	49.44	14.12	1.41	1.41	3.53	1.41
114	Dhekalwadi	850	5.88	17.65	7.06	41.18	14.12	1.18	1.18	5.88	1.18
115	Songaon	1311	4.58	19.07	4.58	34.32	6.10	1.53	0.76	3.81	1.53
116	Mekhali	1150	6.96	21.74	5.22	34.78	13.04	3.48	1.74	5.22	0.87

**Appendix-I**  
**Soil Data of the Baramati Tahsil**

Sr. No.	Name	Village	Crop	Samu(PH)	Salinity	Sendriya karba.	spuradh	Palash
1	Mahendra dadaso Kokare	Malegaon BK.	Sugarcane	8.04	1.06	0.3	31	358
2	Prakash Raghu saste	Malegaon BK.	Sugarcane	8.26	0.93	0.45	25	257
3	Raghu Balu Saste	Malegaon BK.	Sugarcane	8.29	1.05	0.18	42	347
4	Dattatrya Murrappa Honrar	Malegaon BK.	Sugarcane	7.85	0.42	0.3	39	492
5	Harishchandra Ramchandra Yele	Malegaon BK.	Sugarcane	8.08	0.41	0.48	66	268
6	Parvatibai Mahadeo Honrar	Malegaon BK.	Sugarcane	7.99	0.26	0.42	44	4.3
7	Baba Shravba nangre	Malegaon BK.	Sugarcane	8.73	0.29	0.39	42	380
8	Bhagirathi Saheb Devkate	Malegaon BK.	Sugarcane	9.02	0.4	0.4	50	257
9	Mahendra dadaso Kokare	Pandare	sugarcane	7.69	0.48	0.45	19	268
10	Udya satyvan Jagtap	Pandare	sugarcane	7.66	0.45	0.9	28	313
11	Dattatrya sahaddev Jagtap	Pandare	sugarcane	7.85	13.16	0.4	24	324
12	Ramchandra Daulatrao Wagh	Sangvi	sugarcane	8.38	2.3	0.66	27	306
13	Dadaso Ganpat Wagh	Sangvi	sugarcane	8.53	1.2	0.51	30	403
14	Balaso Krushnarao Wagh	Sangvi	sugarcane	8.46	0.53	0.51	19	425
15	Vitthal Bhiku Agavane	Kambaleshawar	Sugarcane	8.4	1.2	0.18	21	627
16	Rajendra Sadashiv Taware	Sangvi	Sugarcane	8.94	1.13	0.63	30	403
17	Mahadev Martand Yajgar	Sangvi	Sugarcane	8.27	1.3	1.2	45	481
18	Satish Mohan yadav	Shiravli	Sugarcane	8.08	1.11	0.82	24	694
19	Uttam Anandrao Tupe	Shiravli	Sugarcane	8.47	0.74	0.6	36	358
20	Jijaba Krushnaji Bhapkar	Shiravli	Sugarcane	7.81	3.8	0.96	24	660
21	Abhinandan Suryakant Saha	Shiravli	Sugarcane	8.9	0.88	0.48	21	616
22	Shubhangi Sachin Taware	Shiravli	Sugarcane	8.23	0.81	0.33	15	638
23	Mayavati Prahlad Devkate	Khandaj	Sugarcane	7.79	0.78	0.6	4	380
24	Mahadev Appaso Mane	Khandaj	Sugarcane	8.32	1.1	0.54	19	291
25	Suhas krushnarao Bhosale	Khandaj	Sugarcane	8.54	1.17	0.45	36	459

26	Sharad Yadavrao Bhosale	Khandaj	Sugarcane	7.9	0.92	0.27	21	406
27	Sanjay ramchandra Deshmukh	Khandaj	Sugarcane	7.49	1.09	0.51	15	638
28	Rajendra Bhiku Ranvare	Nirawaghaj	Sugarcane	8.53	1.58	0.9	45	280
29	Anna Appaji Devkate	Nirawaghaj	Sugarcane	8.22	0.9	0.93	27	134
30	Sopan Kondiba Kokare	Nirawaghaj	Sugarcane	8.7	0.59	0.3	4	145
31	Bapurao Vishnu dhaygude	Nirawaghaj	Sugarcane	8.43	0.27	0.93	25	156
32	Maruti Sambhaji Chopade	Nirawaghaj	Sugarcane	8.37	0.39	0.15	13	156
33	Kisan Ganpat Khandare	Malad	Sugarcane	8.86	0.56	0.27	27	459
34	Datrraya Maruti Agavane	Malad	Sugarcane	8.6	0.92	0.51	24	212
35	Dingamber Namdev Mohalkar	Malad	Sugarcane	8.64	0.52	1.06	21.28	123
36	Sanjay Eknath Jadhav	Malad	Sugarcane	8.5	0.77	0.83	24.38	156
37	Ganesh Ramchandra Madne	Malad	Sugarcane	8.7	0.69	1.18	19.76	548
38	Abhijit Suresh zagade	Medad	Sugarcane	8.81	0.58	0.61	21.36	112
39	Hanumant Mandev Gawade	Malad	Sugarcane	8.63	0.53	0.81	15.2	212
40	Tukaram maruti Kadam	Baramati Rural	Sugarcane	8.06	0.68	0.66	19.76	459
41	Shamrao Dhansing Jagtap	Pandare	Sugarcane	8.03	0.76	0.59	13.68	403
42	Anadrao Kundlik Jagtap	Pandare	Sugarcane	7.95	1.37	0.78	53	336
43	Akshay Hariban Gosavi	Kambaleshawar	Sugarcane	7.99	0.5	0.6	19.76	190
44	Sandip Namdev khalate	Kambaleshawar	Sugarcane	8.21	0.95	0.51	30.4	212
45	Rajendra Shankar Jadhav	Khandaj	Sugarcane	8.26	0.62	0.8	33.44	257
46	Dingamber Maruti Jadhav	Khandaj	Sugarcane	8.14	0.41	0.46	21.28	313
47	Dattatrya Maruti Jadhav	Khandaj	Sugarcane	7.87	0.78	1.41	29	336
48	Ashutosh Gujaba Atole	Khandaj	Sugarcane	8.35	0.53	0.37	51.68	212
49	Bajirao Waman Falake	Khandaj	Sugarcane	7.88	0.81	0.97	24.32	324
50	Changdev Maruti Devkate	Mekhali	Sugarcane	7.98	0.98	0.43	27.36	268
51	Anil Namdev Kambale	Mekhali	Sugarcane	8.44	0.87	0.86	34.96	369
52	Shivaji Nivruti Mohite	Nimbodi	Sugarcane	8.2	0.3	0.63	59.28	246
53	Rajendra Bapurao Dhumal	Nimbodi	Sugarcane	7.94	0.9	0.93	36.48	414
54	Bhaygyawan Haribhau Matkar	Korhale BK.	Sugarcane	7.78	0.77	0.48	7.6	212
55	Prashant Shivaji Dhumal	Nimbodi	Sugarcane	8.29	0.37	0.93	21.28	235

56	Rajendra Bapurao Dhumal	Nimbodi	Sugarcane	8.42	0.39	0.66	13.68	380
57	Umesh prataprao Dhumal	Nimbodi	Sugarcane	8.5	0.24	0.99	4.87	22.4
58	Chandrakant Shantilal Wagh	Vadgao Nimbalkar	Sugarcane	8.32	0.87	0.49	9.12	537
59	Ramrao Maruti Bhosale	Wanevadi	Sugarcane	8.88	1.6	0.73	7.61	313.6
60	Dyandev Waman Gaikwad	Karanjepul	Sugarcane	8.2	1.5	0.71	22.8	246.4
61	Ravindra Ramdas Gaikwad	Karanjepul	Sugarcane	7.71	0.16	0.85	4.56	89.6
62	Kisan Balku Gaikwad	Karanjepul	Sugarcane	8.45	0.92	0.86	10.64	100.8
63	Manisha Kalyan Tukashe	Waghalwadi	Sugarcane	7.95	1.08	0.63	9.12	212.8
64	Dinkar Ramchandra Savant	Waghalwadi	Sugarcane	8.24	0.24	0.18	4.56	280
65	Nanaso Bhauso Sawant	Karanj	Sugarcane	8.18	0.83	0.52	10.54	235.2
66	Bhauso Khandu Lakade	Karanj	Sugarcane	7.85	0.34	0.4	9.12	112
67	Ananta Wamanrao Mokashi	Karanj	Sugarcane	8.22	0.7	0.5	16.75	100.8
68	Bapurao Jachak	Nimbodi	Sugarcane	8.13	0.57	0.6	12.16	100
69	Ravindra Dhumal	Nimbodi	Sugarcane	7.98	0.27	0.57	7.61	78.4
70	Amrut Panditrao Darekar	Vadgao Nimbalkar	Sugarcane	8.09	1.37	0.53	9.12	479
71	Rahul Sukhdev Khomane	Vadgao Nimbalkar	Sugarcane	8.21	0.57	0.87	13.68	168
72	Vardhman Hirachand Shaha	Vadgao Nimbalkar	Sugarcane	8.23	0.78	0.98	16.72	201
73	Sidhart Uday Gite	Hol	Sugarcane	8.15	0.43	0.74	21.28	324
74	rajendra Tukaram Yadav	Hol	Sugarcane	8.1	0.79	0.32	15.2	156
75	Sagar gadekar	Chopdaj	Sugarcane	8.02	0.35	0.84	9.12	100
76	Subhash Nivruti pawar	Chopdaj	Sugarcane	8.22	0.41	0.88	7.6	448
77	Ashok Ganpat gadekar	Chopdaj	Sugarcane	8.7	0.73	0.56	12.16	67

### Appendix-J Rank Distribution

Sr. No.	VILL_NAME	NSA	Jawar	Wheat	Bajara	Sugarcane	Corn	Oilseeds	Pulses	Fruits	vegetables
1	Vadhane	1000	1	4	2	3	5	6	7	8	9
2	Dandwadi	900	1	5	2	6	3	7	8	9	4
3	Naroli	700	1	8	2	4	3	5	6	9	7
4	Kololi	1000	1	5	2	4	3	7	8	6	9
5	Pansarewadi	1336	1	4	2	5	3	6	7	8	9
6	Supe	571	1	6	2	7	3	5	4	8	9
7	Kutwalwadi	968	2	3	1	5	4	6	7	8	9
8	Bhondvewadi	1000	2	4	1	6	3	5	7	8	9
9	Ambi Kh	747	1	5	2	6	3	7	4	8	9
10	Ambi Bk	700	1	4	2	3	5	6	7	8	9
11	Jogwadi	836	2	4	1	3	5	6	8	7	9
12	Morgaon	1923	1	4	2	5	3	7	6	8	9
13	Chandgude Wadi	400	2	4	1	5	3	6	7	8	9
14	Khadukhairewadi	600	1	5	2	4	3	7	6	8	9
15	Kalkhairewadi	1500	1	4	2	5	3	6	7	8	9
16	Sherechiwadi	250	1	4	2	5	3	7	6	8	9
17	Baburdi	1100	2	7	1	4	3	6	5	9	8
18	Karhati	1600	1	5	2	4	3	6	7	8	9
19	Deulgaon Rasal	1453	1	3	2	5	4	7	6	8	9
20	Jalgaon Supe	1622	1	4	2	5	3	7	6	8	9
21	Kharade Wadi	513	3	2	4	1	5	8	7	6	9
22	Shirsuphal	1845	2	4	1	3	5	7	6	8	9
23	Sabalewadi	1243	2	5	1	4	3	6	7	8	9
24	Parwadi	2015	1	4	2	3	5	8	7	6	9
25	Nimbodi	954	2	4	1	3	5	6	7	8	9
26	Gadikhelwadi	1408	1	5	2	4	3	7	6	8	9
27	Jaradwadi	919	1	4	2	5	3	7	6	8	9
28	Undavadi supe	600	1	5	2	4	3	7	6	8	9



29	Karkhel	782	2	4	1	7	3	6	5	8	9
30	Sonvadisupe	900	1	4	2	6	3	5	7	8	9
31	Undavadi Kade Pathar	954	2	4	1	5	3	7	6	8	9
32	Gojubavi	1289	1	4	2	5	3	7	6	8	9
33	Katphal	999	1	4	2	5	3	9	6	7	8
34	Jainakwadi	700	1	3	2	5	4	7	8	6	9
35	Sawantwadi	640	1	3	2	5	4	7	6	8	9
36	Barhanpur	711	1	4	2	3	5	8	6	7	9
37	Nepat Valan	437	2	1	3	4	5	9	6	7	8
38	Medad	1333	1	3	2	4	5	6	7	8	9
39	Tandulwadi	1186	1	5	2	4	3	7	6	8	9
40	Murti	1425	1	5	2	6	3	7	4	8	9
41	Tardoli	1434	1	4	2	6	3	8	5	7	9
42	Loni Bhapkar	2156	2	4	1	6	3	7	5	8	9
43	Sayambachiwadi	1225	1	4	2	6	3	7	5	8	9
44	Malwadi	1367	2	4	1	6	3	7	5	8	9
45	Jalgaon Kade Pathar	900	1	4	2	5	3	7	6	8	9
46	Anjangaon	1267	1	4	2	5	3	7	6	8	9
47	Karhavagaj	1326	1	4	2	5	3	7	6	8	9
48	Bhilarwadi	800	1	3	2	5	4	7	6	8	9
49	Dhakale	1550	2	4	1	6	3	7	5	8	9
50	Kamagalwadi (N.V.)	573	1	4	2	5	3	7	6	8	9
51	Mudhale	2223	1	4	2	7	3	6	5	8	9
52	Jalakewadi Mudhale (N.V.)	396	1	3	2	5	4	8	6	7	9
53	Palshiwadi	806	1	4	2	6	3	7	5	8	9
54	Masalwadi (N.V.)	785	1	3	2	5	4	6	7	8	9
55	Moralwadi	380	2	4	1	5	3	8	7	6	9
56	Modhave	642	1	4	2	5	3	7	6	9	8
57	Umbarwadi	483	3	5	1	4	2	7	6	9	8

58	Chaudhar Wadi	560	3	2	4	1	5	8	9	6	7
59	Waki	855	4	2	5	1	3	8	9	6	7
60	Kanadwadi	482	4	2	5	1	3	8	9	6	7
61	Chopadaj	530	4	2	3	1	5	8	9	6	7
62	Vadgaon Nimbalkar	1378	3	2	4	1	5	6	9	7	8
63	Korhale Bk	1496	4	2	5	1	3	6	9	7	8
64	Thopatewadi	400	1	3	5	2	4	8	9	6	7
65	Malshikare Wadi	203	4	2	5	1	3	6	9	7	8
66	Hol	765	4	2	9	1	3	7	8	5	6
67	Sastewadi	500	4	2	5	1	3	6	9	7	8
68	Magarwadi	780	1	3	4	2	5	7	9	6	8
69	Deulwadi	490	1	4	2	3	5	6	9	7	8
70	Karanje	399	3	2	5	1	4	6	9	7	8
71	Khandobachiwadi	245	4	2	7	1	3	8	9	5	6
72	Gadadarwadi	673	3	2	4	1	5	6	9	7	8
73	Nimbut	1230	4	2	5	1	3	6	9	7	8
74	Soratewadi	456	4	2	5	1	3	8	9	6	7
75	Karanjepul	375	4	2	6	1	3	7	9	5	8
76	Waghalwadi	398	4	2	5	1	3	7	8	6	9
77	Wanewadi	831	6	2	8	1	3	7	9	4	5
78	Murum	1042	4	2	8	1	3	7	9	5	6
79	Sadobachiwadi	597	4	2	8	1	3	6	9	5	7
80	Korhale Kh	814	2	3	5	1	4	6	9	7	8
81	Sonkaswadi	736	2	4	1	3	5	6	8	7	9
82	Malegaon Kh.	932	3	2	4	1	5	6	7	8	9
83	Malegaon Bk	1400	4	2	8	1	5	7	9	3	6
84	Pawnewadi	499	5	2	4	1	3	7	9	6	8
85	Yelewasti	472	5	2	4	1	3	8	7	6	9
86	Pandare	820	5	2	4	1	3	6	7	8	9

87	Pawaimal (N.V.)	540	4	2	9	1	3	6	7	5	9
88	Dhumalwadi	592	4	2	5	1	3	8	7	6	9
89	Manappawasti	520	4	2	5	1	3	8	7	6	9
90	Kurnewadi	586	4	2	5	1	3	6	9	7	8
91	Sirshane	130	4	3	2	1	5	8	6	7	9
92	Pimpalewasti	173	7	3	6	1	2	4	5	8	9
93	Malwadi	209	4	2	3	1	8	6	7	5	9
94	Bajrangwadi	260	5	2	4	1	3	7	6	8	9
95	Late	352	3	2	5	1	4	8	9	6	7
96	Pandharwadi	254	4	2	6	1	3	7	5	8	9
97	Kambleshwar	697	4	2	7	1	3	5	6	8	9
98	Sangavi	1126	8	2	6	1	3	4	7	5	8
99	Shirawali	944	5	2	4	1	3	8	6	7	9
100	Khandaj	1454	8	2	9	1	3	5	6	4	7
101	Nirvagaj	1724	4	2	7	1	3	6	8	5	9
102	Vanjarwadi	374	1	3	2	6	5	9	4	7	8
103	Sawal	1642	1	5	2	4	3	6	7	8	9
104	Rui	296	1	2	5	4	3	6	7	8	9
105	Jalochi	1087	3	2	5	1	4	8	6	7	9
106	Kanheri	920	4	2	5	1	3	7	8	6	9
107	Katewadi	924	5	2	4	1	3	7	8	6	9
108	Pimpali	566	3	2	4	1	5	7	8	6	9
109	Gunwadi	1200	3	2	9	1	5	6	8	4	7
110	Baramati Rural	1621	3	2	5	1	4	6	8	7	9
111	Malad (baramati)	928	6	3	8	1	2	5	9	4	7
112	Dorlewadi	830	5	2	9	1	3	6	8	4	7
113	Zaragadwadi	708	4	2	7	1	3	6	8	5	9
114	Dhekalwadi	850	5	2	4	1	3	8	9	6	7
115	Songaon	1311	4	2	5	1	3	7	9	6	8
116	Mekhali	1150	4	2	6	1	3	7	8	5	9
117	Ghadagewadi	409	3	2	6	1	4	7	8	5	9

**Appendix-K**  
**Crop Combination Region**

Code No.	Name of the Villages	Jowar	Bajara	Sugarcane	II Crop	III Crop
1	Vadhane	1				
2	Dandwadi	1				
3	Naroli	1				
4	Kololi	1				
5	Pansarewadi	1				
6	Supe	1				
7	Kutwalwadi		1			
8	Bhondvewadi		1			
9	Ambi Kh	1				
10	Ambi Bk	1				
11	Jogwadi		1			
12	Morgaon				2	
13	Chandgude Wadi		1			
14	Khadukhairewadi (N.V.)	1				
15	Kalkhairewadi	1				
16	Sherechiwadi	1				
17	Baburdi		1			
18	Karhati	1				
19	Deulgaon Rasal	1				
20	Jalgaon Supe	1				
21	Kharade Wadi			1		
22	Shirsuphal	1				
23	Sabalewadi		1			
24	Parwadi	1				
25	Nimbodi		1			
26	Gadikhelwadi	1				
27	Jaradwadi	1				
28	Undavadisupe	1				
29	Karkhel		1			
30	Sonvadisupe	1				
31	Undavadi Kade Pathar		1			
32	Gojubavi	1				
33	Katphal	1				
34	Jainakwadi	1				
35	Sawantwadi	1				
36	Barhanpur	1				

37	Nepat Valan					
38	Medad	1				
39	Tandulwadi	1				
40	Murti	1				
41	Tardoli	1				
42	Loni Bhapkar		1			
43	Sayambachiwadi	1				
44	Malwadi		1			
45	Jalgaon Kade Pathar	1				
46	Anjangaon	1				
47	Karhavagaj	1				
48	Bhilarwadi	1				
49	Dhakale	1				
50	Kamagalwadi (N.V.)	1				
51	Mudhale	1				
52	Jalakewadi Mudhale (N.V.)	1				
53	Palshiwadi	1				
54	Masalwadi (N.V.)	1				
55	Moralwadi		1			
56	Modhave	1				
57	Umbarwadi		1			
58	Chaudhar Wadi			1		
59	Waki			1		
60	Kanadwadi			1		
61	Chopadaj			1		
62	Vadgaon Nimbalkar			1		
63	Korhale Bk			1		
64	Thopatewadi	1				
65	Malshikare Wadi			1		
66	Hol			1		
67	Sastewadi			1		
68	Magarwadi	1				
69	Deulwadi	1				
70	Karanje			1		
71	Khandobachiwadi			1		
72	Gadadarwadi			1		
73	Nimbut			1		
74	Soratewadi				2	
75	Karanjepul			1		
76	Waghalwadi			1		
77	Wanewadi				2	

78	Murum				2	
79	Sadobachiwadi				2	
80	Korhale Kh			1		
81	Sonkaswadi				2	
82	Malegaon Kh.				2	
83	Malegaon Bk				2	
84	Pawnewadi			1		
85	Yelewasti			1		
86	Pandare			1		
87	Pawaimal (N.V.)				2	
88	Dhumalwadi				2	
89	Manappawasti				2	
90	Kurnewadi					3
91	Sirshane				2	
92	Pimpalewasti				2	
93	Malwadi				2	
94	Bajrangwadi				2	
95	Late				2	
96	Pandharwadi				2	
97	Kambleshwar			1		
98	Sangavi				2	
99	Shirawali				2	
100	Khandaj			1		
101	Nirvagaj				2	
102	Vanjarwadi	1				
103	Sawal	1				
104	Rui				2	
105	Jalochi			1		
106	Kanheri				2	
107	Katewadi				2	
108	Pimpali				2	
109	Gunwadi			1		
110	Baramati Rural			1		
111	Malad (baramati)					3
112	Dorlewadi				2	
113	Zaragadwadi				2	
114	Dhekalwadi			1		
115	Songaon			1		
116	Mekhali			1		
117	Ghadagewadi			1		

## Appendix-L

### Farmer's Inventory

1) Name of the head of the family -

2) Name of the village - \_\_\_\_\_ Taluka - \_\_\_\_\_ District - \_\_\_\_\_

3) Family Details -

Sr. No.	Name of the person	M/F	Relation with H.H.	Age	Educational Status	Occupation	Income
1.							
2.							
3.							
4.							
5.							
6.							
7.							
8.							
9.							
10.							

