"AGRICULTURAL LAND USE AND PRODUCTIVITY IN PHALTAN TAHSIL OF SATARA DISTRICT"

A THESIS SUBMITTED TO

TILAK MAHARASHTRA VIDYAPEETH, PUNE.

FOR THE DEGREE OF

DOCTOR OF PHILOSOPHY

IN

GEOGRAPHY

UNDER THE FACULTY OF MORAL AND SOCIAL SCIENCES

BY

SHRI. K.S.SURWASE
M.A

UNDER THE GUIDANCE OF

DR. S.B.ZODAGE
M.A., B.Ed., Ph.D.
Head and Associate Professor,
DEPARTMENT OF GEOGRAPHY
CHHATRAPATI SHIVAJI COLLEGE, SATARA.

APRIL, 2016

CERTIFICATE

This is to certify that the thesis entitled, ***"Agricultural Land Use and Productivity in Phaltan Tahsil of Satara District",*** *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. Kashinath S.Surwase 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: 25/04/2016 **Research Guide**

DECLARATION

I hereby declare that the thesis entitled ***"Agricultural Land Use and Productivity in Phaltan Tahsil of Satara District",*** *is the original research work carried out by me under the guidance of Dr. S. B. Zodage, Head and Associate Professor, Department of Geography, Chhatrapati Shivaji College, Satara for the award of Ph. D. degree in Geography to the Tilak Maharashtra Vidyapeeth, Pune. This has not been submitted previously for the award of any degree or diploma in any other university.*

Date: 25/04/2016 **K.S. Surwase**

Research Student

ACKNOWLEDGEMENT

I am deeply grateful to my guide Dr. S.B. Zodage, Head, Department of Geography, Chhatrapati Shivaji College, Satara, for his unstinted moral support, valuable guidance, his kindness, help, encouragement and devotion to my work. I find these words inadequate to express my heartfelt gratitude. I am highly indebted to him for all he did for me. I appreciate his valuable criticism and concern in the progress and presentation of my thesis and very useful suggestions at every stage of this research work.

I wish to express my deep sense of gratitude towards Vice-Chancellor, Dr. Deepak Tilak, The Registrar, Dr. Abhijit Joshi, Dr. B.D.Kulkarni Dean, Faculty of Moral and Social Sciences, Prof. Ganesh Dendage, Head, Department of Geography, T.M.V., Dr. B.C. Vaidya Department of Geography, JNU, Delhi, Dr. S.N. Karlekar, Dr. S.W. Gaikwad, S.P.College, Pune, Dr. Dhanistha S. Khandare, Librarian, Pournima Wate, Head, Department of Ph.D., Patil Sir, Ph.D. Section, and all administrative staff of Tilak Maharashtra Vidyapeeth, Pune for their co-operation and all types of support throughout the research work.

I am also thankful to the Secretary Saheb, Shrimant Sanjivraje Naik Nimbalkar, Phaltan Education Society, Phaltan, Principal Dr. S.P. Rasal, Mudhoji College, Phaltan for their moral support and encouragement.

I would like to express my cordial gratitude and indebtedness to Prof. S.M. Jadhav, Y.C.M. Karmala, Dr. A.A.Patil, Dr. A.Y. Shinde, Prof M.T. Dhole, Prof. S.B. Inamdar, Dr. Gaikwad S.S., Dr. Gaikwad A.R., Dr. S. M. Gawade, Dr.S.G. Dixit, Prof. U.V. Ranware, Dr. R.S. Suryawanshi, Garware College, Pune, Dr. V.P. Gaikwad, Dahiwadi College, Dahiwadi, and my friends and colleagues Dr. B.S. Kamble, Prof. G.K. More, Prof. P.R. Ratanaparkhe, Prof. B.E. Girhe, Prof. M.J. Padavi, Dr. T.P. Shinde, Prof. R.S. Chaure, Prof. V.H. Madane and Prof. M.B. Chavan for their co-operation and full support throughout the research work.