4) Details regarding the land holding -

[A] Size of land owned by family (Total) : (Hect//Acre)

[B] Irrigated land : \_\_\_\_\_ Ha/Acre

[C] Unirrigated : \_\_\_\_\_

5) Last year (2010) cropping details -

Sr. No.	Crops	Area	Production	Home consumed	Sold	Cost of production
1.						
2.						
3.						
4.						

6) Details regarding expenditure for 2010 -11

Sr. No.	Crops	Seeds	Fertilizers	Pesticides	Labour	Irrigation	Other	Total
1.								
2.								
3.								
4.								

7) Current year cropping details (2010-11)-

Sr. No.	Crops	Area	Production	Price (Rs.)
1.				
2.				
3.				
4.				

8) Details regarding expenditure for 2010-11 -

Sr. No.	Crops	Seeds	Fertilizers	Pesticides	Labour	Irrigation	Other	Total
1.								
2.								
3.								
4.								

9) Details of Irrigation -

Sr. No.	Type	Perennial Area	Seasonal Area	Total Expenditure
1.	Well			
2.	Canal			
3.	Lift			



**Appendix-M**  
**Village Inventory**

1) Name of the village - Code No. -

Taluka - Dist. -

2) Population (2001) -

3) Number of households -

4) Geographical background of the village -

[a] Location (Site and situation) :

[b] Local physiography :

[c] Soil type and its distribution :

5) Details regarding crops -

[a] Kharif crops

Sr. No.	Crops	Area (Hect/Acre)	Production
1.			
2.			

[b] Rabi crops

Sr. No.	Crops	Area (Hect/Acre)	Production
1.			
2.			

6) Irrigation details

Sr. No.	Type	Area in kharif	Rabi area	Perennial area
1.				
2.				
3.				
4.				
5.				
6.				

7) Village roads and communication -

Sr. No.	Place	Distance (km)	Road quality
1.	Taluka place		
2.	District place		
3.	Weekly market		
4.	Agro-service centre		
5.	Cattle market		
6.	Bus stop		
7.	Railway Station		
8.	Provision shop		
9.	Grain market		
10.	Vegetable market		
11.	National highway		
12.	State road		
13.	Other district road		

8) Group discussion with villagers on the following points

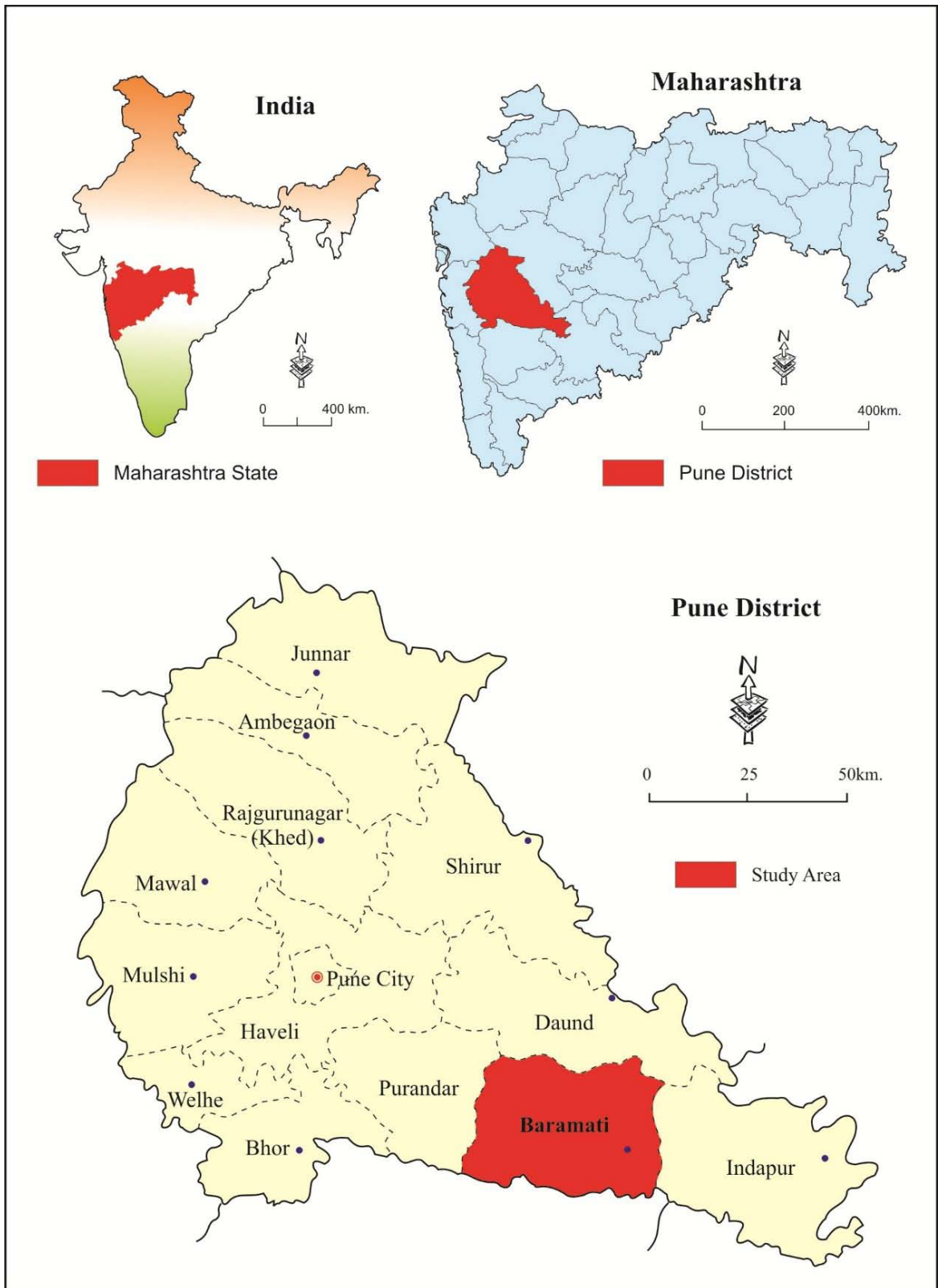
1. Agriculture
2. Irrigation
3. Soil type
4. Water table
5. Dairy
6. Poultry
7. Week market
8. Transportation & communication
9. Other problems faced by villages.

10) Other Income sources -

Sr. No.	Source	Monthly / Yearly Income (Rs.)
1.	Service	
2.	Dairy	
3.	Poultry	
4.	Self-employment	
5.	Other	

11) State your personal / regional problems with probable solutions.

Sr. No.	Field	Problems	Solutions
1.	Agriculture		
2.	Irrigation		
3.	Dairy		
4.	Market		
5.	Employment		
6.	Migration		
7.	Other		
8.			
9.			
10.			



**Location of the Study Area**

**Fig. 1.1**

### Revenue circle of the Study Area

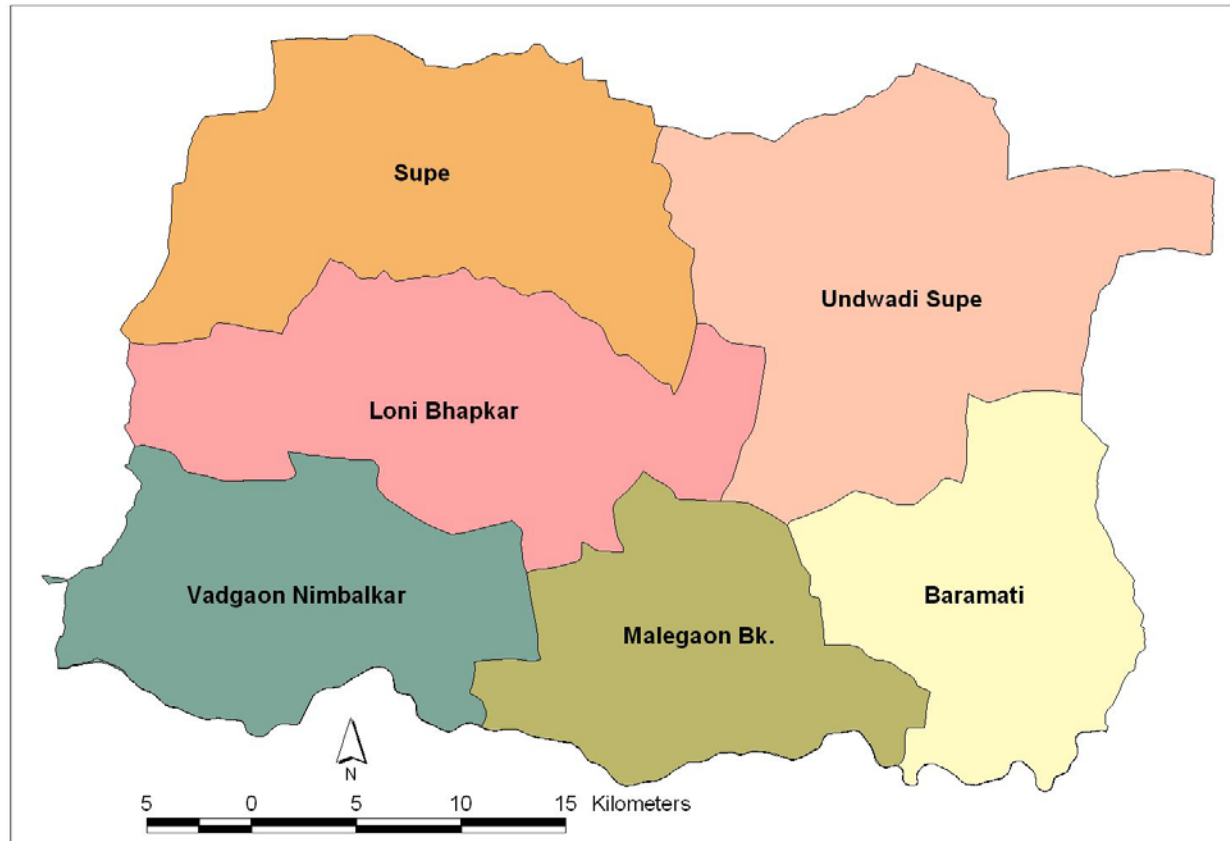
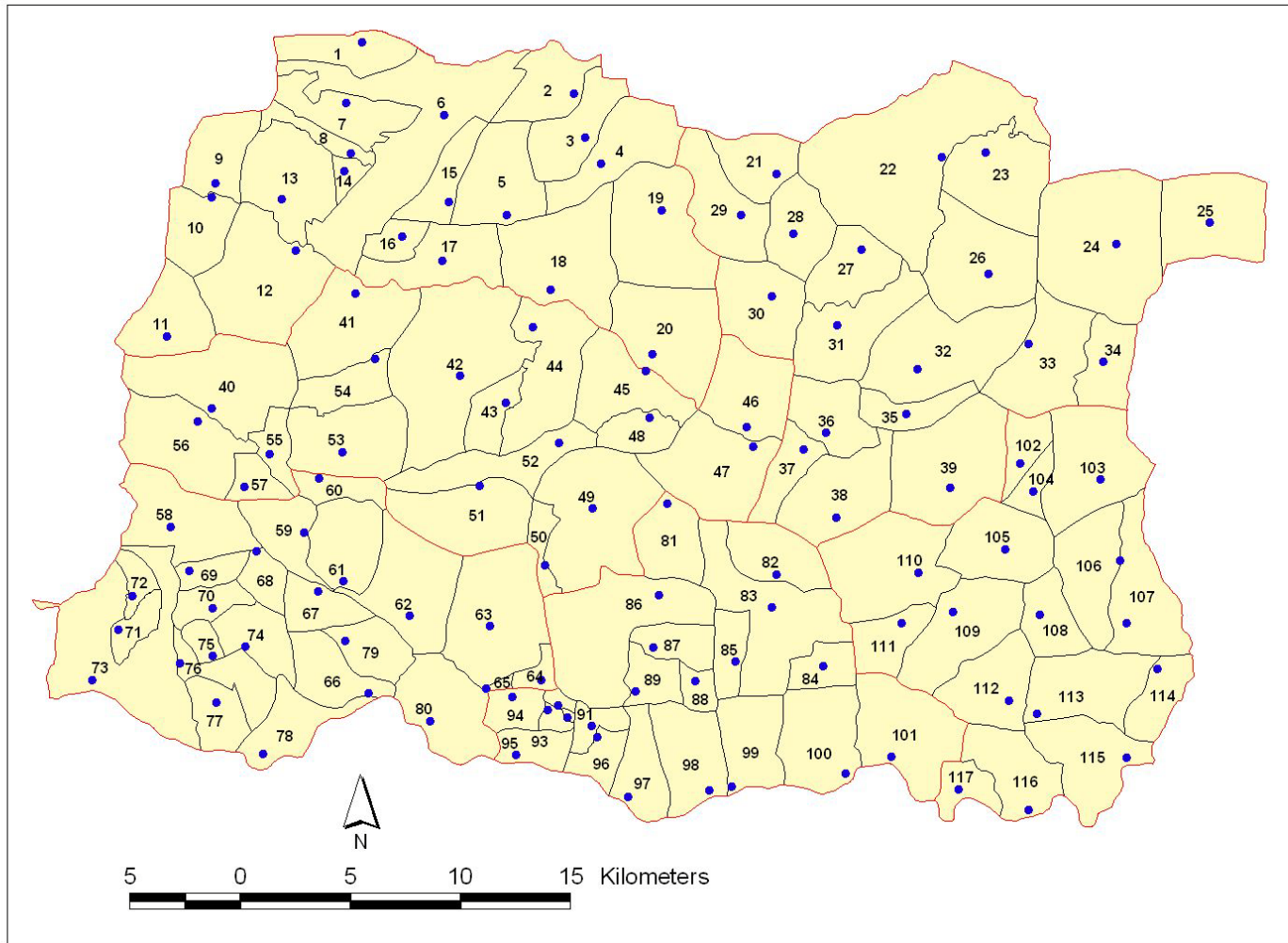


Fig. 1.2: Revenue Circles of Baramati Tehsil

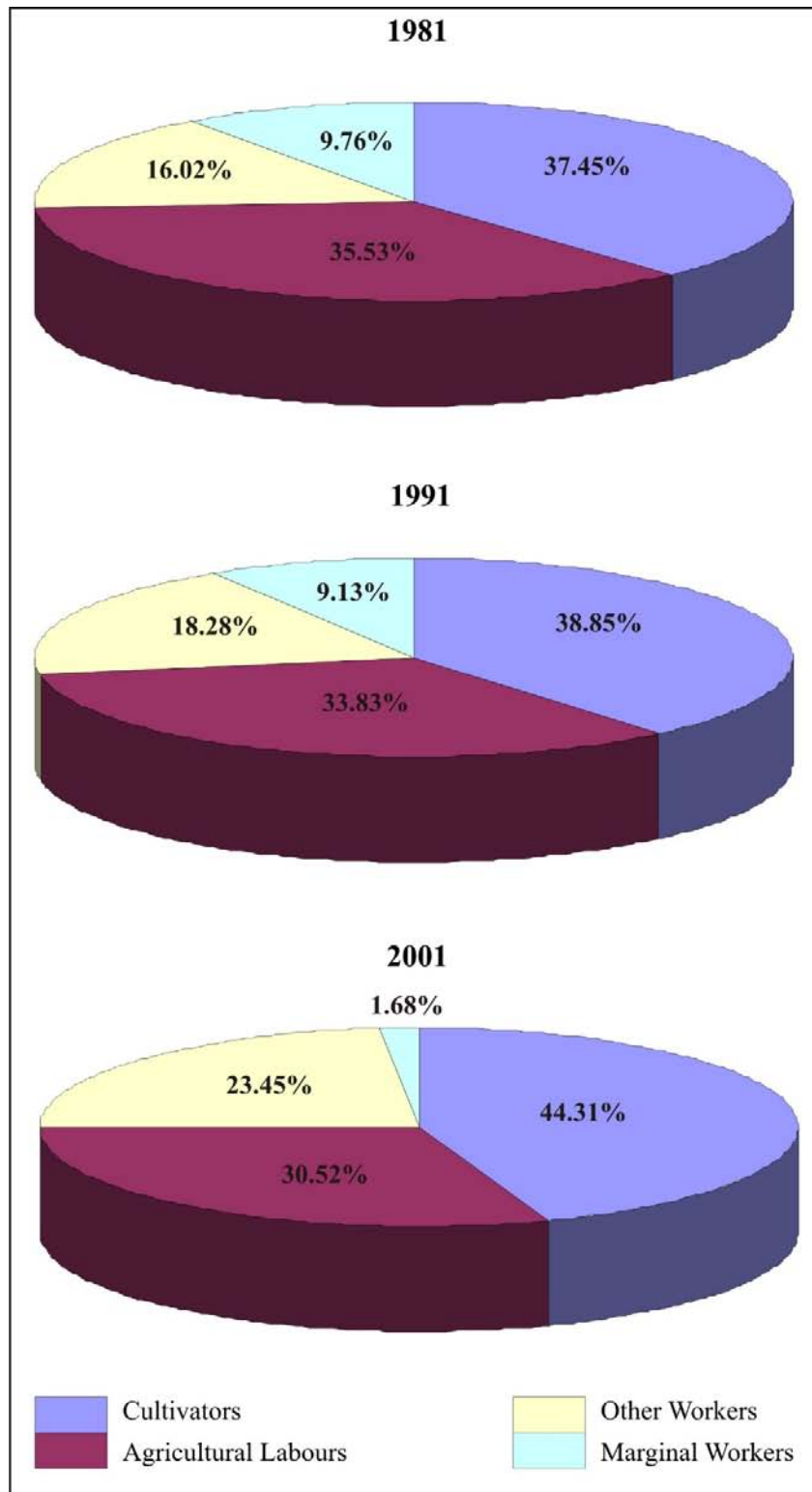
**Fig. 1.2**

### Index No. of the Villages in the Study Area



**Fig. 2.1**

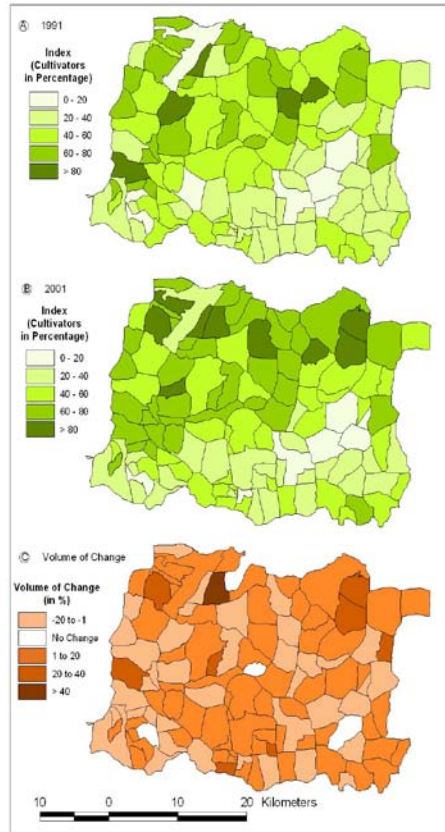
## Occupational Structure of the Baramati Tahsil



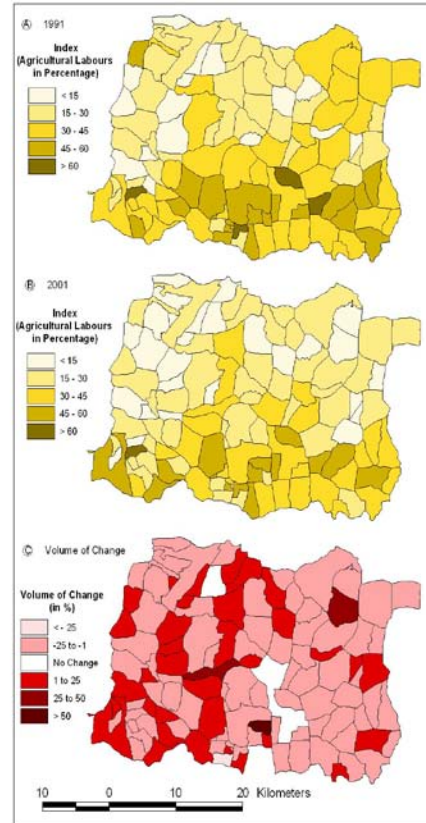
**Fig. 2.10**



### Cultivators



### Agricultural Labours



### Other Workers

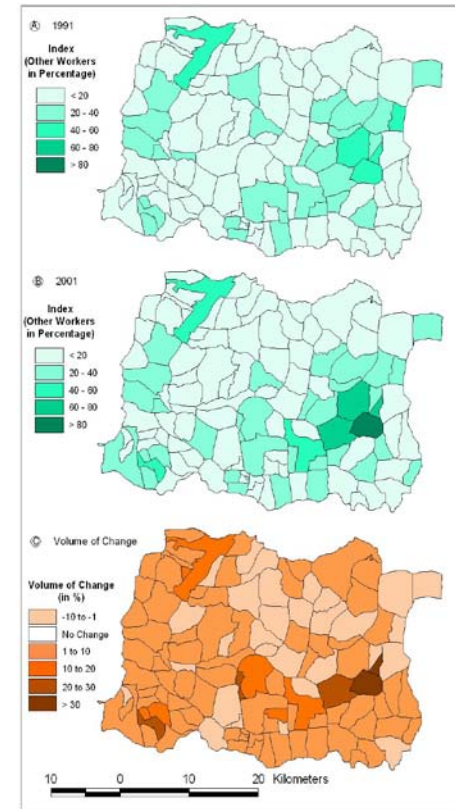
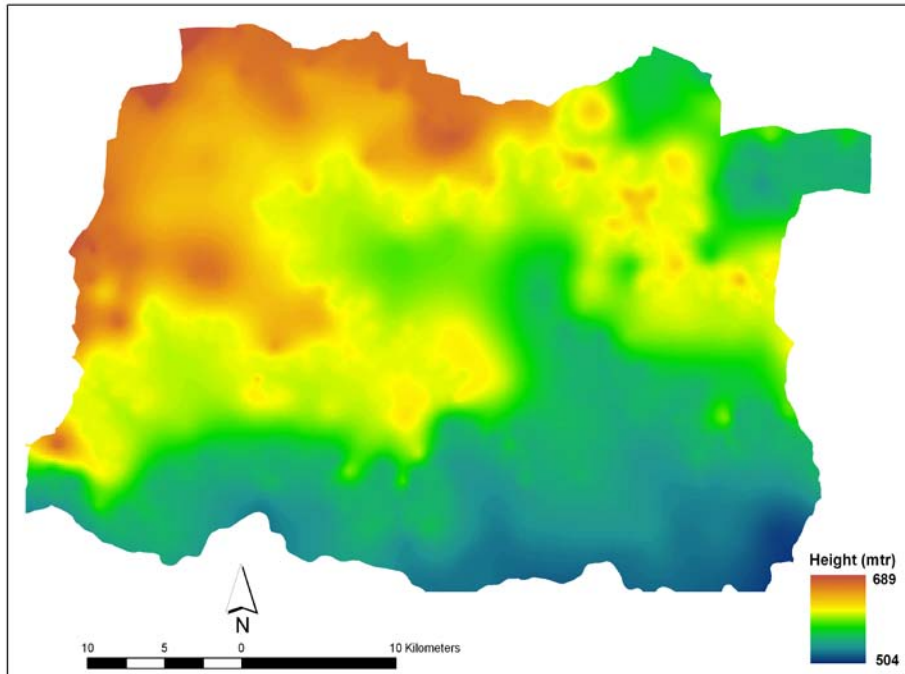


Fig. 2.11

### DEM of the Baramati Tahsil



### Drainage Pattern of the Study Area

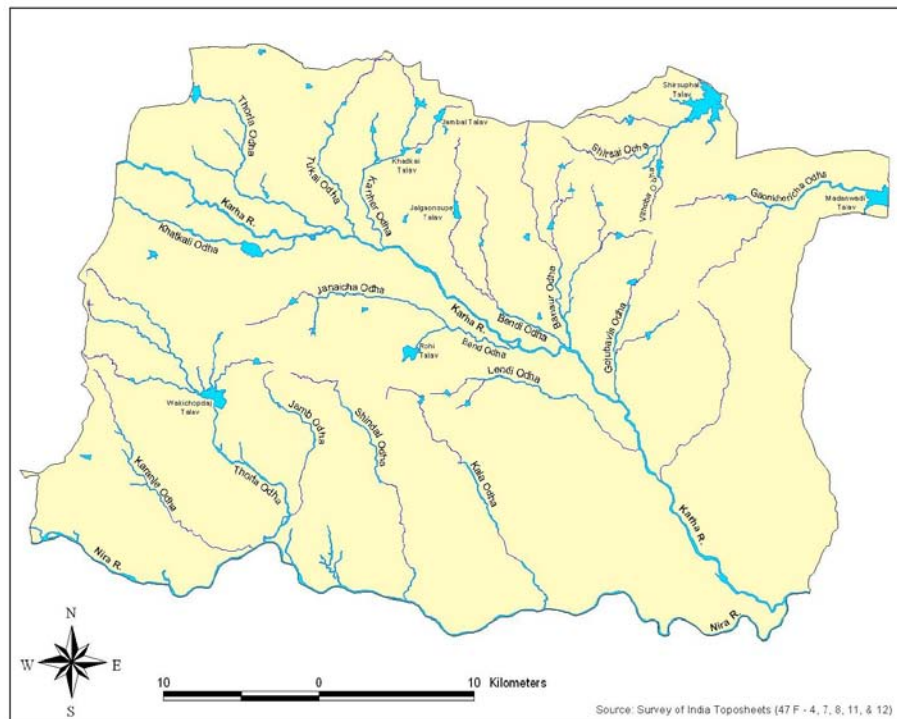


Fig. 2.3

## Geological Map of the Study Area

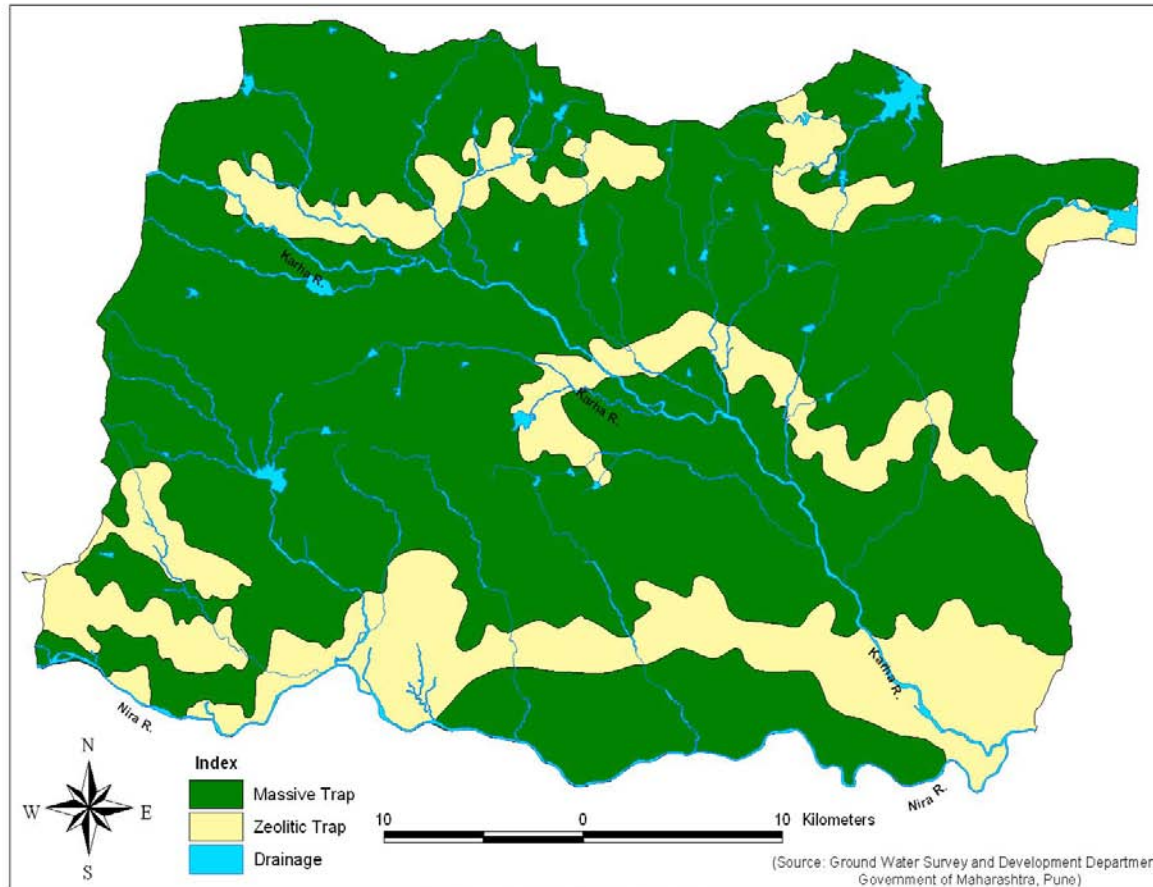


Fig. 2.4: Geological Map of the Study Area

**Fig. 2.4**

## Soil Map of the Study Area

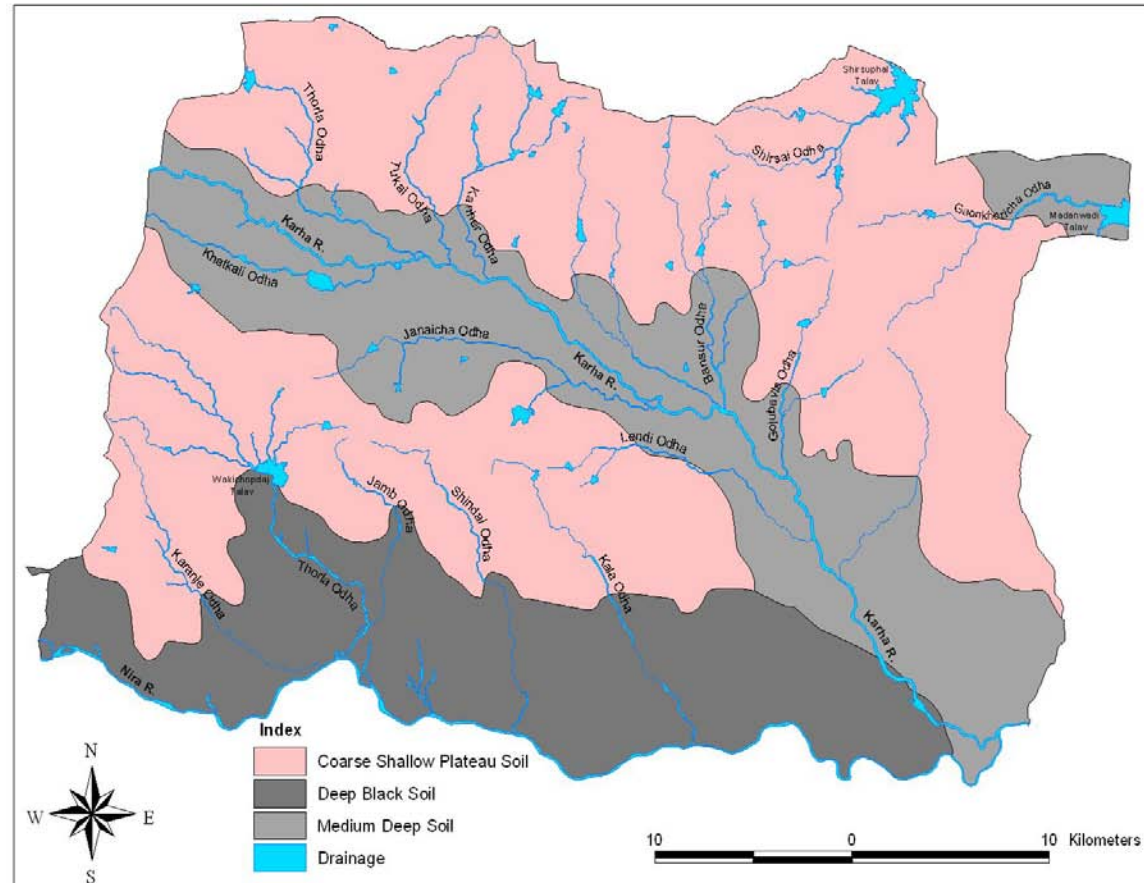


Fig. 2.5: Soil Map of the Study Area

Fig. 2.5

## **Temperature and Rainfall in the Study Area**

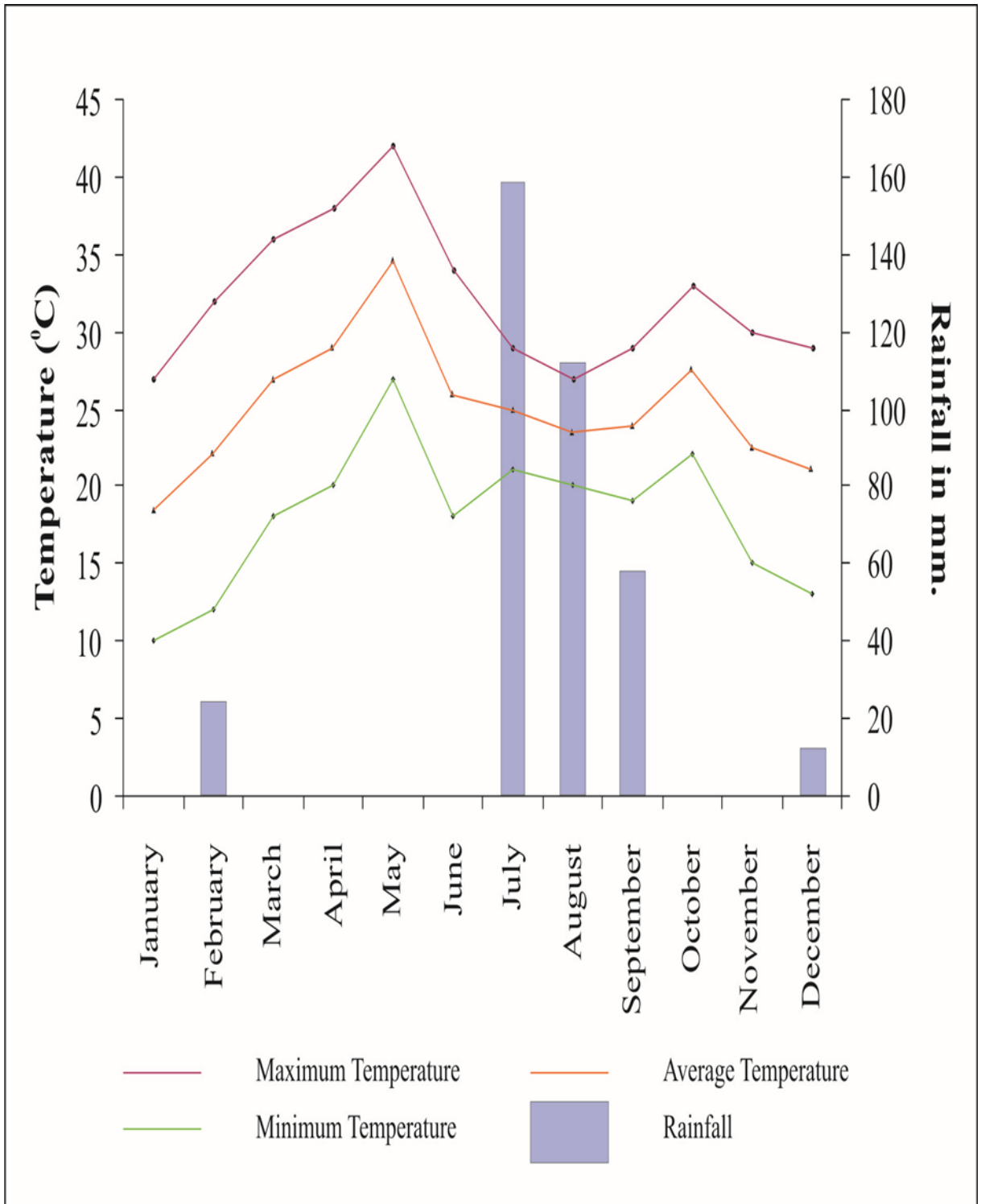


Fig. 2.6: Temperature and Rainfall in the Study Area



## Transport Map of the Study Area

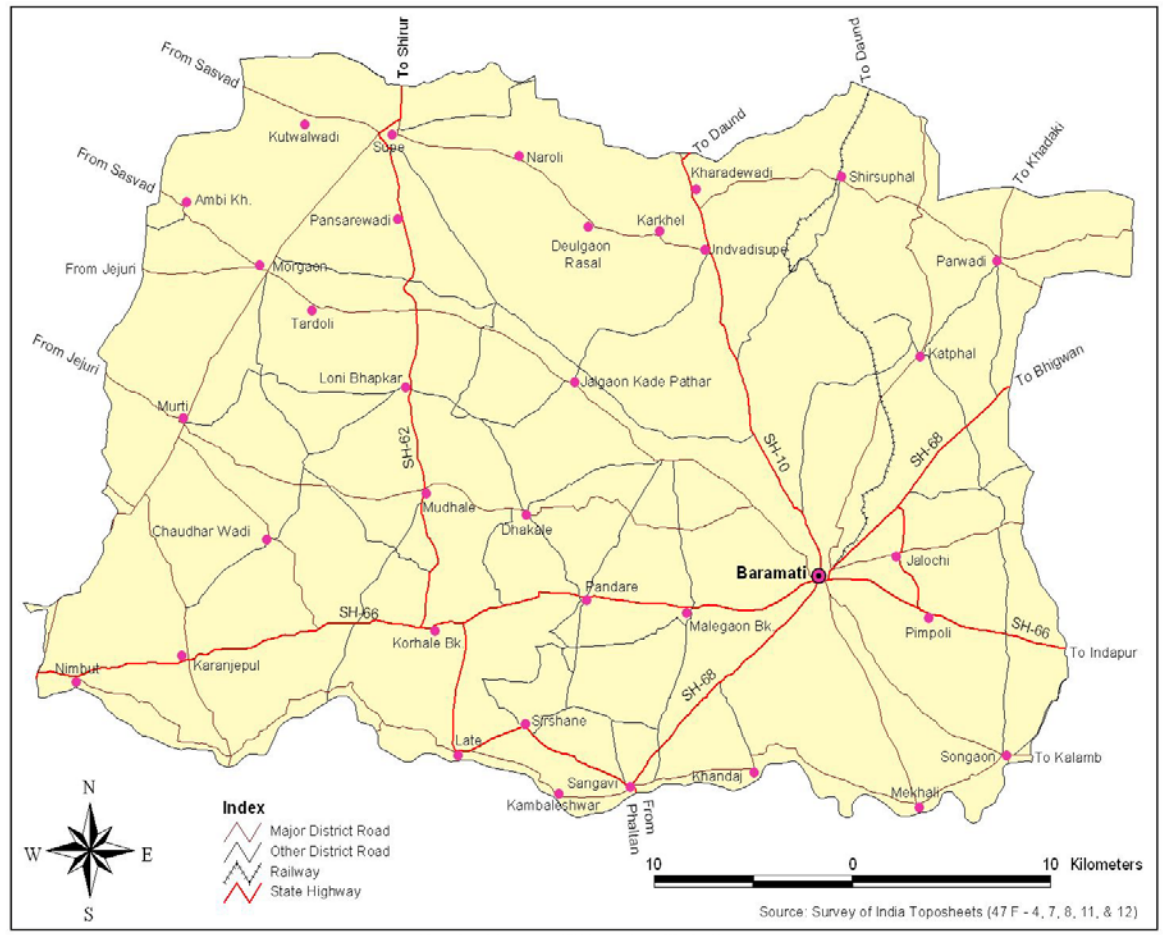


Fig. 2.7: Transport Map of the Study Area

**Fig. 2.7**

## Population Density of the Study Area

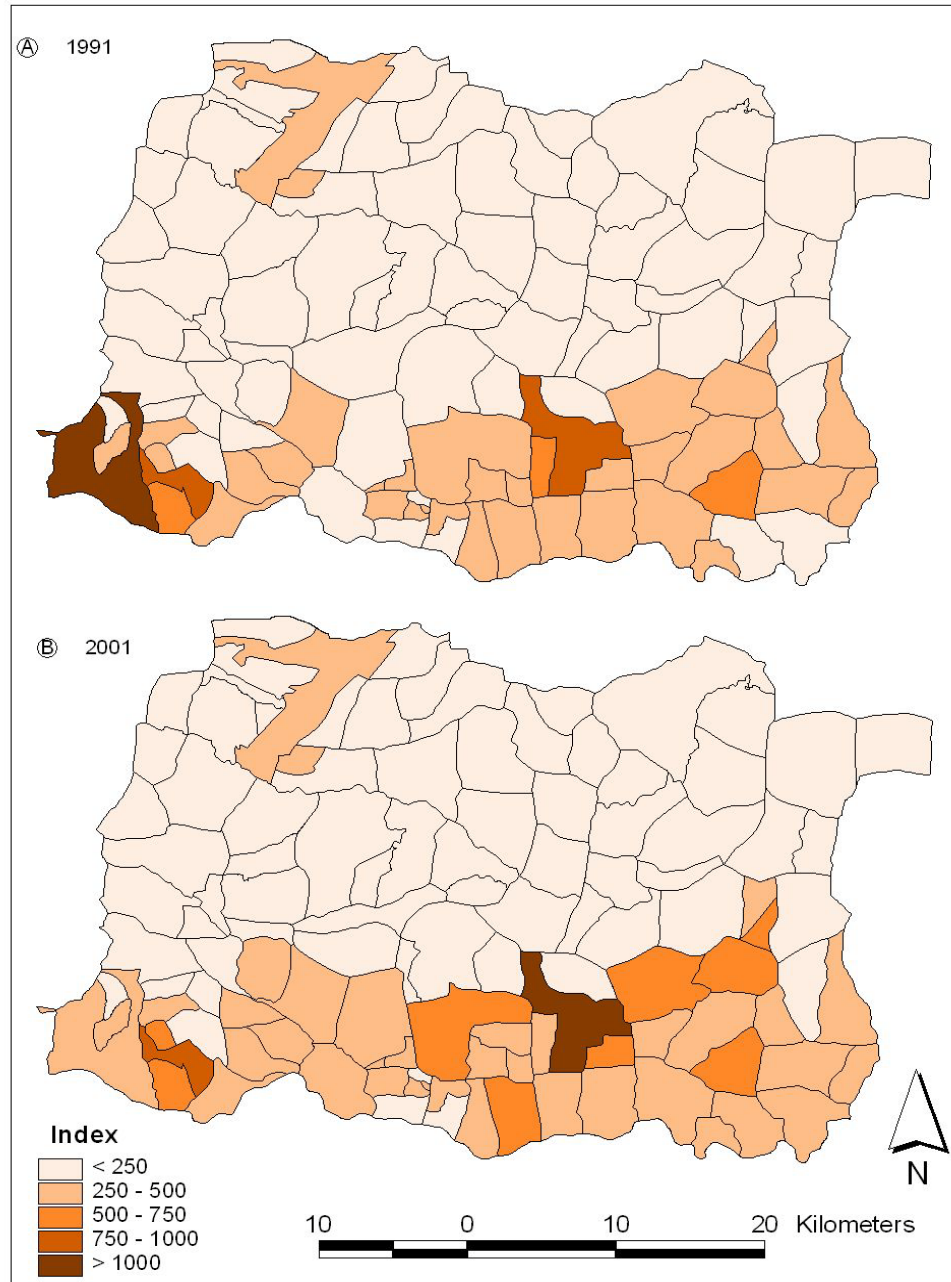