I am also thankful to the administrative staff of my college for providing me various facilities for smoothening the work. I take this opportunity to thank Dr. Sunil Ogale, V.P. Baramati for allowing me to pursuit this study in the

Geography Department. I am grateful to the Revenue Department of Phaltan Tahsil Office for their help in the data collection. I convey my thanks to Mr. M.B.Dhumal, Agricultural Assistant and Mr. R.M. Palave, Agricultural Superintendent, Phaltan Tahsil and his agricultural staff for being very helpful to me at different levels in providing me all possible data related to the research work.

I am indebted to the authorities of Agricultural Department, Phaltan for imparting me an easy access for data collection and fieldwork. I must also be thankful to Prof. Kolekar, C.S.College, Satara for cartographic assistance and Mrs. Vijaya K. Surwase for computer typing.

I would like to thank Mr. Somnath Kharade and Appa Surwase and all my friends for building my confidence. I also owe my indebtedness to my wife Mrs. Vijaya Surwase who not only encouraged me but also appreciated and supported in all way. My son Prashant and daughter Sneha often complained for not giving them enough time but they played a crucial role by entertaining my tired mind. I thank them also. I am also thankful to all those who might have inadvertently failed to mention here, but have made positive contribution in successful completion of this research work.

Place: Pune

Date: 25 /04/2016 **Research Student**

(K. S. Surwase)

CONTENTS

LIST OF FIGURES

LIST OF THE TABLES

LIST OF APPENDICES

LIST OF PHOTOGRAPHS

CHAPTER-I
APPRAISAL OF THE PROBLEM

1.1 Introduction

1.2 Choice of the Area

1.3 Study Area

1.4 Objective

1.5 Selection of the Problems

1.6 Methodology

1.7 Source of Data

1.8 Review of Literature

1.9 Design of the Work

1.10 References

CHAPTER-I
APPRAISAL OF THE PROBLEM

1.1 Introduction:

India is the agrarian country. Agriculture is the main occupation of Indians. In ancient time when the study of Geography started, man was totally unknown about his surroundings. The study of Geography is connected with the arrangement of all things on surface of the earth. The Geographer finds many things and geographical phenomenon and their characteristics of different places on the earth. The Geographer makes analysis of thought and observation of the geographical elements. Geography is considered as a description of the earth surface and exploration of it, gradually emerged with non-active relationship. Land is resource capital of the country. Agriculture is the main occupation of the rural area. The economic and industrial development depends on agriculture and its development.

Agriculture is one of the oldest and prime activities of the human being. It has remained an important source of food from ancient times. In spite of growing industrialization and urbanization in the world, nearly fifty per cent working population is still engaged in agriculture. In developing countries agriculture sector has been a major source of employment and contributed to the national economy. The word agriculture is derived from the Latin word 'ager'. It means the land or field and 'cultra' means cultivation; it means the science and art of producing crop and livestock for economic purpose. Agriculture is an art of raising plant life from the soil for the use of mankind. The basic aim of agriculture is to raise stronger and more fruitful crops and plants and to help them for their growth by improving the soil and supplying the water. Agriculture is the mile stone in the history of human civilization, due to agriculture man settled at a particular place. That's why agriculture is a part and parcel of human life.

The term agricultural "productivity" is defined, as a ratio of the output to input in relation to land, labour, capital and overall resources employed in agriculture. Singh Jasbir (1984) considered agricultural productivity as the degree of which the economic, cultural, technical and organizational variables (i.e. the man made frame) are able to exploit the abiotic resources of the area for agricultural production. Bhatia (1965) defined agricultural efficiency as the

aggregate performance of various crops in regard to their output per acre but the contribution of each crop to the agricultural efficiency would be related to its share of the crop land. Singh (1976) defined agricultural productivity as the quantity of return from arable land. He argued that quantity of production denotes its intensity and the spatial expansion. The crop productivity is manifestation of the influence of various factors including the physical factors like relief, climate and soil. Socio-economic factors like size of the operational holding, occupational structure of population, the type of farming and tendency of farmers and technical and organization factors like crop rotation, irrigation and mechanization) also influence crop productivity (Bhatia, 1968).

Despite of technological advancement and conquest over nature, the agricultural activities in the world are closely controlled by physical factors. Indian agriculture is not an exception for this; today India is facing two main problems concerned with agriculture. The first is meeting the increasing demand of food and other is supplying agro products for ever increasing population and the second is uneven development of agriculture and changing pattern of agricultural land use. India tried to be self-sufficient in agriculture through five year plans after Independence by taking systematic efforts. Due to the unique importance, agriculture gets more and more attention in every five year plans and top priority is given for the development of agriculture. In our country agriculture mainly dependant on the land. As land is one of the important constituents of agriculture, the study of land and agriculture from the geographical point of view gained more importance after 1950.

At the beginning of 1970 and later on the Green Revolution brought a remarkable change in the field of agriculture. Due to this, India became not only self-sufficient in food grains but it could also export a small quantity of it. The green revolution also known as the HYV revolution, strengthen the Indian agriculture. Even then, the process of agricultural development is not properly channelized because of uneven rainfall, unavailability of basic infrastructure facilities and unbalance allocation of resources. The green revolution is succeeded only in the areas of irrigation. In spite of lot of efforts made by government, the small farmers could not get the benefit of it. This creates a large gap between small and big farmers and imbalance is created. To reduce this gap, systematic planning is required. For this purpose, it is necessary to

have the detailed information of the region which agricultural geography can give detailed information of a particulate area. The research in agricultural geography in the region can be useful to solve the problems of the area and helpful in planning for agricultural development. The present exposition has an attempt to study the Phaltan Tahsil for the better planning and development of agriculture.

The present study is the modest attempt to study the land use and levels of agricultural development in Phaltan Tahsil of Satara District for its better agricultural development.

1.2 Choice of the Area:

Phaltan Tahsil is selected for the study. It has many reasons. The choice of topic under investigation is influenced by many considerations. Firstly, researcher belongs to Phaltan Tahsil and he is familiar with study area. Secondly study area falls in drought prone region of Deccan trap of Maharashtra State, receiving annual average rainfall between 450-500 mm. It is distributed unevenly in the study area. The study can be useful to solve the problems of drought prone area and helping in planning for agriculture development of this area. Thirdly irrigation is a dominant factor in study area having considerable impact on land use of Phaltan Tahsil. The Banganga River, the Nira River, wells and tube wells are the source of irrigation in the study area. Fourthly, unfortunately this area has not been so far studied in depth from land use point of view.

1.3 Study Area:

Phaltan Tahsil covering the part of the Nira river basin is one of the economically prosperous tahsils of Satara district in the southern Maharashtra. It lies between $17^{O}58'$ North to $18^{O}9'$ North latitude and $74^{O}10'$ East to $74^{O}45'$ East longitude. It has total geographical area of 1190 sq.km. with 128 villages and one urban settlement (2011 census). This area is bounded by the Nira river in the northern side. The area attains 576 metres height (M.S.L.) with southward land drained mainly by the Banganga, a right tributary of the Nira River. Phaltan Tahsil lies in the east of Satara district. It is surrounded by Baramati tahsil in the northern side, in the southeast side lie Man tahsil, in the southern side lies Khatav tahsil, the south-western sides lies Koregaon tahsil

and in the western side lies Khandala tahsil and Solapur district belongs to the east.

1.4 Objectives:

1. To study the geographical setting of the study area.
2. To study the general and agricultural land use pattern.
3. To analyse the changes in cropping pattern between the period 1991 to 2011.
4. To analyse the crop ranking, crop combination and crop diversification of the study area.
5. To measure the productivity and agricultural development of the study area.

1.5 Selection of the Problems:

The selection of the problems under investigation has been influenced by many considerations. The following are a few of them.

1. Area selected for present research is more dominant in agriculture, mostly in the Banganga River and the Nira river basin.
2. The northern part of the tahsil has significant area under cash crops like sugarcane, wheat. This is influenced by adoption of modern technology in the study area.
3. Farmers are diverted from their traditional methods of agriculture to modern advanced techniques for increasing agricultural production in it.
4. Development of agro based industries specially sugar factories grow and provide financial assistance and source of employment to the farmers of the study area.
5. The significant increase in cash crops in the study area has been due to facilities of irrigation and modern implements.
6. In the last three decades agricultural development and major changes have been placed in the land use and cropping pattern.