Fig. 2.8: Population Density Map of the Study Area

Fig. 2.8



### Weekly Market Centre of the Study Area

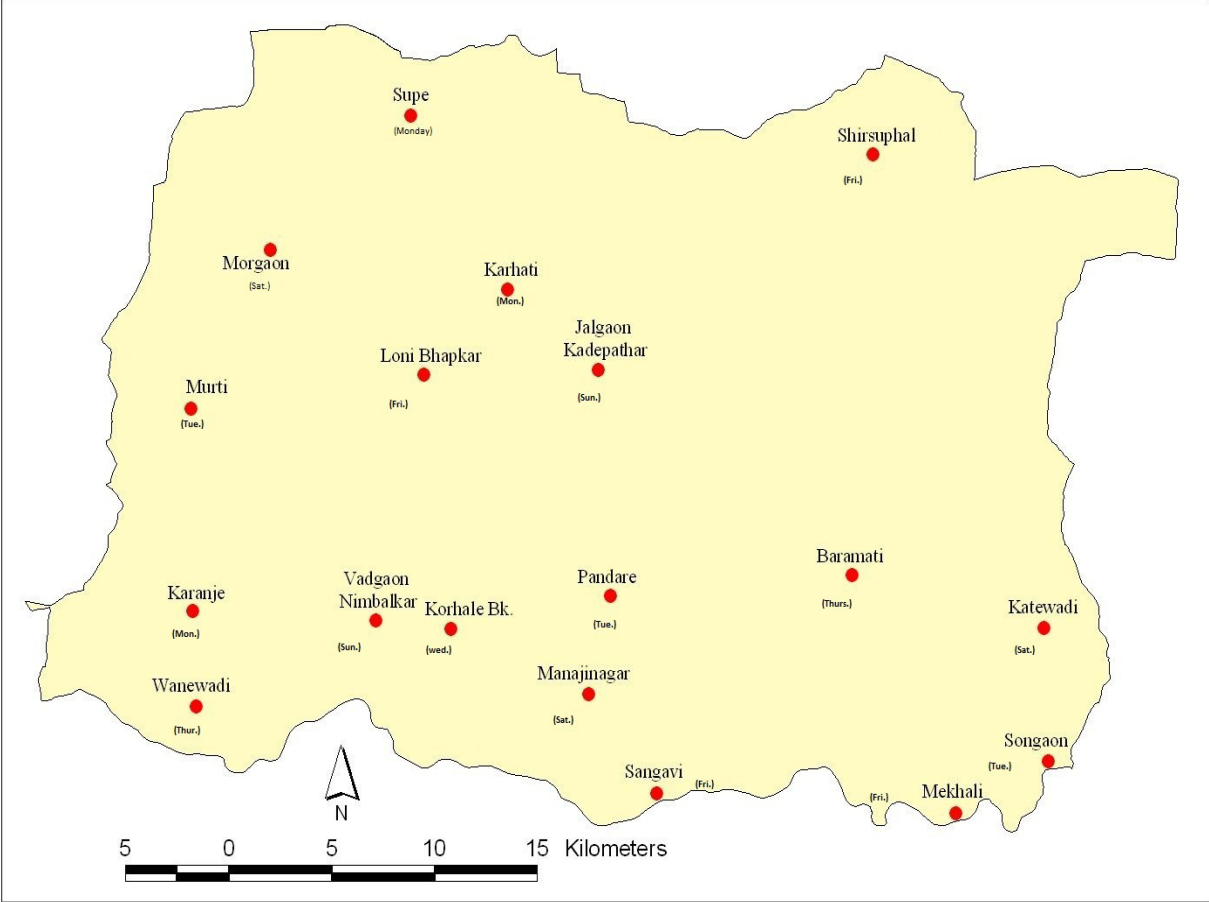
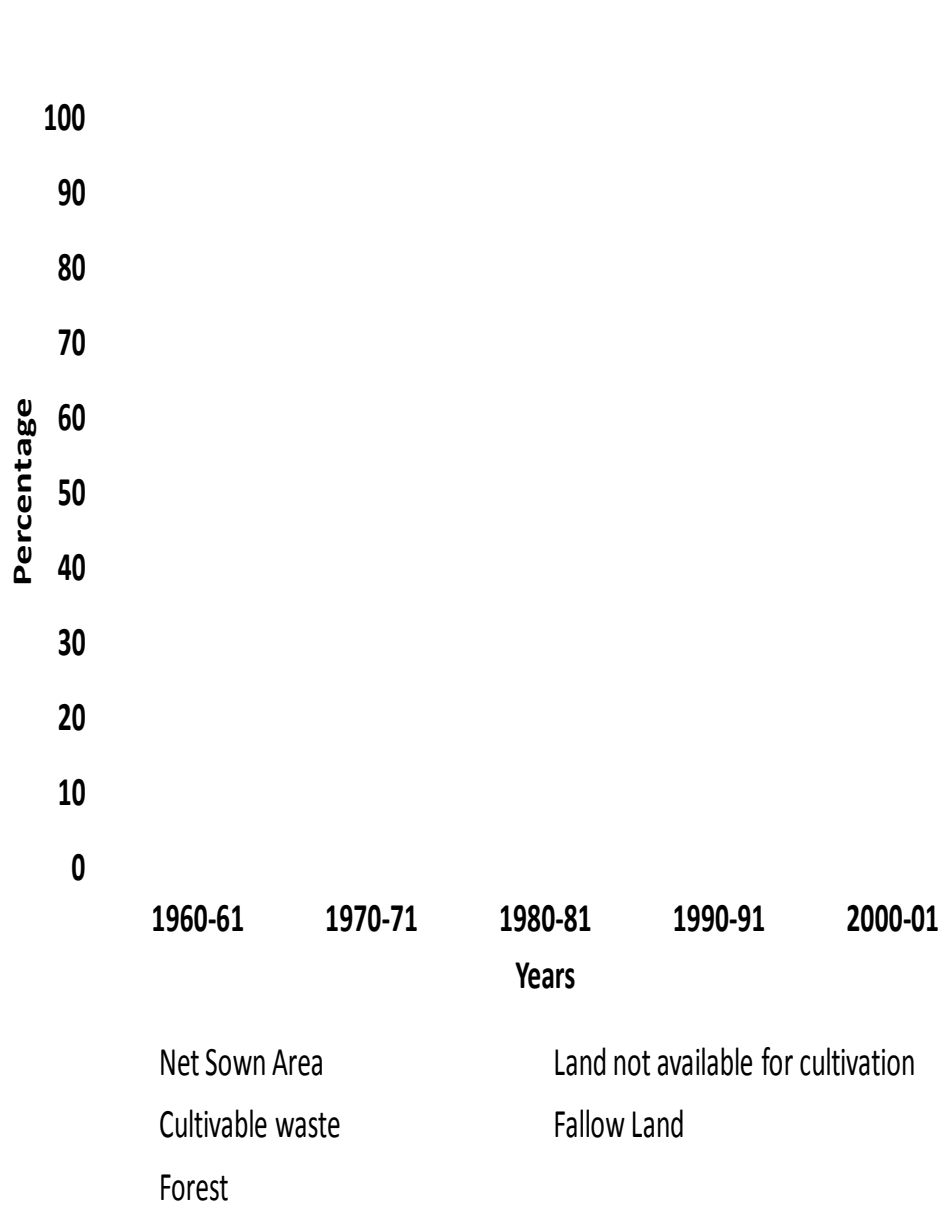


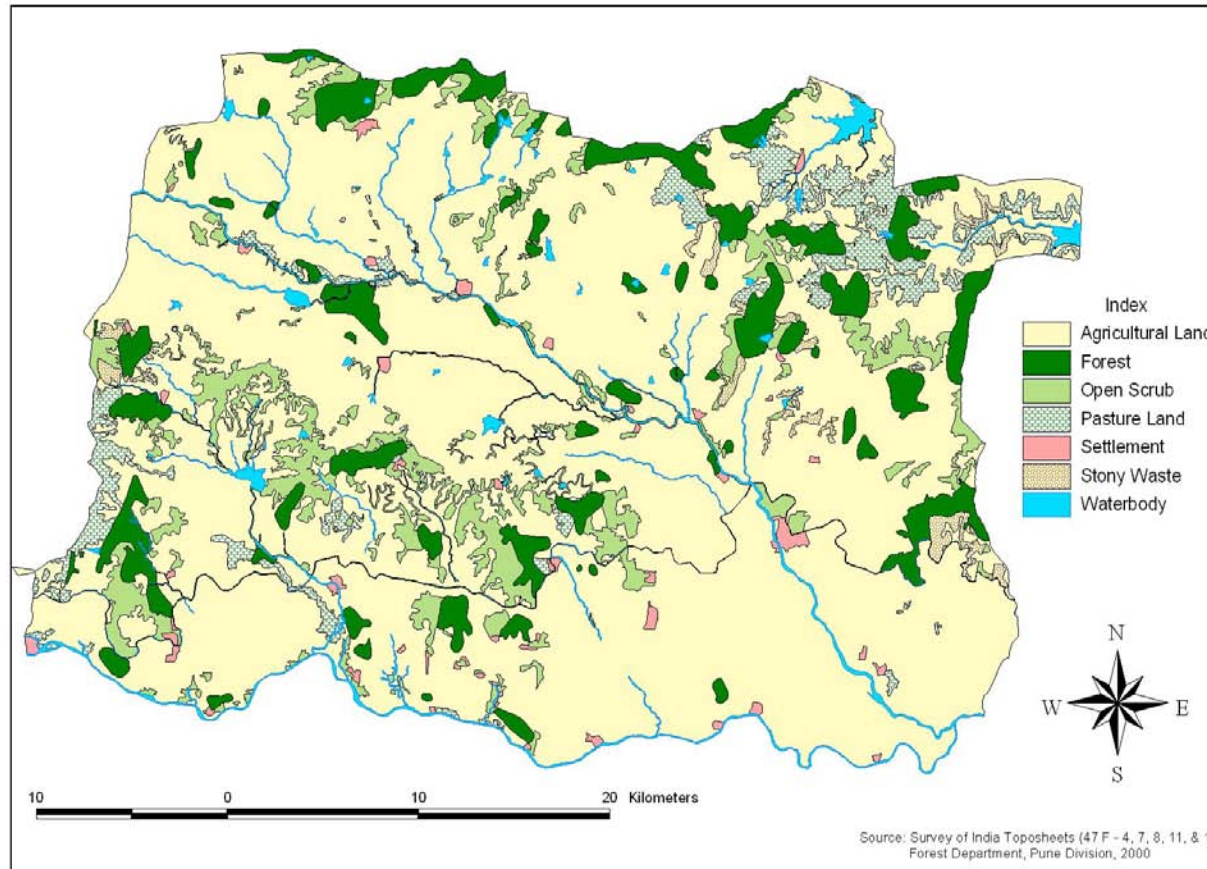
Fig. 2.9

### Temporal Variation in General Landuse Pattern of the study area



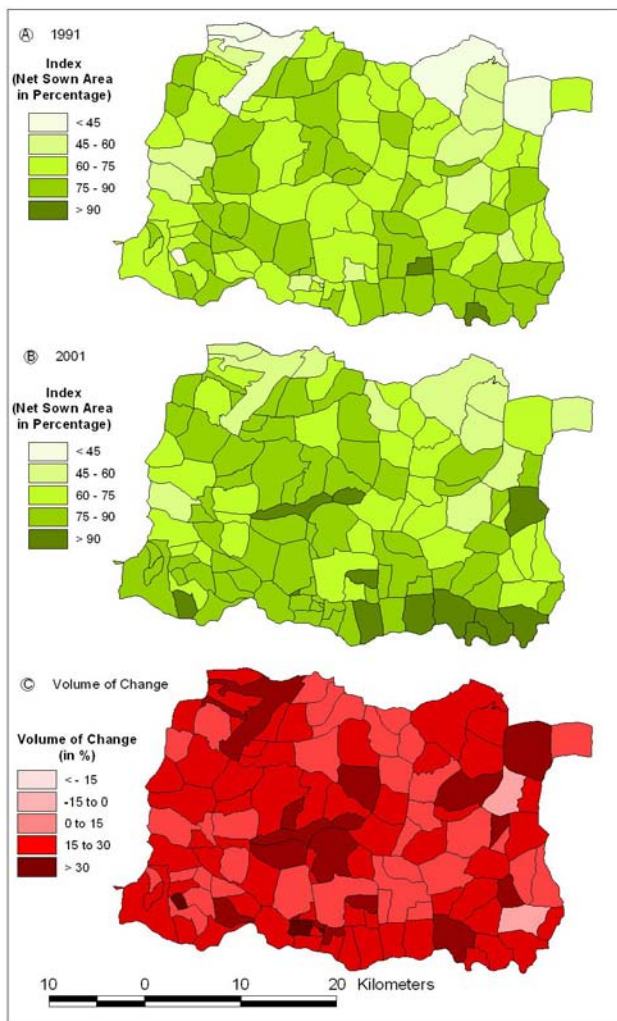
**Fig. 3.1**

### General Landuse of the Study Area (2001)



**Fig. 3.2**

### Net Sown Area



### Land Not Available for Cultivation

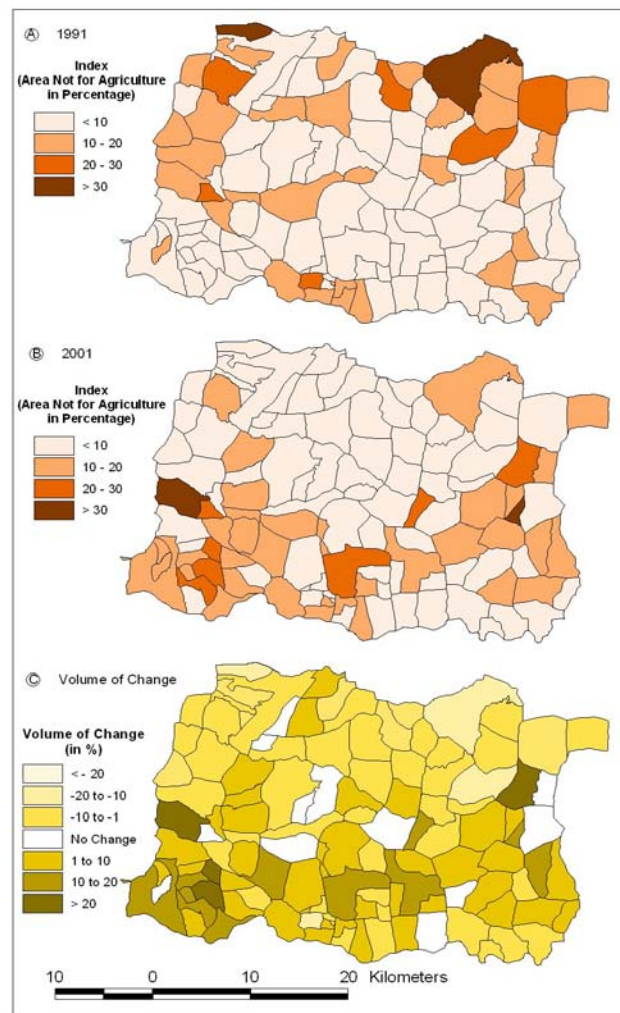
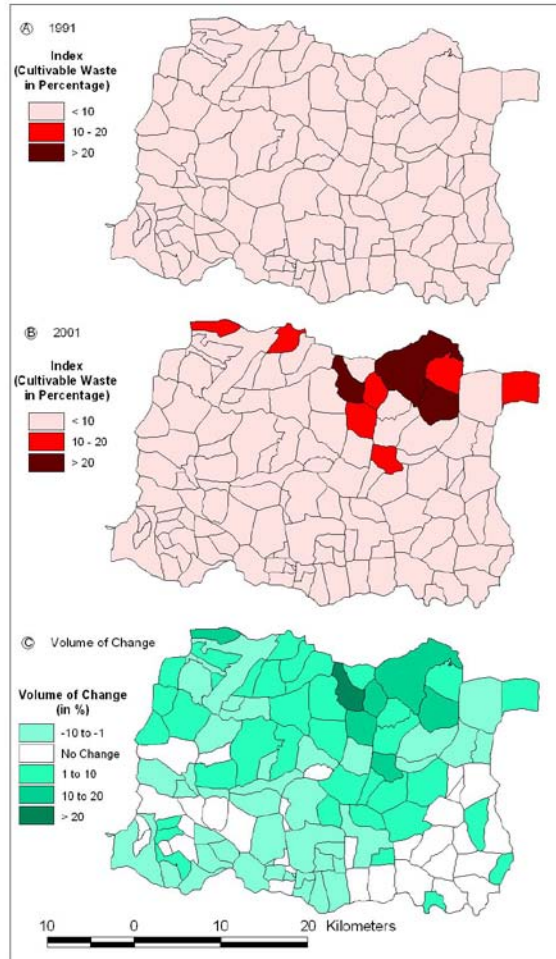


Fig. 3.3

### Cultivable Waste



### Fallow Land

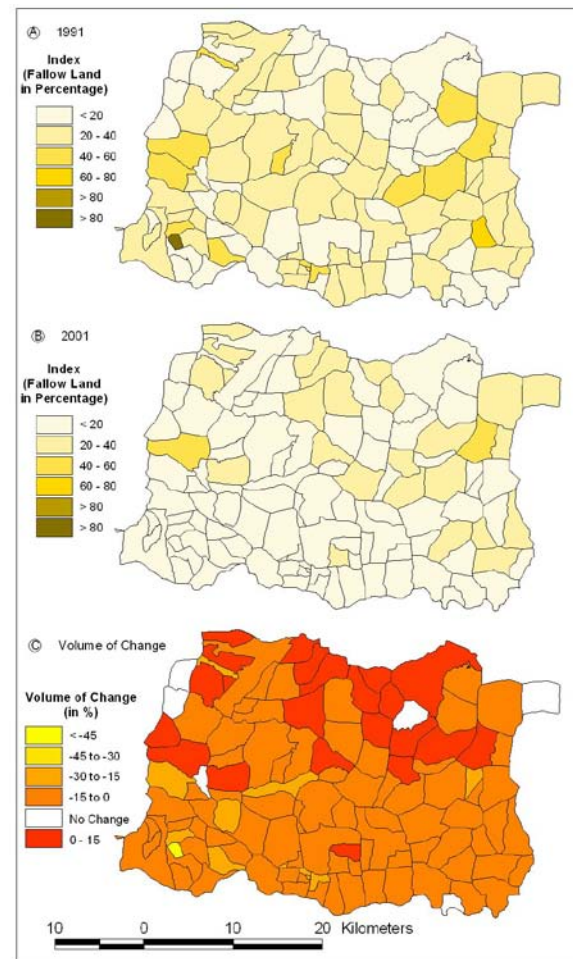
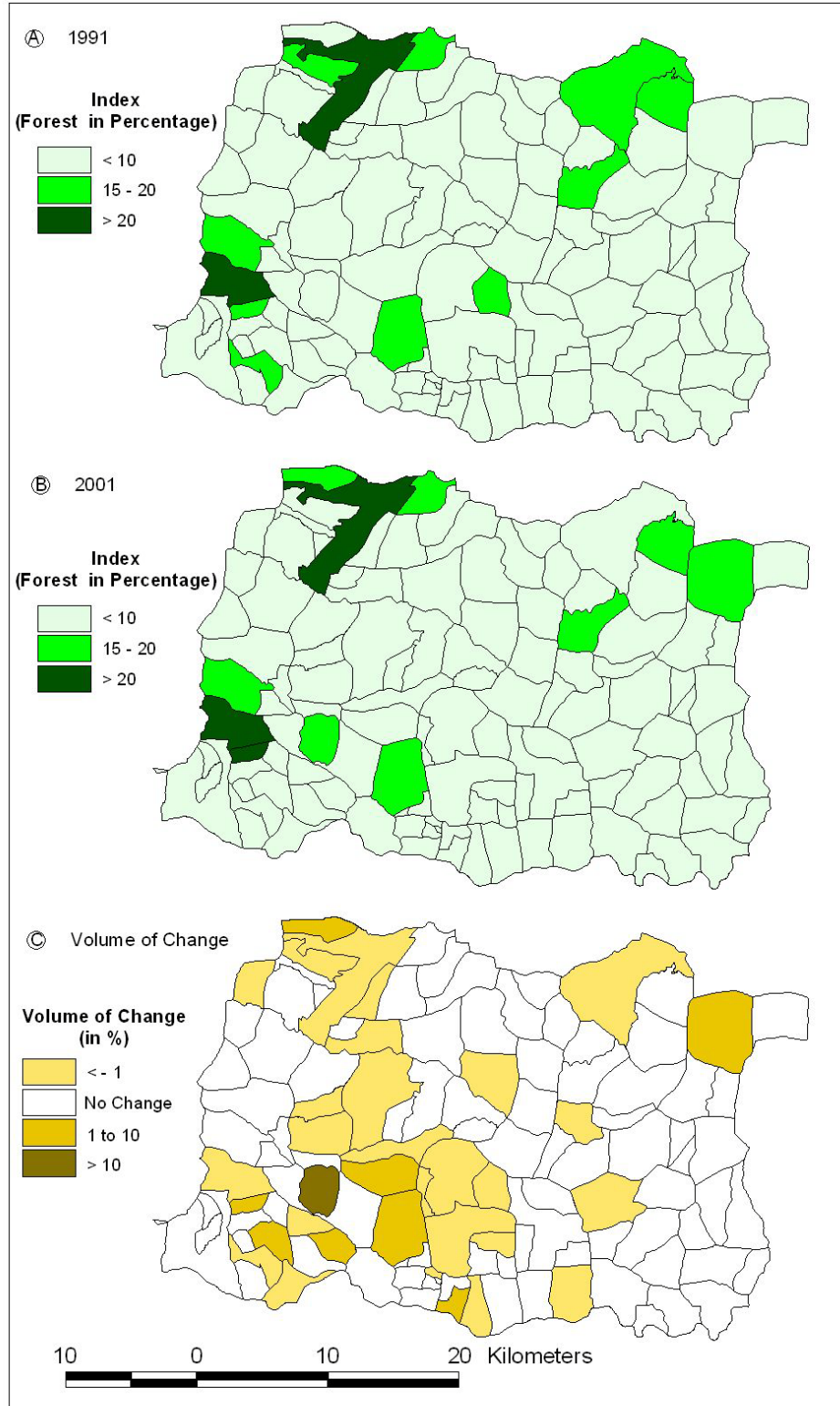