1.6 Methodology:

The period for the present investigation is considered from 1991 to 2011. Statistical methods, cartographic techniques are used as per availability of data and requirement. Collected information is tabulated, analysed and conclusions have been drawn. Research methodology is a way to systematically solve the research problems.

The following methods are used for the study.

Crop combination:

Rafiullah's (1965) Crop Combination technique has been introduced for 128 villages in Phaltan Tahsil.

Formula-

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

Where- d = deviation

n = number of crops

Dp = Positive difference

Dn = Negative difference

Crop diversification:-

Gibb's Martin Index has been applied for the Crop Diversification and computed for 128 villages in Phaltan Tahsil.

Formula-

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

Crop Productivity:

Enyedi's Method is chosen to computed Crop Productivity of Phaltan Tahsil as-

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

Where - Y = Production of selected crop in a unit area.

Yn = Total production of selected crop in entire region.

T = Area under selected crop in a unit area

Tn = Area under selected crop in entire region.

Agricultural Development:

For determining the levels of agricultural development various, variables will be used and the data of the all variables have been transformed into indices using 'Z' score technique. The formula is:

Agricultural Development:

$$Z_i = \frac{X_i - \bar{X}}{SD}$$

Where-

Zi = standard score for the i th observation,

Xi = original value of the i th observation,

X = mean of the value of X variable,

SD = standard deviation of X variable,

The spatial distribution of crop productivity and agricultural development for selected villages are computed, mapped and interpreted. Apart from these percentage methods used at various places this research focuses on study of the geographical setting, socio-economic setup, and changing cropping pattern and the agricultural development of the study area. It focuses on the study of environmental problems which shows are the outcomes in agricultural development in the study area.

1.7 Source of Data:

The present study is based on primary and secondary sources of data.

Primary Sources:

Primary data is based on the information obtained from 128 villages through questionnaires. The questionnaires cover aspects like Crop, land use, farmer's education, income from various and problems regarding agriculture and allied sectors. Besides this information, concerned Talathi, Gramsevak and Sarpanch are contacted to get more information of sample villages. The spatial and temporal aspects of general and agricultural land use are studied in depth.

Secondary sources:

The secondary published sources are namely, Talula Revenue Record, Socio-economic Abstract of Satara District 1991, 2001 and 2011, District Hand book Census, Department of Irrigation, Department of Forest, Agriculture Trust of Phaltan, Taluka Land Record office and Survey of India (SOI) Topographical sheet No. 47K/1, 47K/5, 47K/9 and 47J/8 on 1:50000 scale. The general land use data on net sown area, forest, fallow land, land not available for cultivation and waste land have been obtained for 1991 to 2011from Taluka revenue record of Phaltan. The data regarding major ten crops has been obtained for year 1991 to 2011 at village level from secondary sources.

1.8 Review of Literature:

Agricultural land use and productivity in Phaltan Tahsil of Satara District is the topic of the present research work. Most of the researchers have studied Agricultural land use and productivity at village level. But agricultural productivity is in practice an elusive term and its measurement is a very difficult job. Many experts in the field of agricultural geography and agricultural economics have long been engaged in determining and measuring agricultural productivity in different parts of the world. They also worked on delimiting the weaker areas for understanding problems and formulating development programs for same. They used different variables to compute the productivity and evolved some methods.

Majid Husain (1979):

Majid Husain is one of the experts in the field of agricultural Geography. He is the eminent expert; he has made important contribution in his book entitled "Agricultural Geography". According to him fruit farms are small and are located where communication links with the consumption centres. He has also pointed out that soil fertility is maintained by the heavy application of manures and fertilizers. His contribution to the field of agriculture Geography is appreciably good.