Fig. 3.4

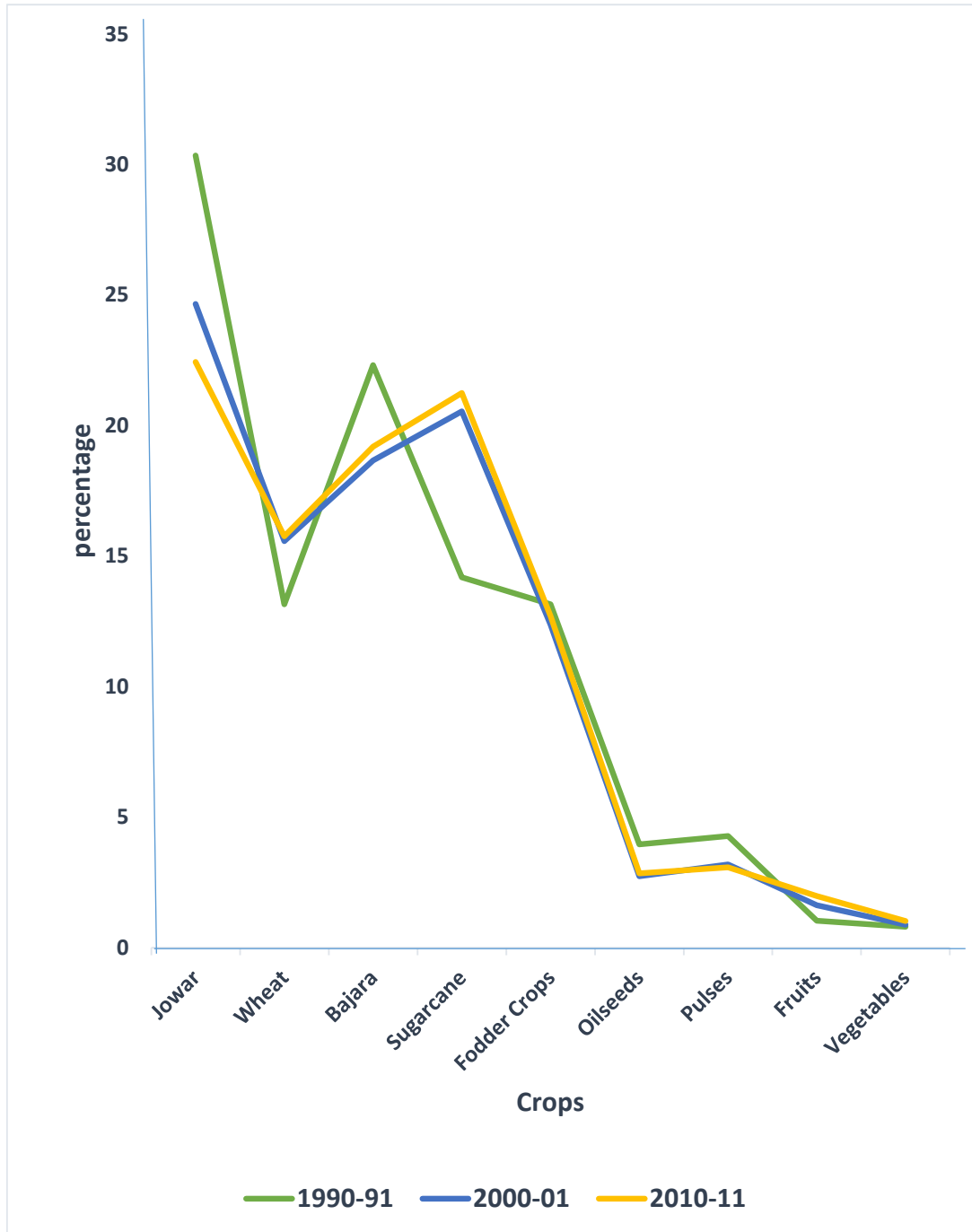


# Forest Land



**Fig. 3.5**

**Temporal Variations of the Baramati tahsil of major crops  
(1990-91 to 2010-11)**



**Fig. 4.1**

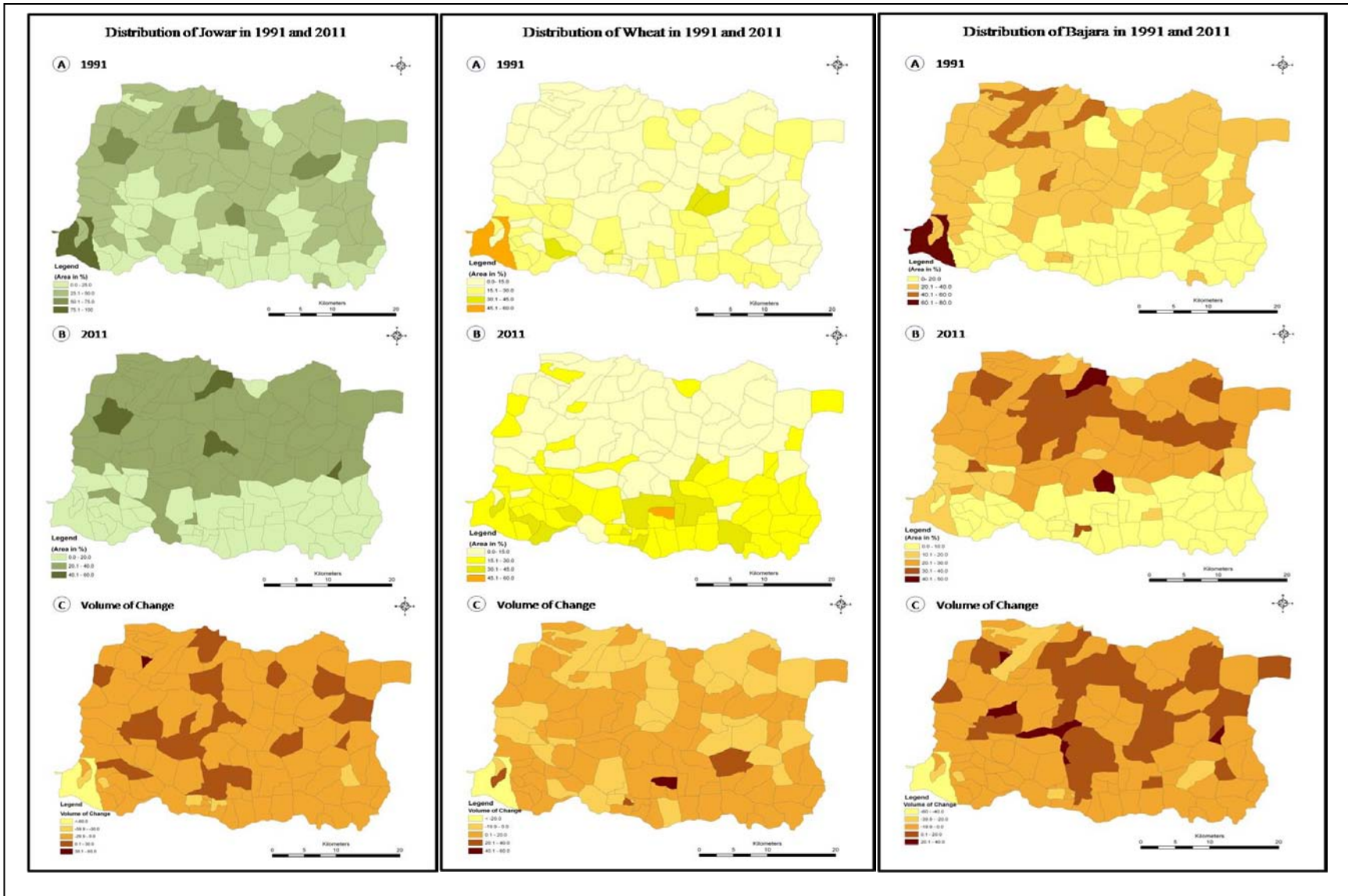


Fig.4.2



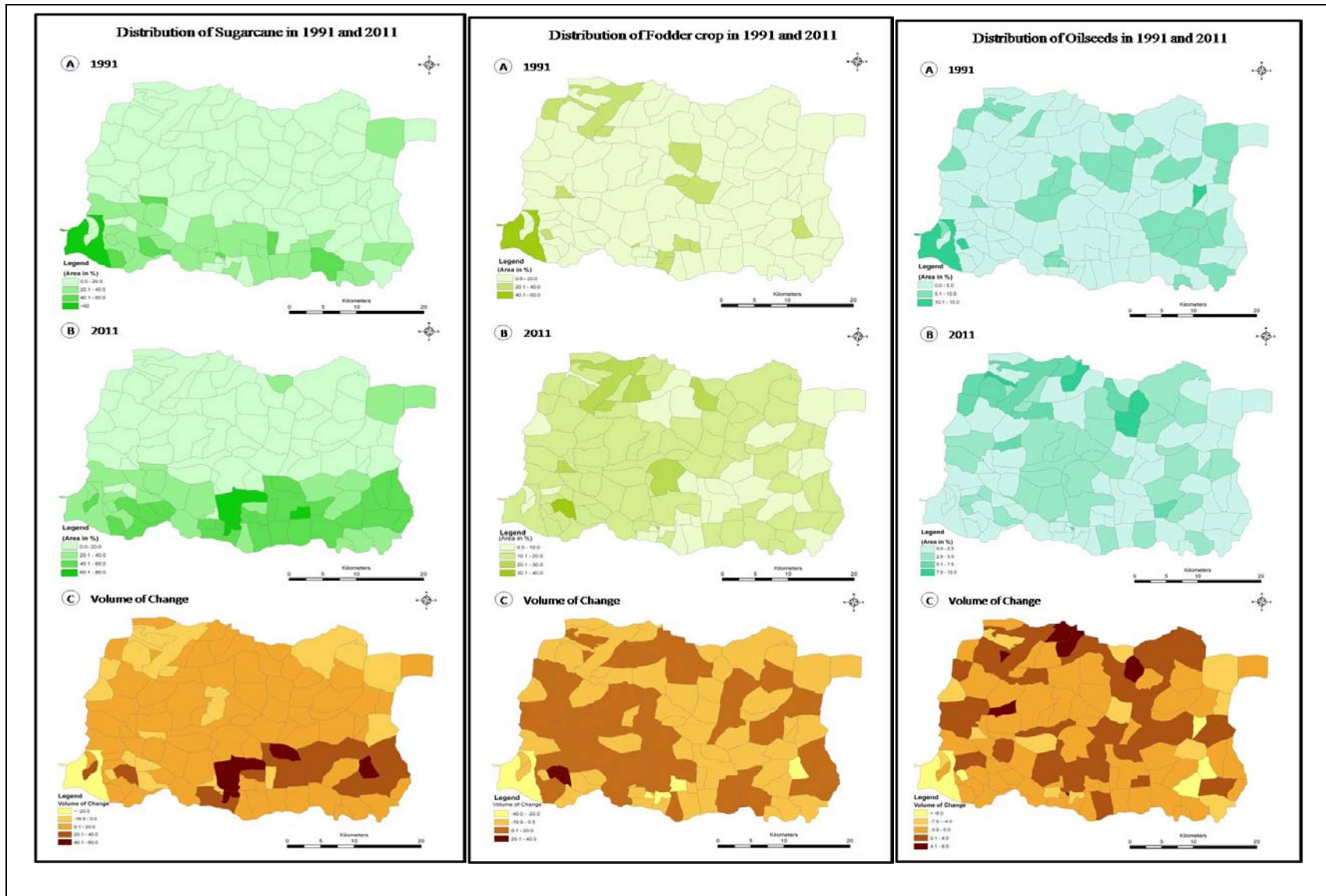
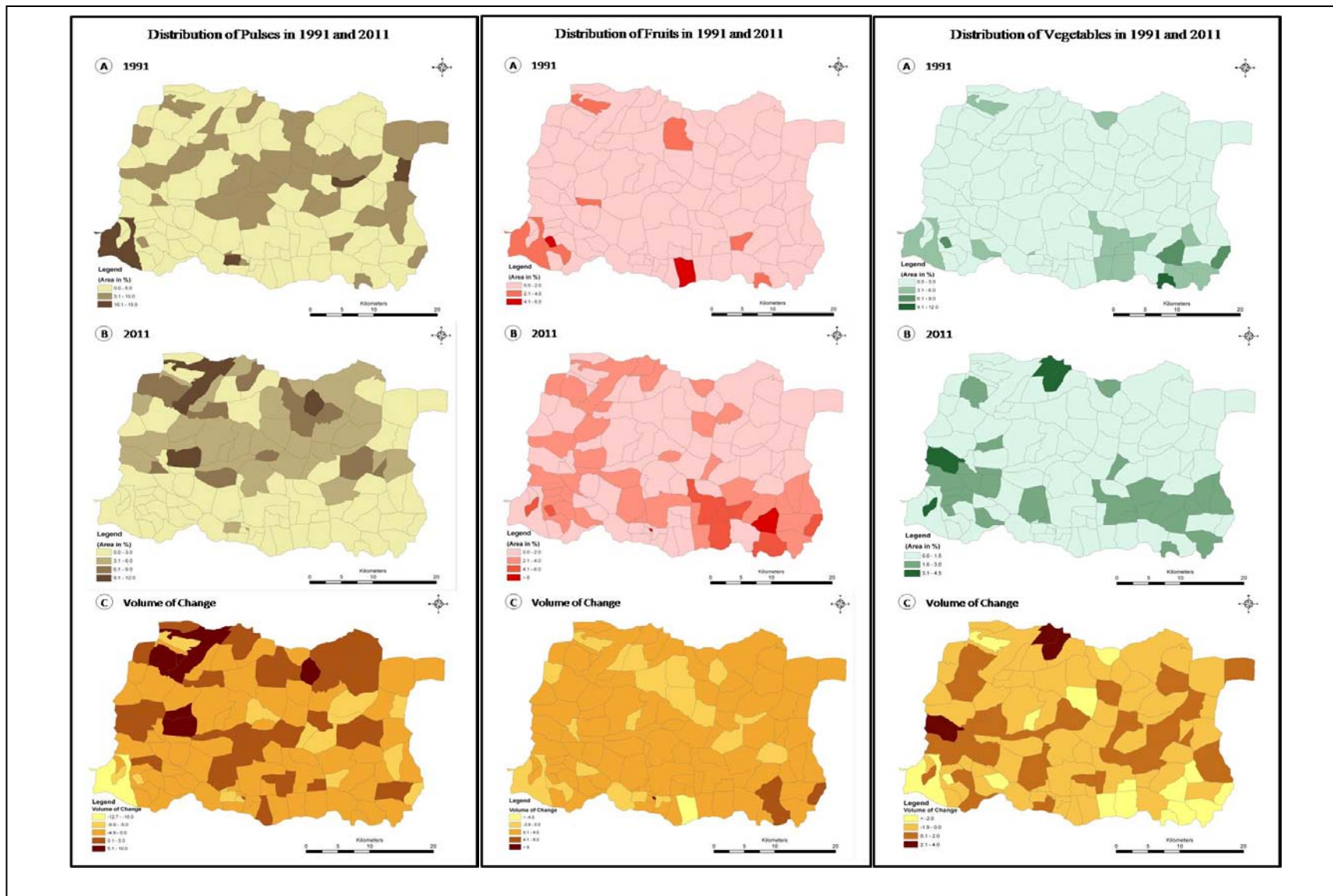
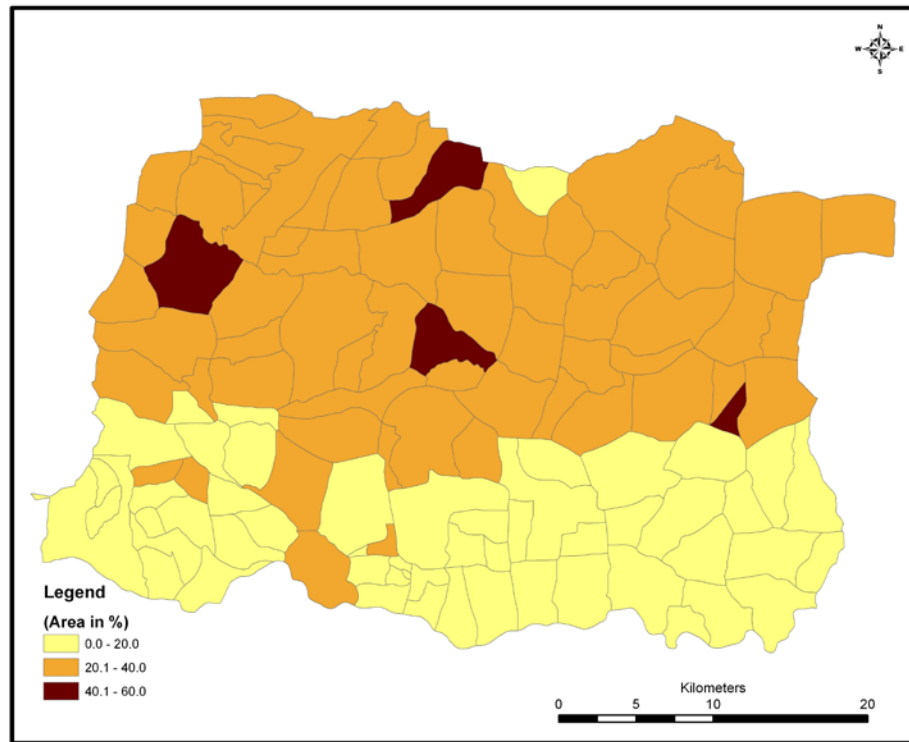


Fig. 4.3



**Fig. 4.4**

## Distribution of Jowar



## Distribution of Wheat

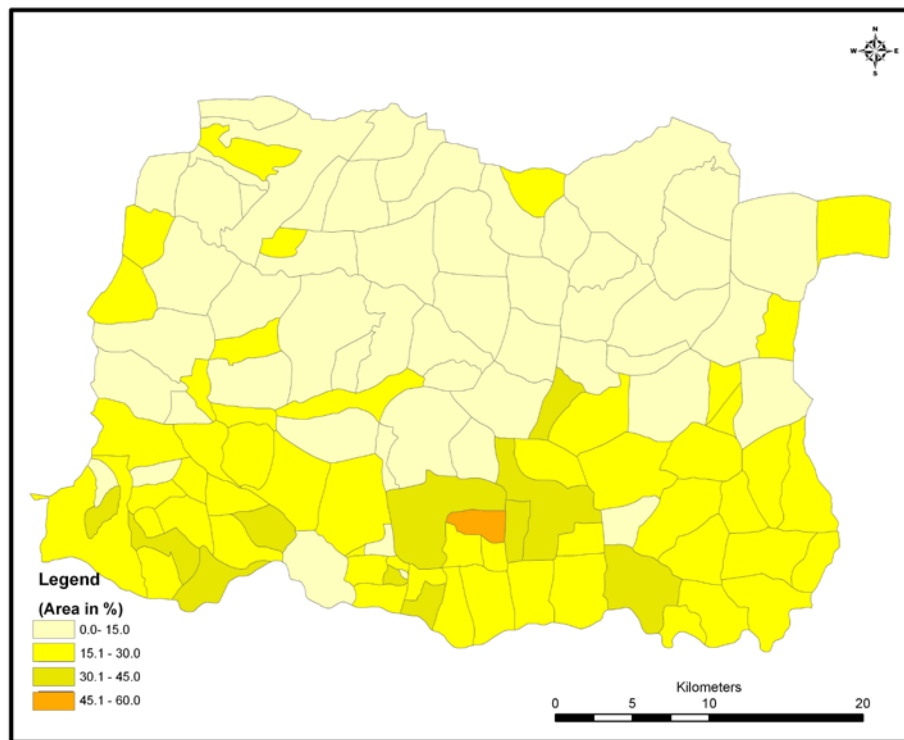
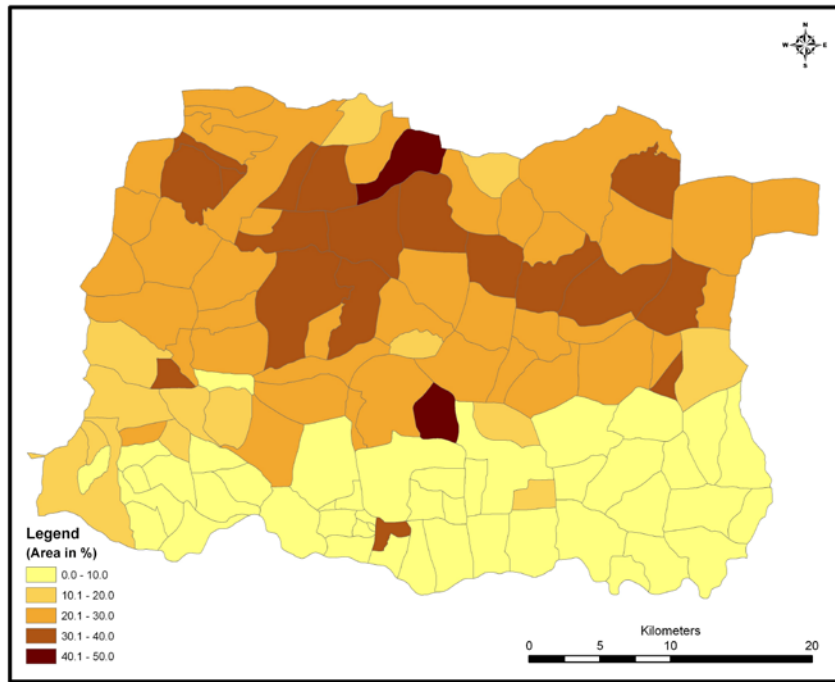


Fig. 4.5

### Distribution of Bajara



### Distribution of Sugarcane

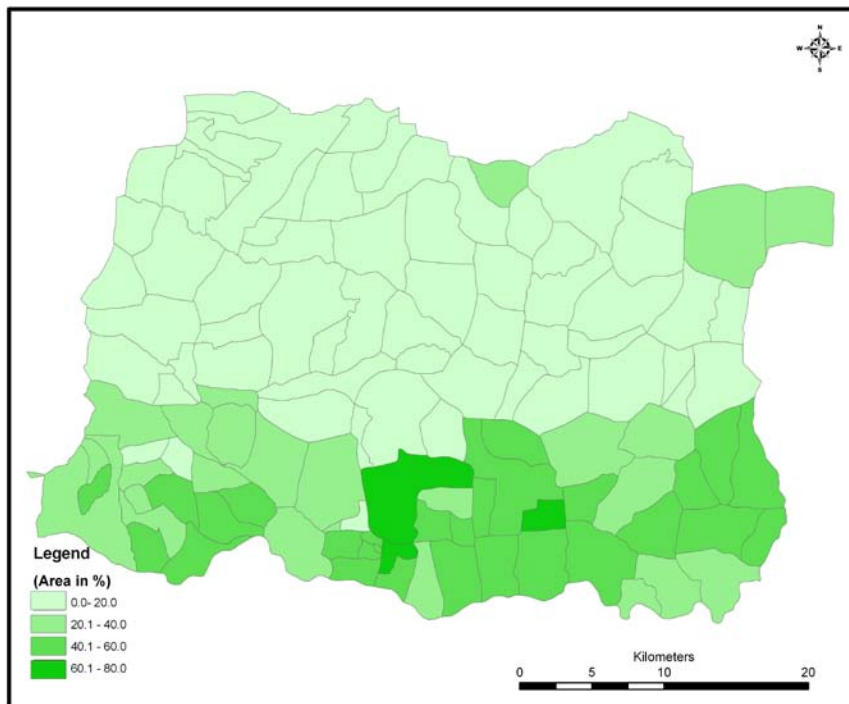
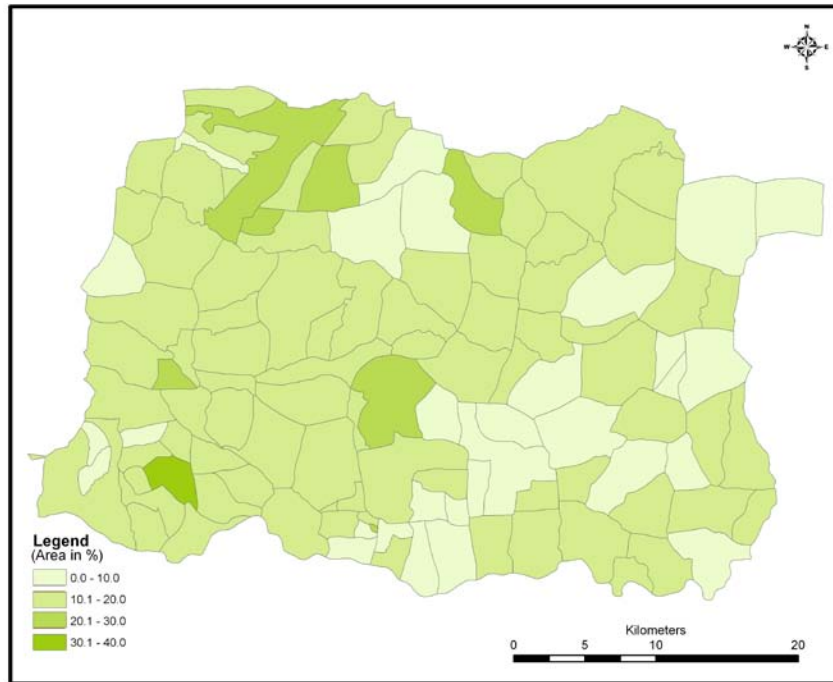


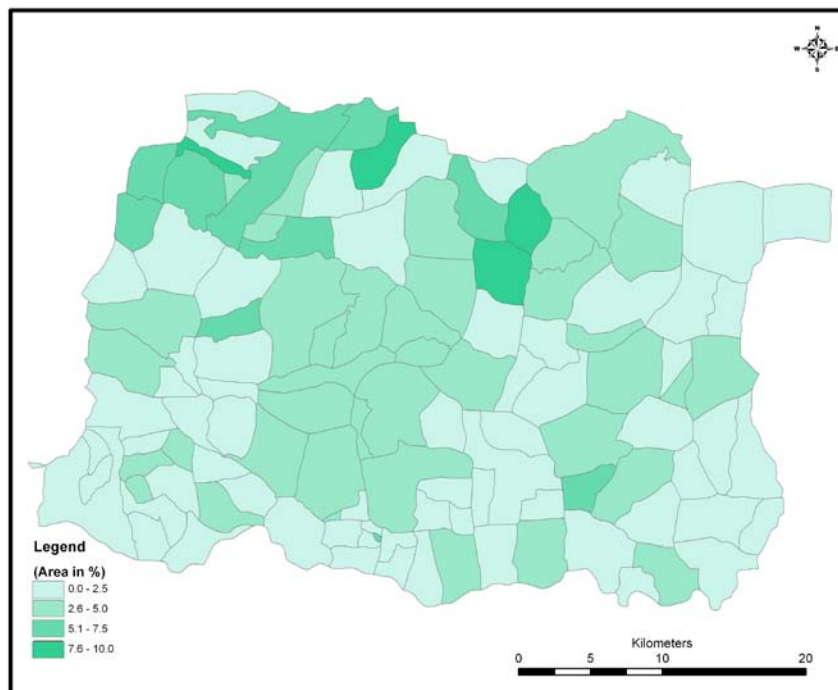
Fig. 4.6



## Distribution of Fodder Crops

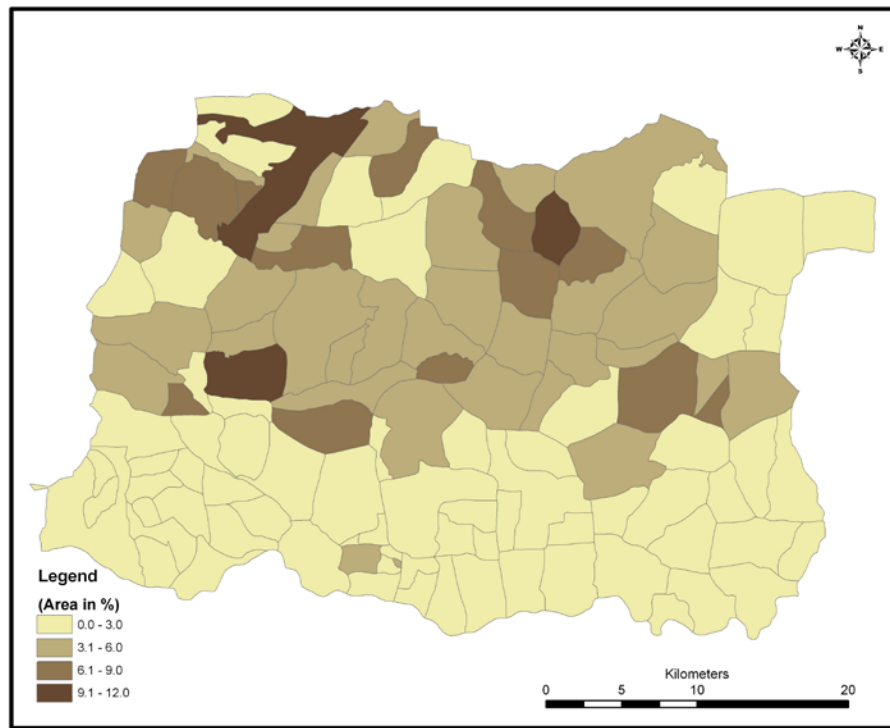


## Distribution of Oilseeds

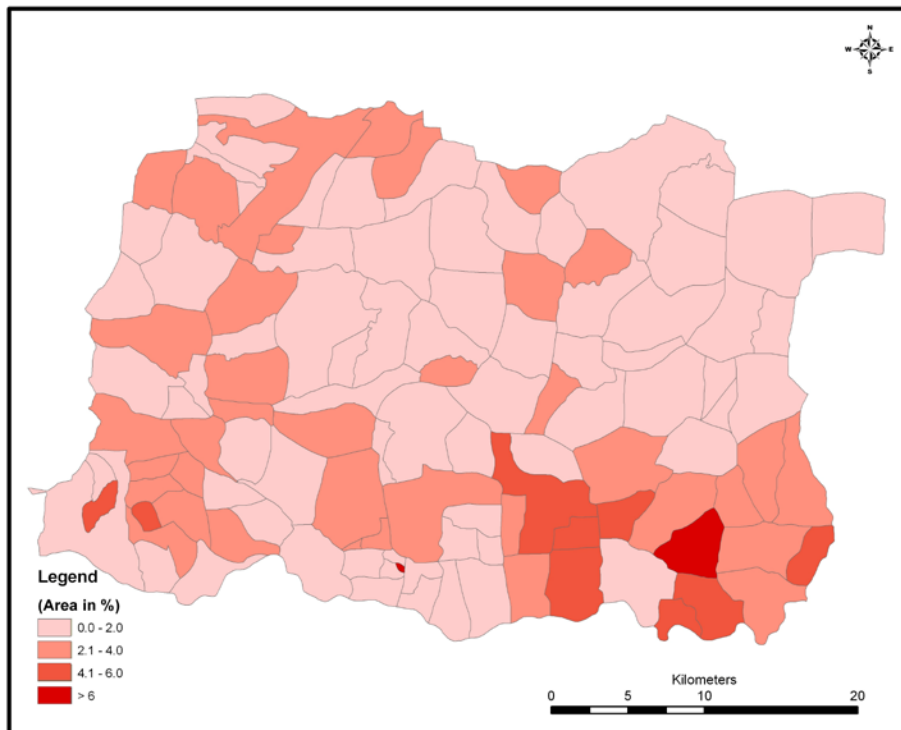


**Fig. 4.7**

## Distribution of Pulses

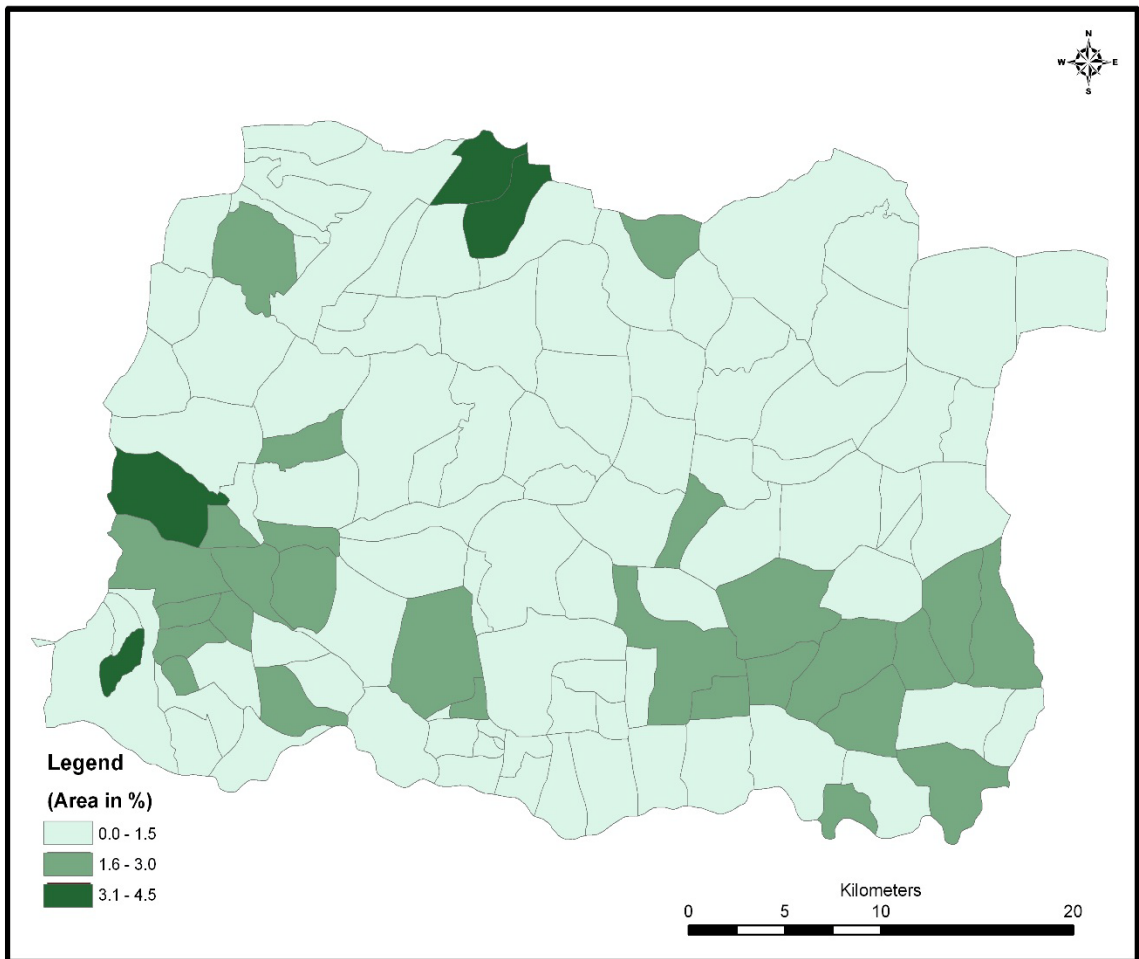


## Distribution of Fruits

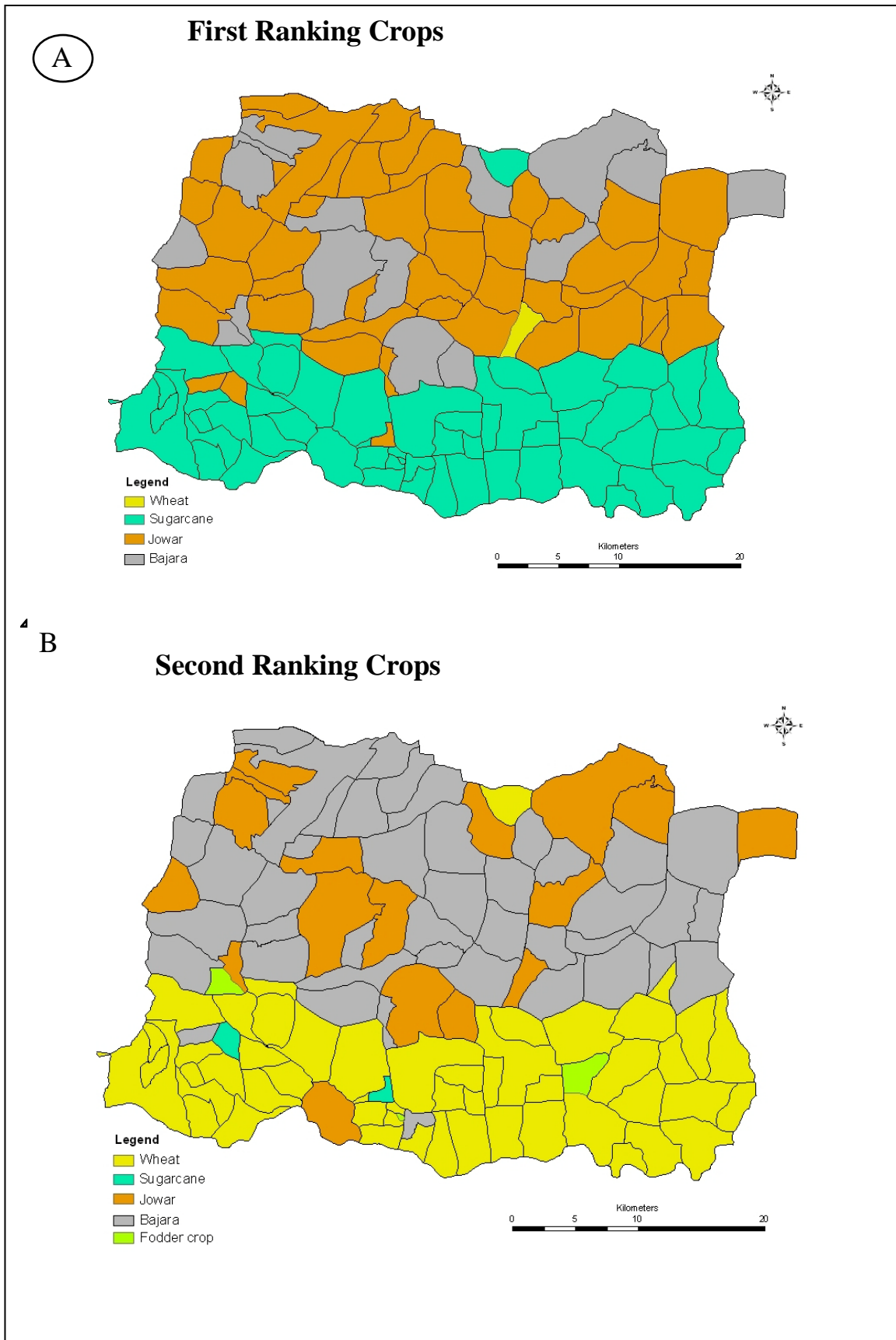


**Fig. 4.8**

## Distribution of Vegetables

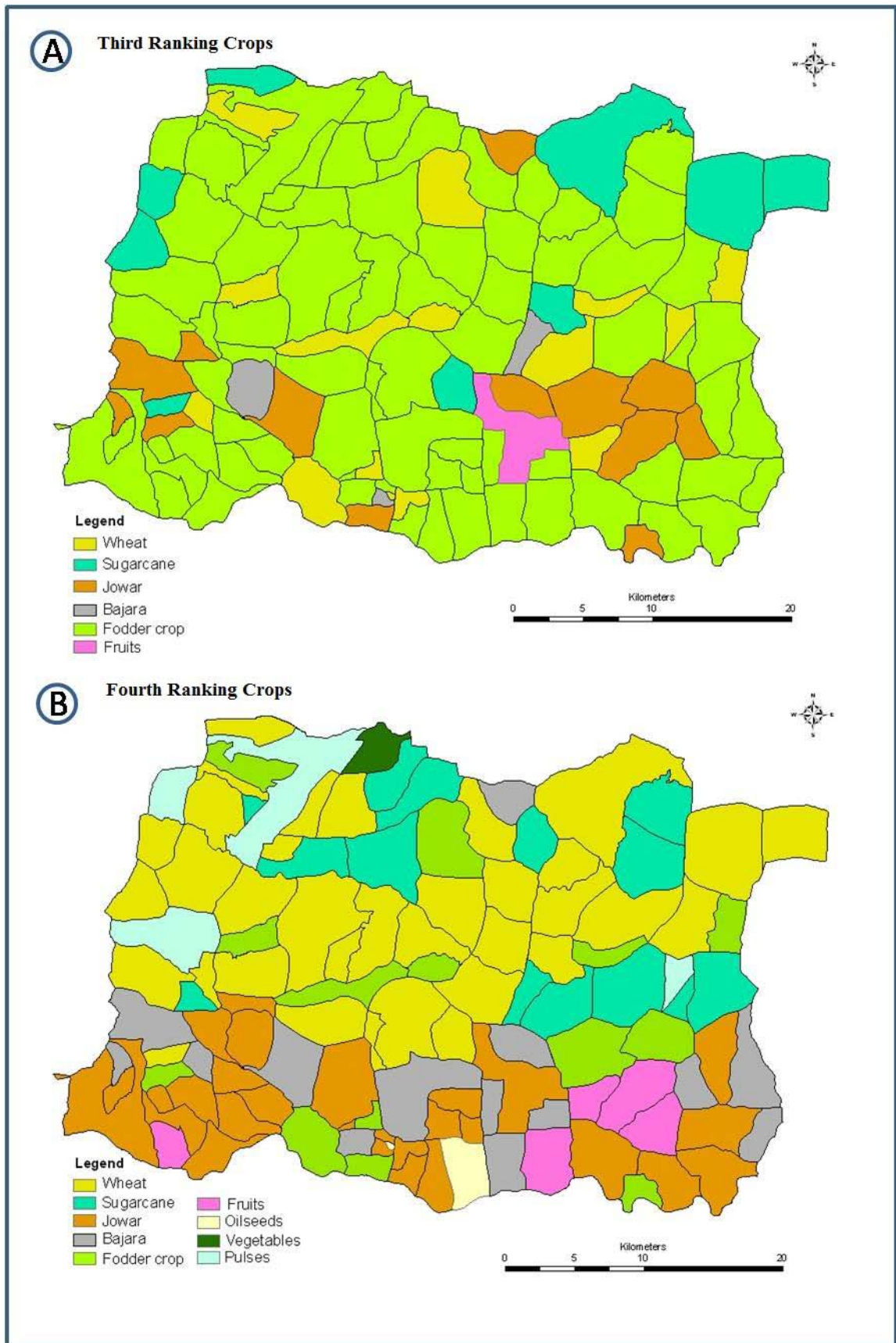


**Fig. 4.9**

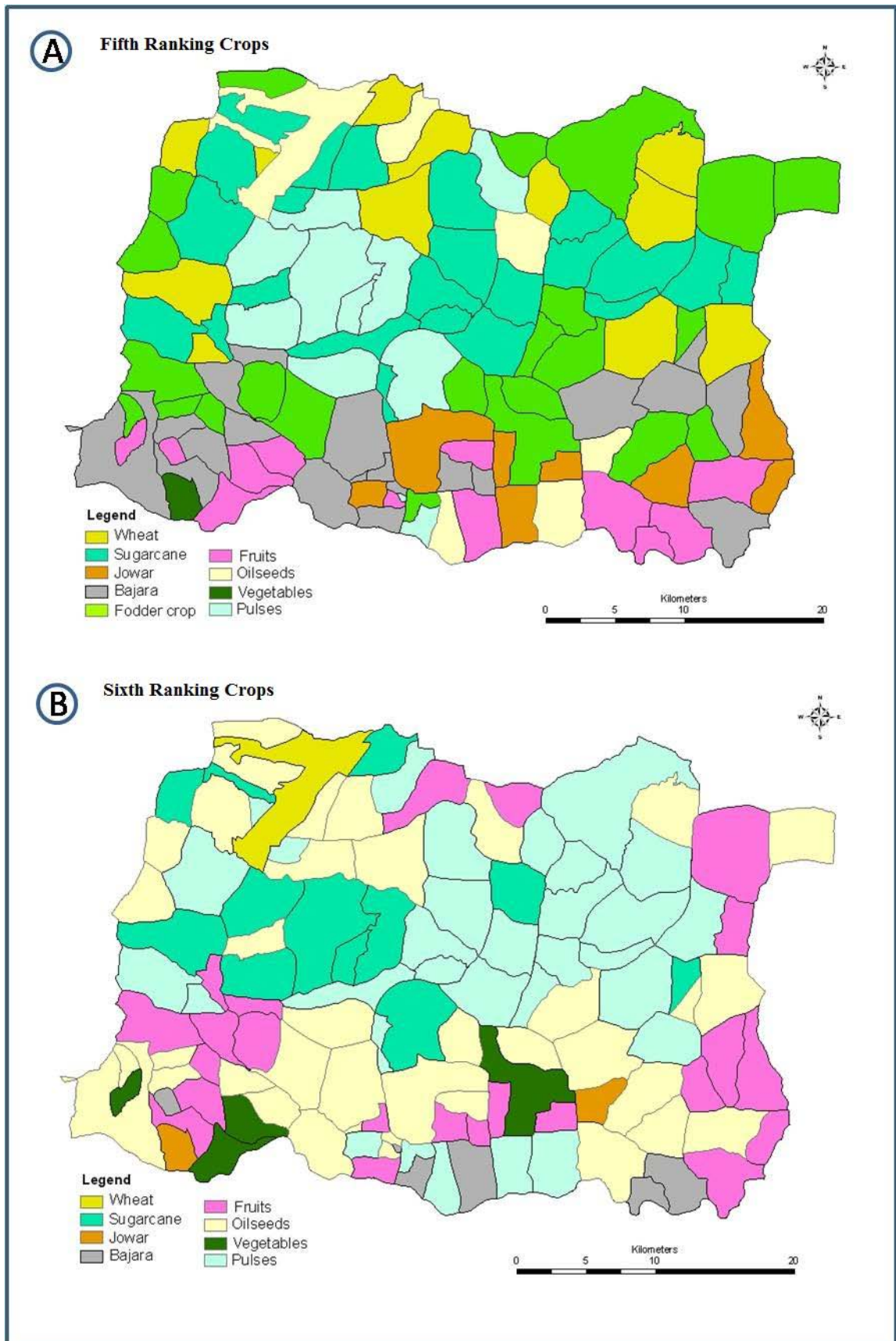


**Fig. 5.1**

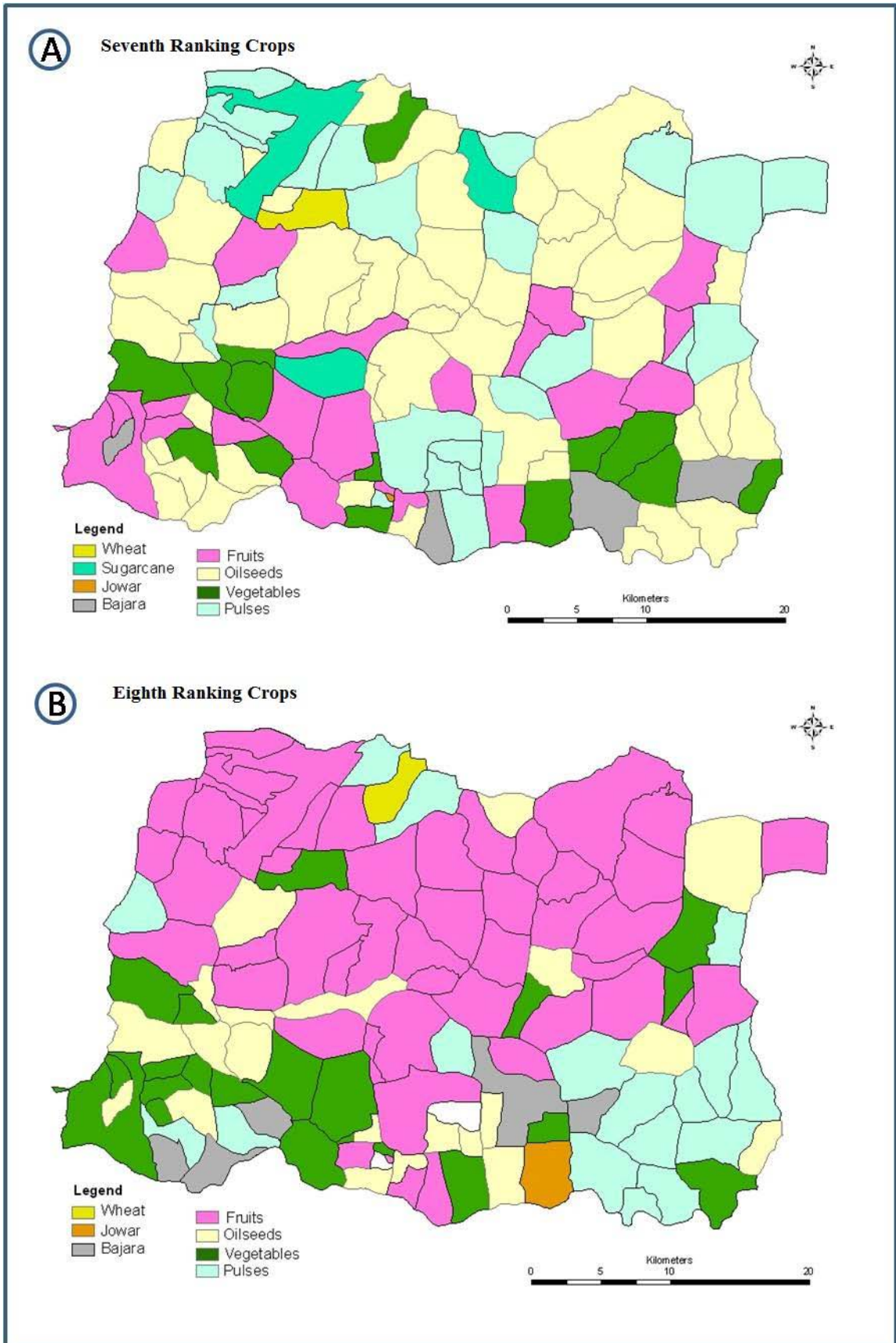




**Fig. 5.2**

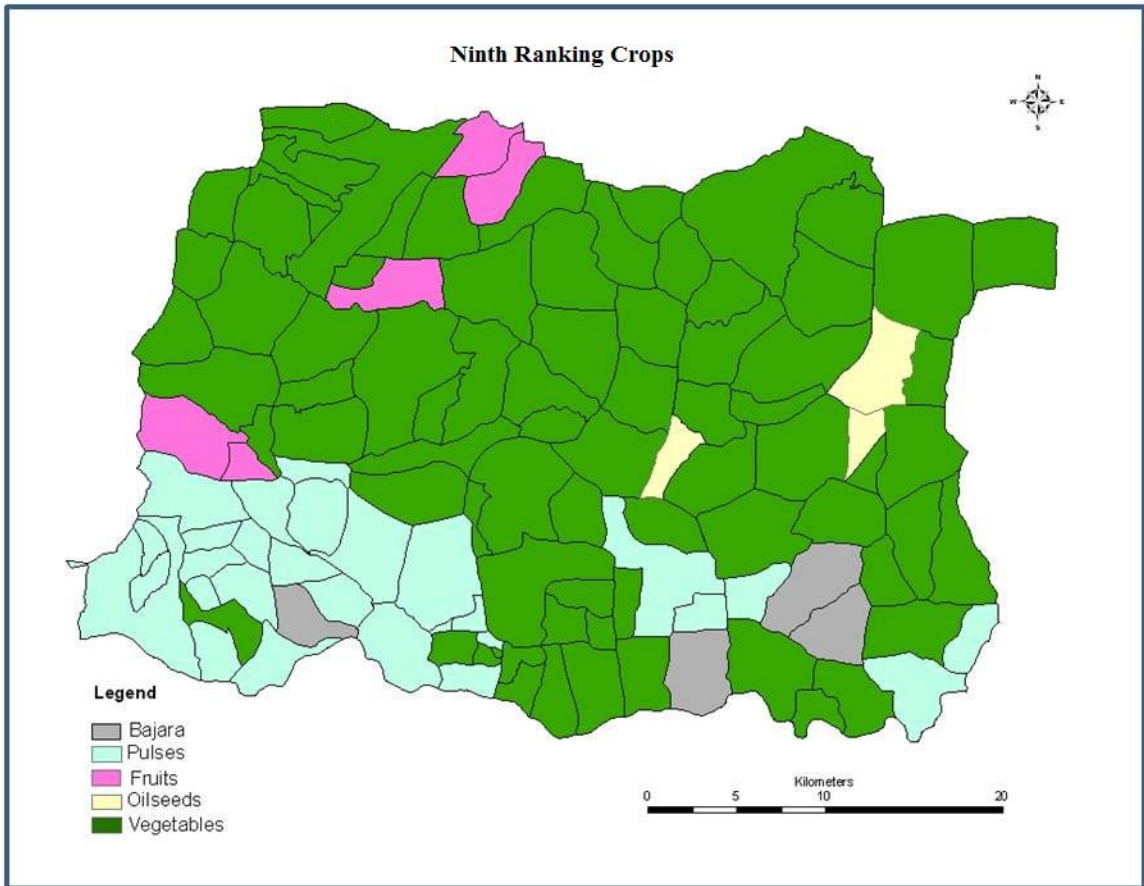


**Fig. 5.3**



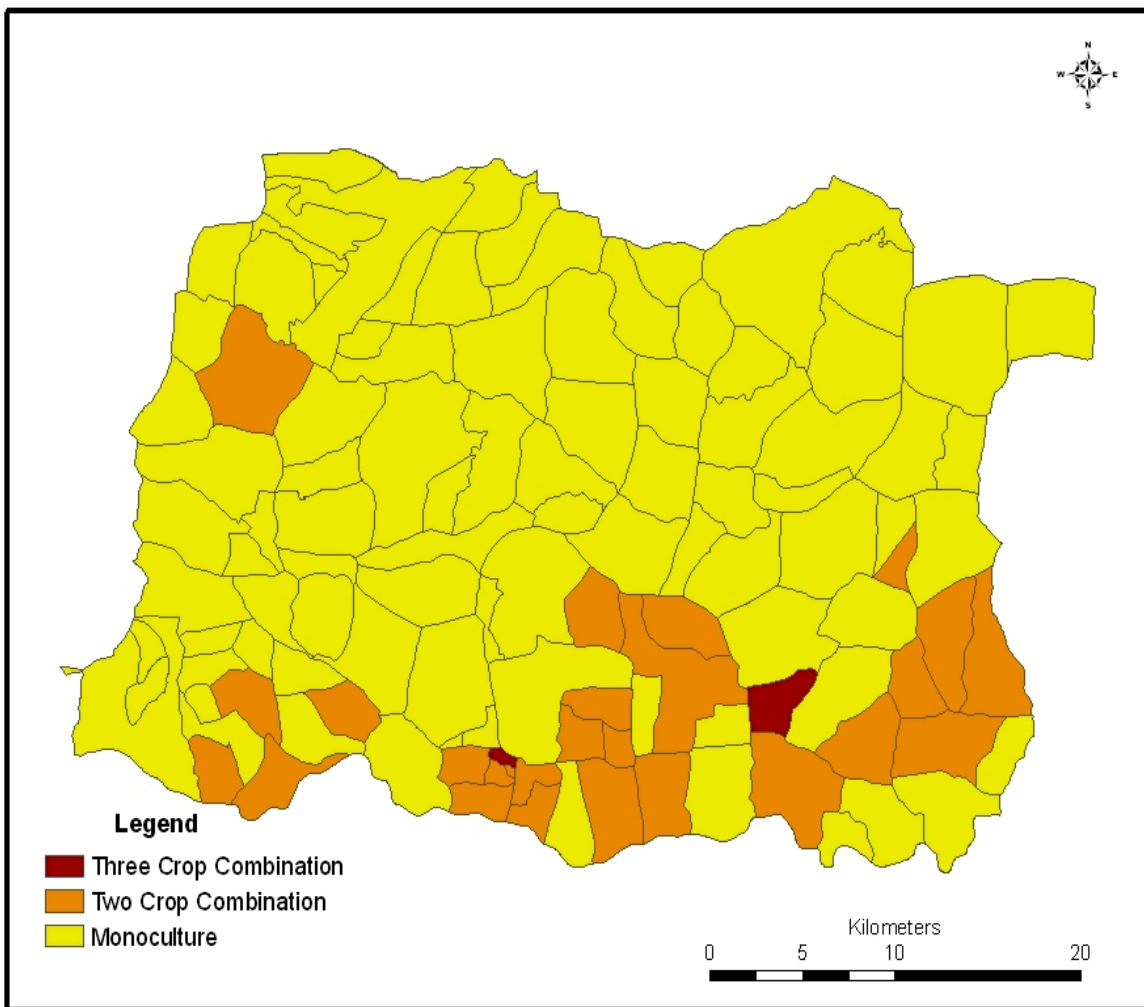
**Fig. 5.4**





**Fig. 5.5**

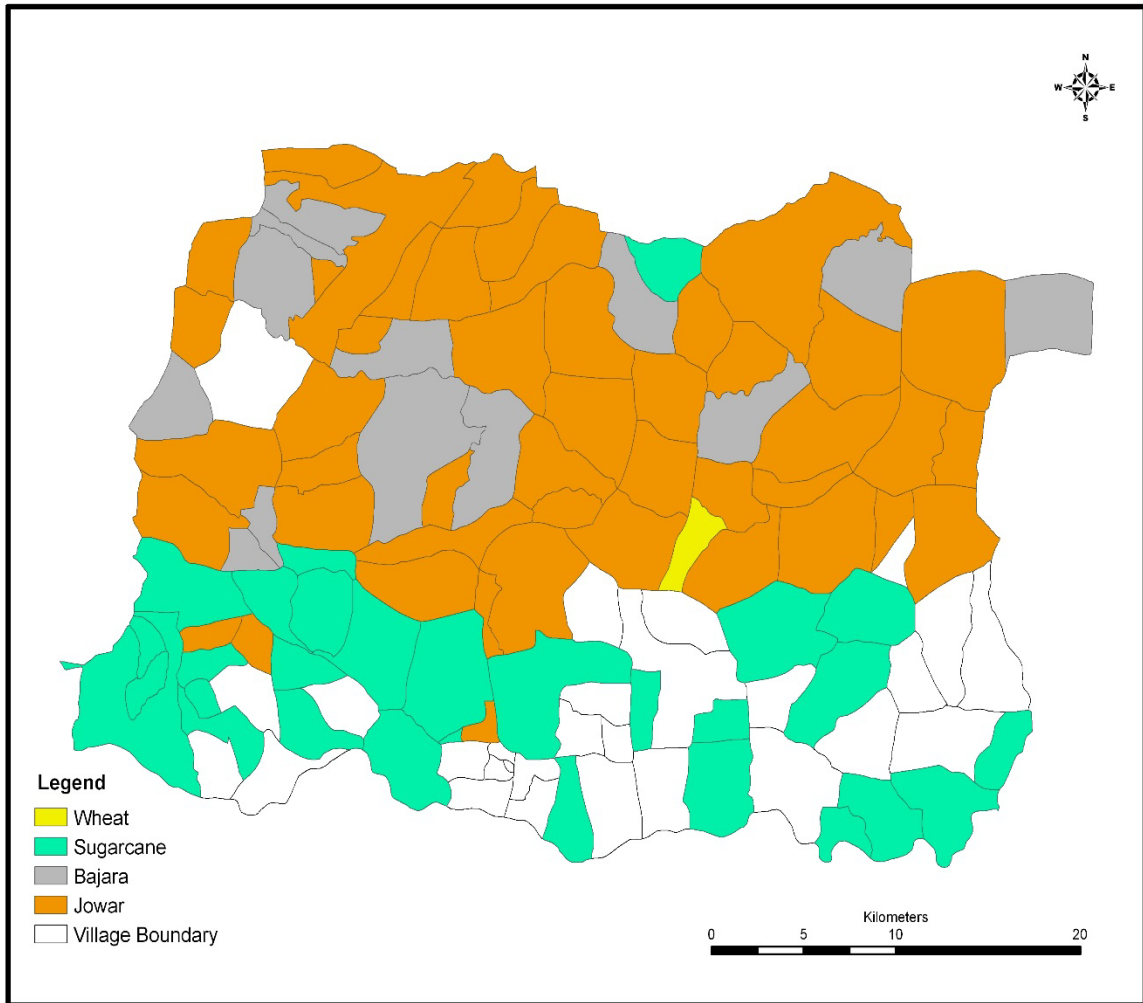
## Crop Combination Region



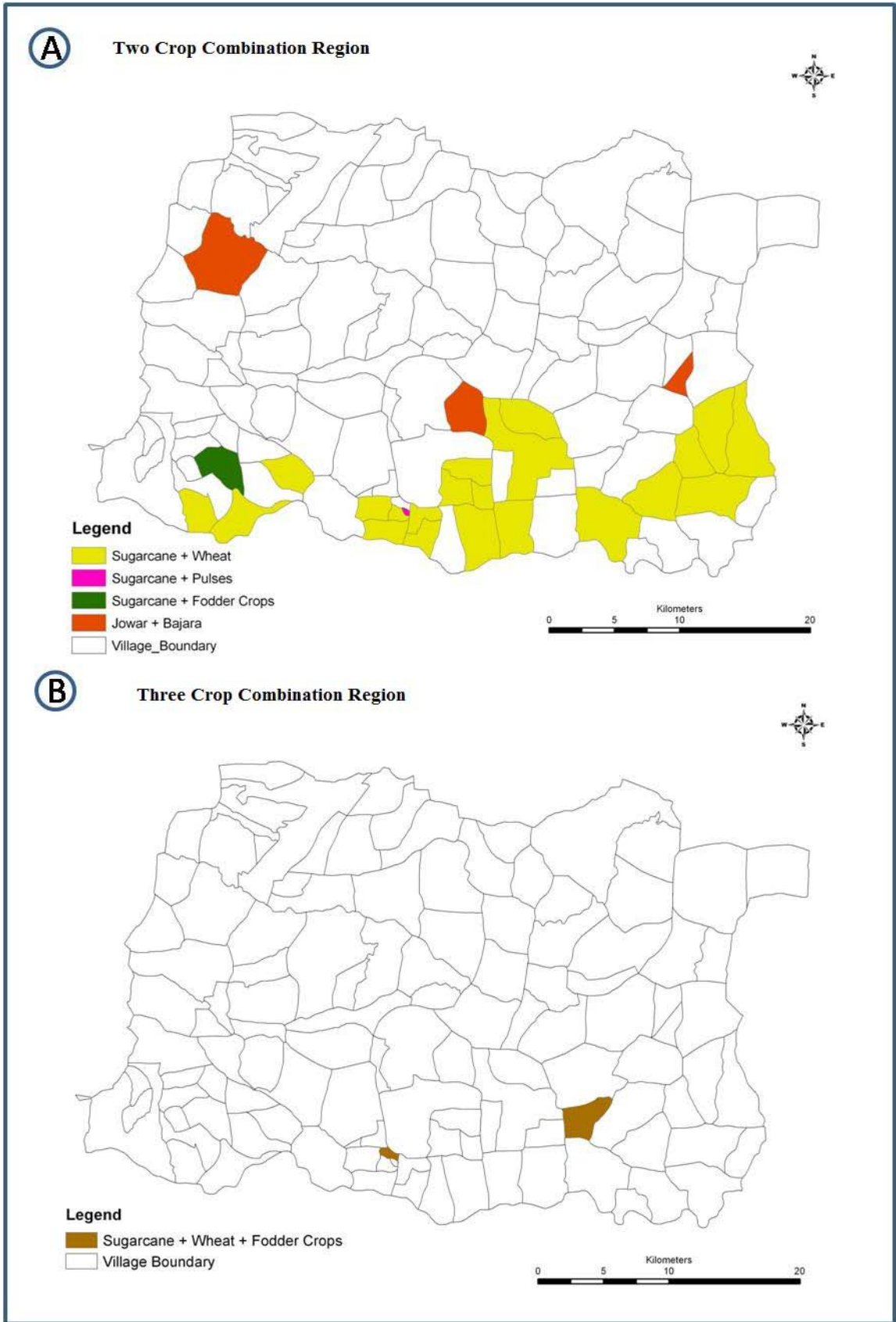
**Fig. 5.6**



## Monoculture Crop Combination



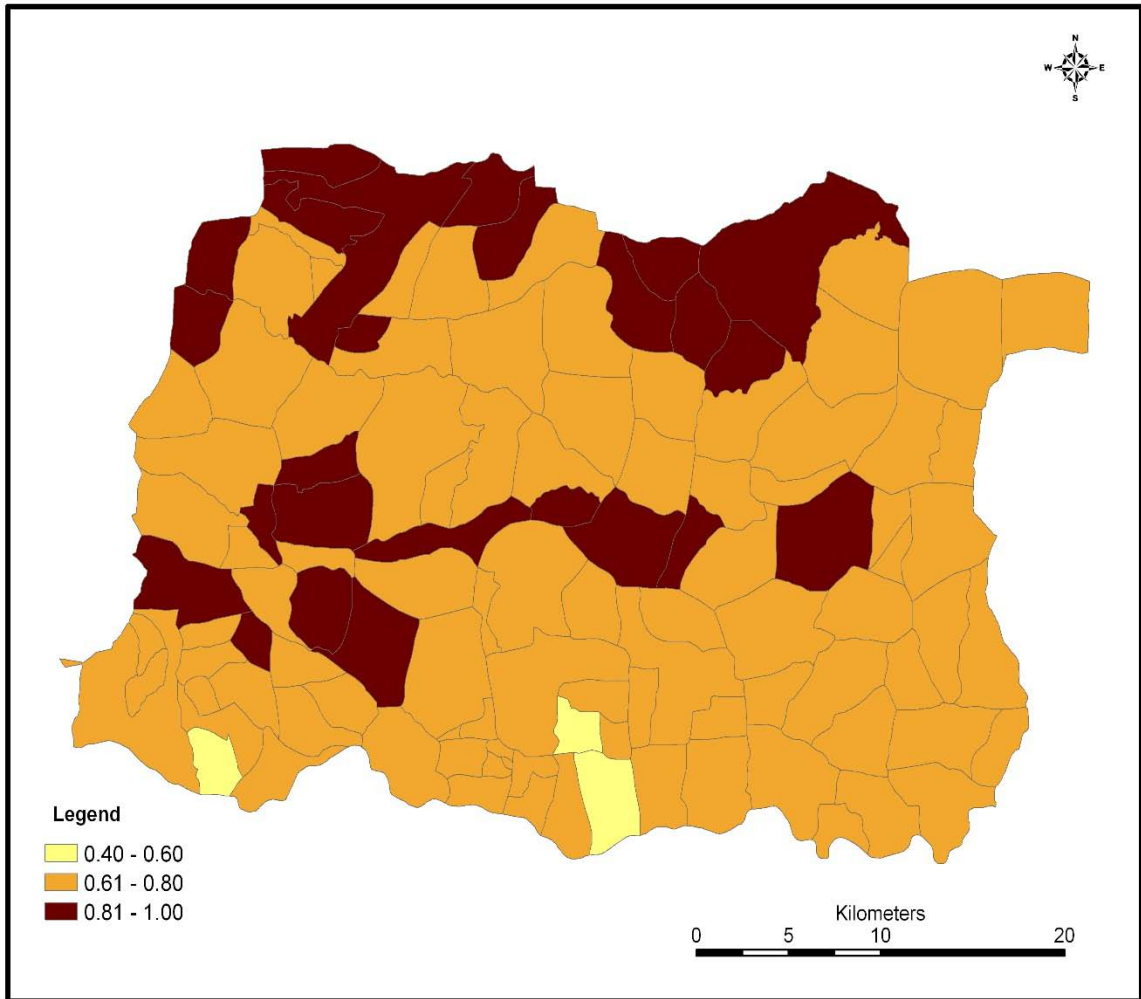
**Fig. 5.7**



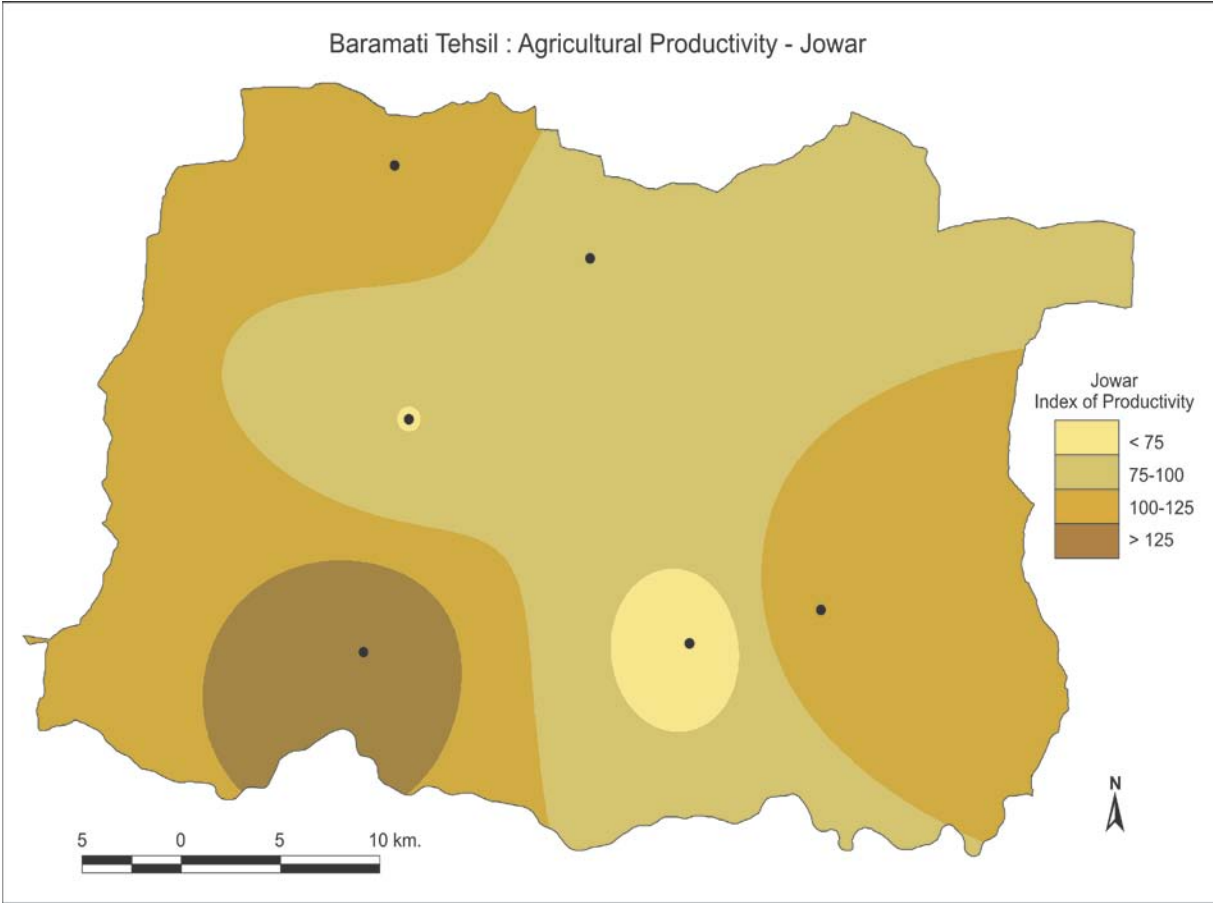
**Fig. 5.8**



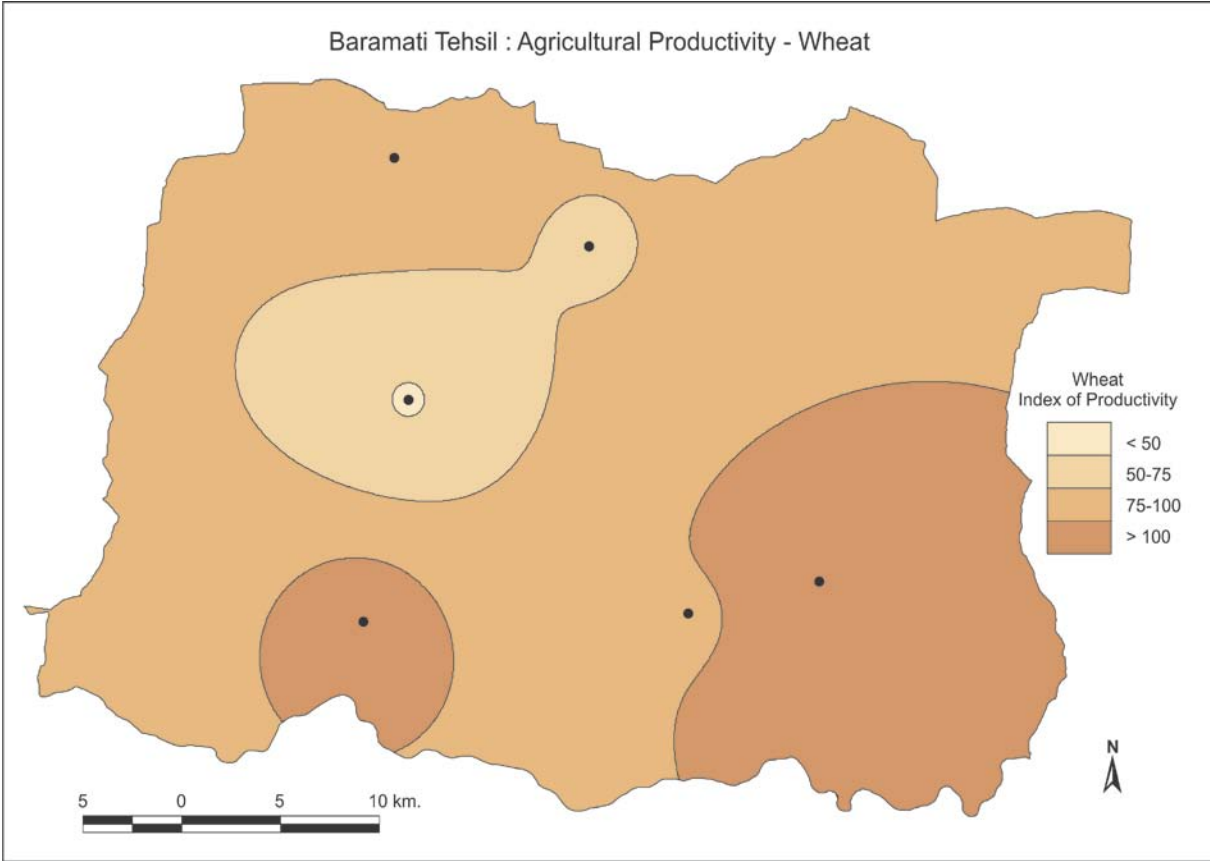
## Crop Diversification Region



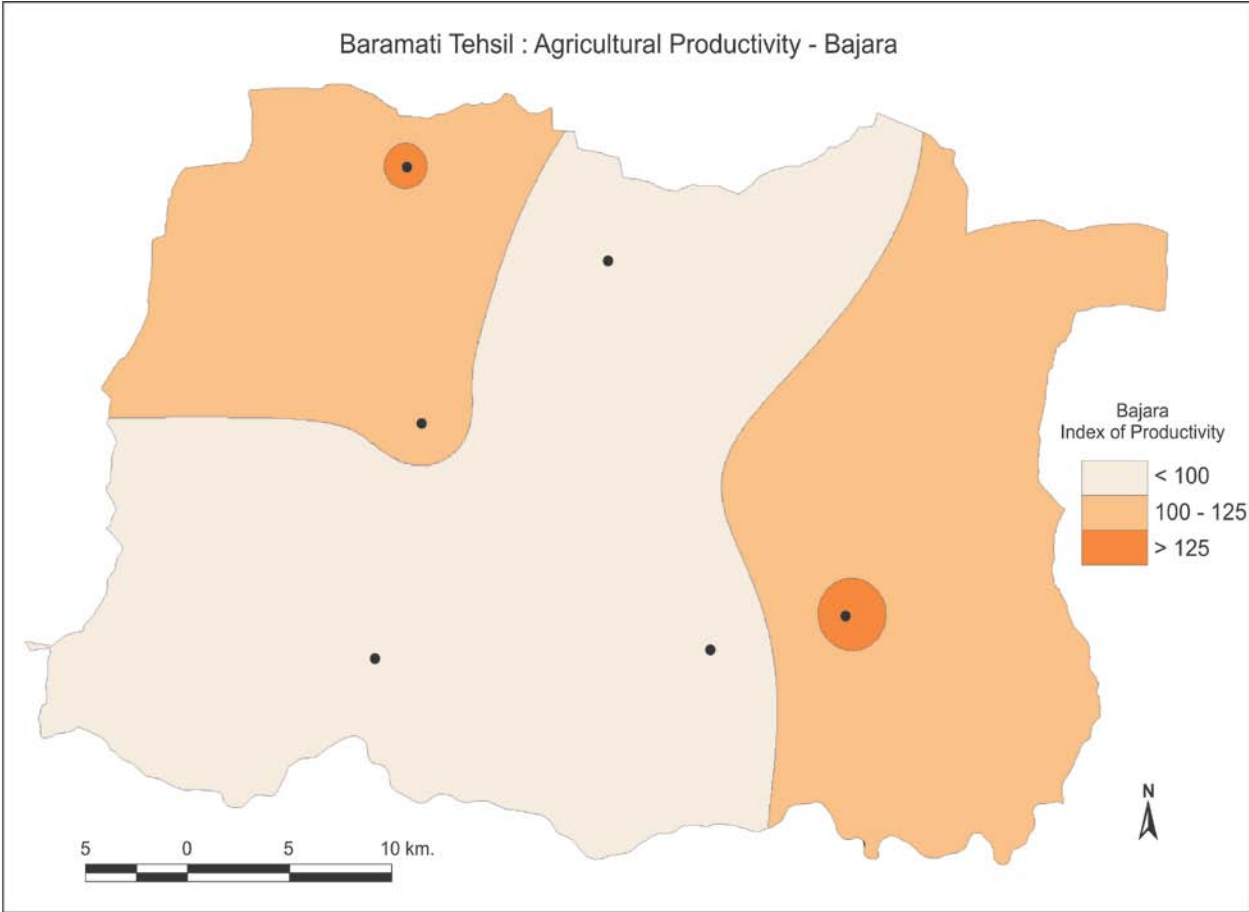
**Fig. 5.9**



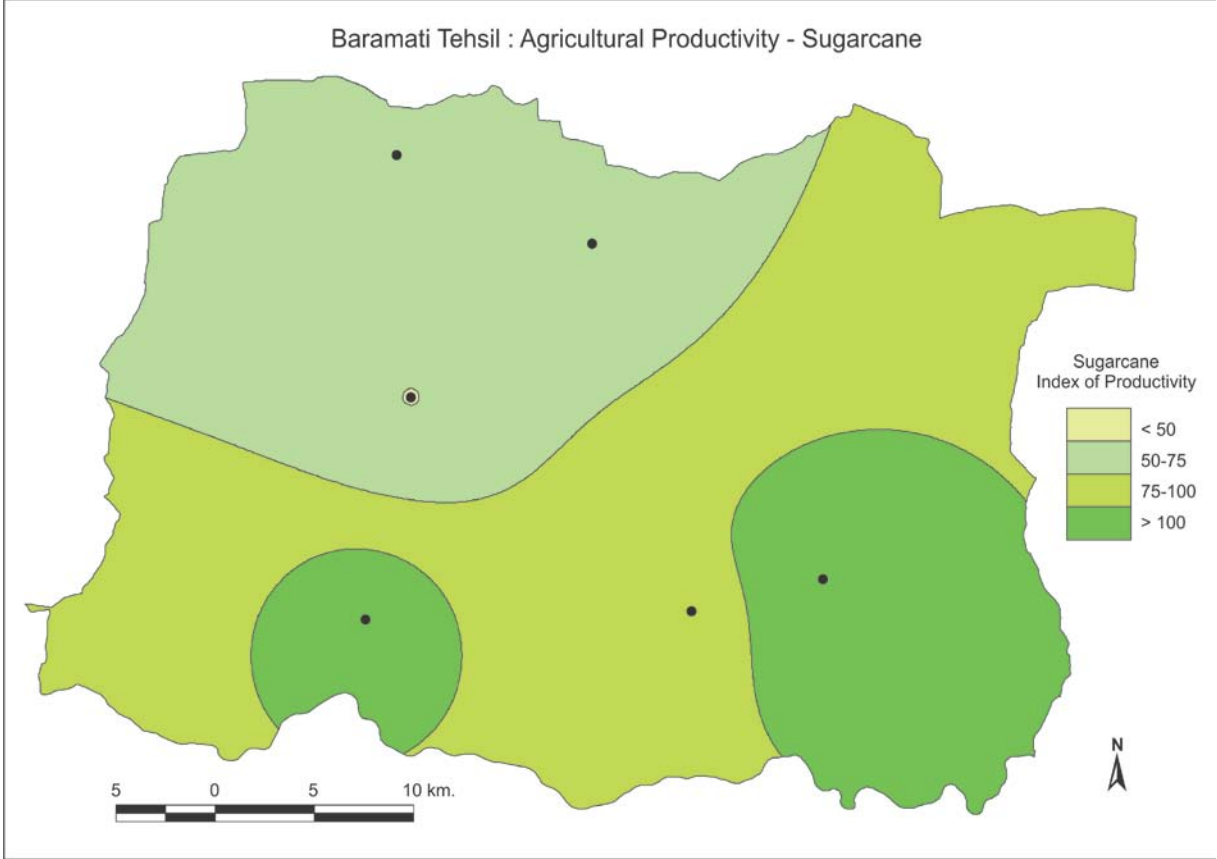
**Fig. 6.1**



**Fig. 6.2**



**Fig. 6.3**



**Fig. 6.4**

**Table- 2.1 : Name and Code Numbers of the Villages in Baramati Tahsil**

Code No.	Name of the Villages	Code No.	Name of the Villages	Code No.	Name of the Villages	Code No.	Name of the Villages	Code No.	Name of the Villages
1	Vadhane	27	Jaradwadi	53	Palshiwadi	79	Sadobachiwadi	105	Jalochi
2	Dandwadi	28	Undavadisupe	54	Masalwadi (N.V.)	80	Korhale Kh	106	Kanheri
3	Naroli	29	Karkhel	55	Moralwadi	81	Sonkaswadi	107	Katewadi
4	Kololi	30	Sonvadisupe	56	Modhave	82	Malegaon Kh.	108	Pimpali
5	Pansarewadi	31	Undavadi Kade Pathar	57	Umbarwadi	83	Malegaon Bk	109	Gunwadi
6	Supe	32	Gojubavi	58	Chaudhar Wadi	84	Pawnewadi	110	Baramati Rural
7	Kutwalwadi	33	Katphal	59	Waki	85	Yelewasti	111	Malad (baramati)
8	Bhondvewadi	34	Jainakwadi	60	Kanadwadi	86	Pandare	112	Dorlewadi
9	Ambi Kh	35	Sawantwadi	61	Chopadaj	87	Pawaimal (N.V.)	113	Zaragadwadi
10	Ambi Bk	36	Barhanpur	62	Vadgaon Nimbalkar	88	Dhumalwadi	114	Dhekalwadi
11	Jogwadi	37	Nepat Valan	63	Korhale Bk	89	Manappawasti	115	Songaon
12	Morgaon	38	Medad	64	Thopatewadi	90	Kurnewadi	116	Mekhali
13	Chandgude Wadi	39	Tandulwadi	65	Malshikare Wadi	91	Sirshane	117	Ghadagewadi