Singh J. (1972 and 1984):

He has devised a new technique for measurements of agricultural efficiency in Harayana. Further Singh (1990) has calculated the agricultural performance of India. Dutt and Sen Gupta's contribution is noteworthy in West Bengal. The selected indicators approach has been used by Dutt and Sen Gupata (1969) for assessing the agricultural development of west Bengal.

Shafi (1972):

In 1972, Shafi has also shown greater interest in agricultural productivity. He critically examined various measures applied for deriving the efficiency of agricultural productivity and determining the productivity index of the Great Plains of India. Shafis another useful contribution on the measurement of agricultural productivity in 1947. After assessing the pros and cons of various formulas, he has applied a modified formula for determining the productivity index of the whole of India. Based on the productivity index, the author has demarcated regions of high, medium, low and very low

productivity and the regions which are marginally productive and where the productivity is below the national level.

Mc Clelland (1974):

Mc Clelland's contribution to measure agricultural productivity is noteworthy. In 1974, he has measured agricultural productivity in India by the output per unit area of leading individual crops in the districts. Similarly Sharma and Countinho's investigation of the dynamism in area is remarkable. In 1974, they have investigated the dynamism in area and productivity per unit area in jowar in Karnataka. They have correlated the changes with the changing socio-economic variants and have highlighted the regional imbalances in the level of jowar productivity. This research is very useful.

Ali, Mohammad (1975):

In 1975, another researcher Ali Mohammad from Uttar Pradesh has studied agricultural land use and nutrition in Kher Sitapur and Barabanki District (UP). His entire study is divided into four sections consisting of fourteen chapters. In the forest post researcher has endeavoured to make a comprehensive study of the natural environment physiography, climate and soil of the region with a view bringing out the element of influences of these factors on the existing crop land use. A study has also been made on spatial patterns of general land use, agricultural land use and crop combination regions. The principles of the selection of villages for intensive study of land use and pressure of population have been logically discussed in one chapter.

Hussain Majid (1976):

The remarkable work in the agriculture productivity is of Hussain Majid. Who converted the agricultural production into the whole region? Thus the higher the money return per unit of area higher is the agricultural productivity. Money returns are calculated per unit or even per head of agricultural worker (including the cultivator and agricultural labourer) it should be mentioned here that the money value coefficient does not take into consideration the value of the by-products of the crops.

V. R. Singh (1979):

In 1979, it is V.R. Singh who has studied a new method of analysis of agricultural productivity for Andhra Pradesh.in his research he takes into account not only the yield of crops but also their areal spread. Based on

intensity of use, reflected in yield and areal spread of the crops, he has devised nine categories by a combination of high, medium, and low yield intensity with high, medium and low spread of crops in the study area.

Varsha Vaidya and V. S. Date (1987):

Two scholars from Maharashtra Varsha Vaidya and V. S. Date have studied influence of variables on productivity.in 1987; they have examined influence of some selected variables on agricultural productivity of Maharashtra. Their hypothesis was the productivity which is related to some socio-economic variables, applying correlation and multiple regression techniques. This hypothesis is tested by applying for the years taken into consideration (1961, 1966, 1972 and 1978). They have selected six variables i.e. productivity index (Bhatia 1967), Shafis modified productivity index, standard nutrition unit per hectare, calories per head of total population, money returns per hectare of crop land and money return agricultural worker. The authors used data for the period of 1960-61 and 1979-80.

V. S. Date and N.S. Pawar (1988):

V. S. Date and N.S. Pawar who has worked on agricultural productivity: A micro level study of two villages (Maharashtra). They studied the association between productivity of four selected crops and soil characteristics and economic factors at micro level. Soil samples and related data were collected from Bhadalwadi and Kuravli villages differing in physical and economic aspects. They used 16 variables and finally correlation and multiple regression techniques were used in order to measure significance of the variables and their associations with productivity of four important crops grown in both the villages viz. jowar, bajara, wheat and sugarcane.

Rameshwar Thakur (1989):

Rameshwar Thakurs study of agriculture productivity also remarkable. He examined agricultural productivity in south Bihar plain. He has discussed in his research paper the agricultural productivity in south Bihar, as demonstrated by the coefficient of agricultural productivity. The spatial variation in productivity worked out on the basis of Anchal as an area unit is explained in terms of physical as well as human parameters that govern crop yield.