14	Khadukhairewadi	40	Murti	66	Hol	92	Pimpalewasti		
15	Kalkhairewadi	41	Tardoli	67	Sastewadi	93	Malwadi		
16	Sherechiwadi	42	Loni Bhapkar	68	Magarwadi	94	Bajrangwadi		
17	Baburdi	43	Sayambachiwadi	69	Deulwadi	95	Late		
18	Karhati	44	Malwadi	70	Karanje	96	Pandharwadi		
19	Deulgaon Rasal	45	Jalgaon Kade Pathar	71	Khandobachiwadi	97	Kambleshwar		
20	Jalgaon Supe	46	Anjangaon	72	Gadadarwadi	98	Sangavi		
21	Kharade Wadi	47	Karhavagaj	73	Nimbut	99	Shirawali		
22	Shirsuphal	48	Bhilarwadi	74	Soratewadi	100	Khandaj		
23	Sabalewadi	49	Dhakale	75	Karanjepul	101	Nirvagaj		
24	Parwadi	50	Kamagalwadi (N.V.)	76	Waghalwadi	102	Vanjarwadi		
25	Nimbodi	51	Mudhale	77	Wanewadi	103	Sawal		
26	Gadikhelwadi	52	Jalakewadi Mudhale	78	Murum	104	Rui		

Source: District Census Handbook of Pune, 2001.

**Table 6.6: Correlation Matrix**

Variables	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12	X13	X14	X15	X16	X17	X18	X19
X1	1.000																		
X2	0.748	1.000																	
X3	0.528	-0.066	1.000																
X4	0.711	-0.236	-0.122	1.000															
X5	0.279	-0.345	0.838	-0.384	1.000														
X6	0.809	0.682	0.263	0.674	0.012	1.000													
X7	0.632	0.557	0.111	0.558	-0.058	0.585	1.000												
X8	0.566	0.667	-0.105	0.694	-0.361	0.635	0.783	1.000											
X9	0.458	0.042	0.516	0.033	0.510	0.352	0.325	0.190	1.000										
X10	0.255	-0.023	0.452	-0.131	0.406	0.155	0.244	0.000	0.528	1.000									
X11	0.424	0.306	0.293	0.273	0.165	0.351	0.229	0.271	0.246	0.333	1.000								
X12	0.475	0.518	0.063	0.481	-0.049	0.294	0.270	0.290	0.085	0.086	0.405	1.000							
X13	0.424	-0.056	0.738	-0.117	0.739	0.130	0.155	-0.059	0.515	0.461	0.401	0.182	1.000						
X14	0.335	-0.281	0.849	-0.360	0.929	0.044	-0.007	-0.333	0.489	0.388	0.202	-0.040	0.714	1.000					
X15	0.424	-0.056	0.738	-0.117	0.739	0.130	0.154	-0.059	0.515	0.461	0.401	0.182	1.000	0.714	1.000				
X16	0.261	0.173	0.169	0.204	0.039	0.312	0.289	0.140	0.168	0.211	0.188	0.160	0.300	0.040	0.300	1.000			
X17	0.230	0.021	0.438	-0.031	0.324	0.063	0.185	0.015	0.310	0.477	0.290	0.085	0.681	0.304	0.681	0.587	1.000		
X18	0.266	0.213	0.065	0.290	-0.046	0.394	0.243	0.184	0.161	0.048	0.096	0.156	0.139	-0.058	0.139	0.265	0.301	1.000	
X19	0.206	-0.010	0.444	-0.061	0.354	0.014	0.142	-0.021	0.319	0.482	0.288	0.060	0.710	0.315	0.710	0.478	0.979	0.205	1.000

(Values significant at 0.05 level)

- Note:
- |                                       |  |                                       |
|---------------------------------------|--|---------------------------------------|
| X1=Percent of N.S.A. to T.G.A.        | X8=Percent of Pulses to N.S.A.                     | X15= Agriculture Density / Square Km. |
| X2= Percent of Jowar to N.S.A.        | X9= Percent of Fruits to N.S. A.                   | X16= Yield of Jowar per Hectare       |
| X3= Percent of Wheat to N.S.A.        | X10= Percent of vegetables to N.S. A.              | X17= Yield of Wheat per Hectare       |
| X4= Percent of Bajra to N.S.A.        | X11= Percent of Land not Avail. for culti.to T.G.A | X18= Yield of Bajara per Hectare      |
| X5= Percent of Sugarcane to N.S.A.    | X12= Percent of Follow Land to T.G.A.              | X19= Yield of Sugarcane per Hectare   |
| X6= Percent of fodder crops to N.S.A. | X13= Percent of Irrigated area to N.S.A.           |                                       |
| X7= Percent of Oil seed to N.S.A.     | X14= Population Density / Square Kilometre         |                                       |

# PHOTOGRAPHS



**Supa-Jowar Cultivation**



**Undavadi Supa-Bajara Cultivation**





**Mix Crops –Bajara + Oilseeds**



**Jowar Crop**



**Malegaon Bk.-Sugarcane Cultivation**



**Sangvi Village –Sugarcane Farm**





**Nepat Valan Village -Wheat Cultivation**



**Wheat Cultivation**

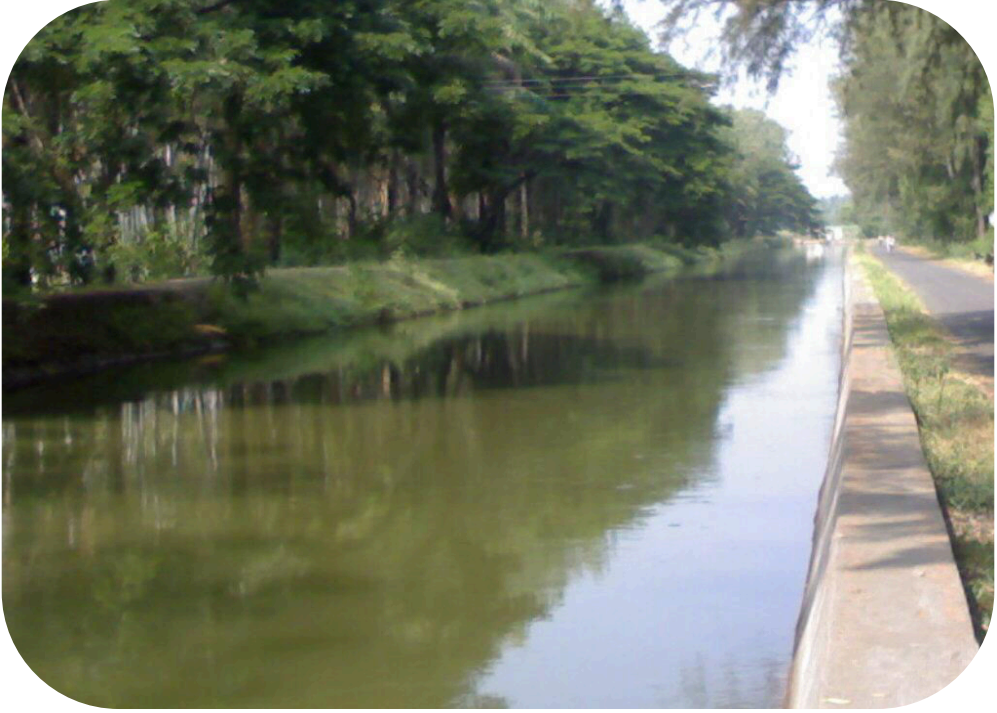


**Sunflower Cultivation**



**Sunflower Cultivation**





**Nira Left Canal – Malegaon Bk.**



**K.T. Wear Bandhara Nira River Sangvi Village**



**Dairy Farm – Medad Village**



**Dairy Farm – M.I.D.C. Baramati**





**Nira River – K.T. Wear Bandhara**



**Percolation Tank**



**Grapes Cultivation-Katewadi Village**



**Grapes Cultivation-Pimpli Village**





**Cauliflower Cultivation**



**Groundnut Cultivation**



**Mango Cultivation-Vadgaon Nimbalkar Village**



**Pomegranate Cultivation-Loni Bhapkar Village**





**Chico Cultivation-Agricultural Trust Malegaon Bk.**



**Banana Cultivation-Gunavadi Village**



**Artificial Agricultural Pond**



**Artificial Agricultural Pond**





**Gerbera Plantation (Polyhouse)**



**Tuti Plantation- Agricultural Trust**