Singh J (1994):

Singh J. has made very remarkable research on mechanization of agriculture and its effect on agricultural productivity. Singh J has used the approach to determine the level of mechanization of India. The impact of irrigation may be visualized from the angle of transformation in agriculture. The productivity of land is induced in modern subsector and cropping intensity also rises whereas productivity remains low in the traditional subsector and cropping intensity remain quite low in the traditional subsector and cropping intensity remains quite low. Increase in land productivity depends on the intensity of machination. The intensity of machination can be defined as quantum of application of modern inputs such as seeds (HYV), chemical fertilizers, pesticides, pumps and tractors per unit area.

Patil Arun A. (2000):

In 2000, Patil Arun A. has studied changes in Agricultural productivity in Upper Bhima and Upper Krishna Basins in Maharashtra; A Geographical analysis. they selected six variables i.e. Kendall's Ranking Co-efficient, Bhatia's productivity Index, Agricultural productivity based on standard nutrition Units, based n the total number of calories available per person, money value method and Enyedi's (1964) method. Aggregate productivity was calculated for the study area and productivity regions were demarked by using six variables. This is done for each of the three years of 1985-86, 1990-91, and 1996-97.

Majid Husain (2002):

In 2002, Majid Husain stated that "Green Revolution" is a term coined to describe the emergence and diffusion of new seed of cereals. The new cereals were the product of research work and concentrated plant breeding with the objective of creating high yielding varieties of rice, lick -8 (miracle rice), at the International rice research Institute, Philippines in the 1960s. The increase in yield from the new seed has been spectacular. In some cases the yield of HYV is more than double the yield of traditional varieties.

N. G. Mali (2004)

In 2004, N.G. Mali worked on A critical study of Agricultural productivity in Parbhani district (M.S.): A geographical and analysis. He has used Weavers and Doi's methods are used for the calculation of crop

combination of every tahsils. In order to determine the tahsil wise concentration of crops Bhatia's (1965) formula is used. Jasbir Singh's (1976) formula is used to calculate index of crop diversification.

N. S. Adnaik (2005):

N.S. Adnaik research of agricultural productivity in the drought prone area is remarkable. He selected eight variables i.e. Kendall's Ranking co-efficient, Bhatia's productivity index, Agricultural productivity based on standard Nutrition units, Enyedi's productivity index, Shafis modified index, based on calories per capita, Sapre and Deshpande's index and based on Aggregate productivity index was calculated for the study region and productivity regions were demarked by using eight variables. This is done for each of the two years of 1985-86 and 1998-99.

Ogale S. (2013):

Recently Ogale S. has studied agricultural land use and productivity of Baramati Tahsil. He selected eight variables i.e. Kendall's Ranking co-efficient, Enyedi's Productivity Index, Agricultural productivity based on standard Nutrition units, Enyedi's productivity index based on calories per capita, and productivity regions were demarked by using eight variables

1.9 Design of the Work:

The present investigation consists of eight chapters.

Chapter first deals with the study covering its objectives, source of the data methodology used in processing data, analysis and interpretation of problems encountered, limitations restricting the scope of study.

Chapter second attempts to present the Physical, Socio-economic profile of the study area. This chapter includes location, physiography, drainage, climate, soil, vegetation, transportation, irrigation and population etc.

Chapter third unfolds The Spatial and Temporal Analysis of General Land Use, study volume of change for net sown area, land not available for cultivation, cultivable waste fallow land and forest land in Phaltan Tahsil.

Chapter fourth assesses The Agricultural Land Use Pattern of ten selected crops both spatial and temporal variations in the study area.

Chapter fifth studies Crop region by applying Crop Ranking, Crop Combination, Crop Diversification and factor analysis techniques.

Chapter sixth deals with Agricultural Productivity and Levels of Agricultural Development of the study area.

Chapter seventh studies the Case Studies of Selected Sample Villages.

Chapter eight throws light on Conclusion, Agricultural Problems of the study area and specific suggestions to solve them.

Bibliography, Questionnaire, and Abbreviations with full forms and Appendix is eventually be enclosed.

1.10 References:

1. Ahmad, A. and Siddiqui, M. F. (1967),"Crop Association Pattern in the Luna Basin", Geographical Review of India, Vol. 14, Pp. 69-80.

2. Baker, O.E., (1926), "Agricultural Regions of North America", Economic Geography, (1932), pp.325-377, (1933), pp. 167-197.

3. Behead, N.K., (2005), "Present Status and Future Prospects of Agricultural Development in Pangoli Basin of Gondia District (M.S.), A Geographical Study", Unpublished Ph.D. Thesis, Nagpur University, Nagpur, pp. 14-17.

4. Bhatia, C. S., (1981), "Changing Land use and Cropping Pattern in Bihar", Perspective in Agricultural Geography, Concept Publication, New Delhi.

5. Bhatia, S. S., (1965), "Pattern of Crop-combination and Diversification in India". Economic Geography, pp- 40, 41, 53, 54.

6. Datye, V.S., (1983), "Spatial Analysis of Agricultural Land Use in Pune District", Ph.D. Thesis (Unpublished), Department of Geography, University of Poona, pp. 17-22.

7. Enyedi, G.Y., (1964), "Geographical Type of Agriculture", Applied Geography in Hungary, Budapest, Pp-61.

8. Husain, Masid, (1996), "Systematic Agricultural Geography", Rawat Publication, New Delhi.

9. Husain, Maid, (2004), "Agricultural geography" Rawat Publication, Jaipur.

10. Jabir Singh and S.S. Dhillon, (2006), "Agricultural Geography" Tata McGraw-Hill Publishing Company Limited, New Delhi.

11. Karlekar, Shrikant, and Kale, Mohan, (2007), "Research Methods In Geography", Diamond Publication, Pune.

12. Kasid, D.L., (2010), "Study of Agricultural Productivity in Sindhudurg District (1981-82 to2005-06)", Unpublished Ph.D. thesis, submitted to the Shivaji University, Kolhapur.

13. Rafiullah, S.N., (1967), “Region, Regionalism and regionalization”, The Geographer, Aligarh, 14/1. pp. 36-37.
14. Singh, Jasbir, (1982), “Determinants of Agricultural Productivity in Haryana: A Sample study of operational holdings for Lands Use Planning, Kurukshetra”, Vishal Publications, University campus, pp-128.
15. Singh, Jasbir, (1976), “An Agricultural Geography of Haryana”, Kurukshetra, Vishal Publications, pp. 131,135,138, 187-190.
16. Vaidya, B.C., (1990), “Cropping Pattern in the Yashoda Basin”, The Deccan Geographer, Secunderabad, Vol. 28 No.2 and 3.
17. Wagh, A.S., (2013), “Agro Service Centers and Agricultural Development in Satara District, (1981 to 2001)”, Unpublished Ph.D. thesis, submitted to the Shivaji University, Kolhapur.
18. Topographical sheet No. 47K/1, 47K/5, 47K/9, 47J/8 and 47J/12.

CHAPTER-II
PROFILE OF THE REGION

CHAPTER-II
PROFILE OF THE REGION

2.1 Introduction:

Agriculture, the most important primary economic activity, is closely related to physical environment particularly the relief, climate and soils. According to Singh and Dhillon (1984), to carry out study and to understand any scientific and feasible analysis of agricultural phenomena, it is therefore a perquisite to pay attention to the basic relation between these physical determinants and agriculture. However, the physical environment plays a significant role in determining the development of agricultural productivity. The diverse environmental conditions lead to diversify the nature of agriculture which further mark into variations in agricultural productivity. Thus the physical set up of the region governs its agrarian structure. From the view point of a Geographer, an elaborate account of the physical setting is presented in the present chapter, particularly as the base for the superimposition of agricultural productivity on the physical environmental aspects. McHarg (1966) on the basis of principles of ecological determinism has shown how nature can impose limits; provide guidelines and assistant in solving environmental planning problems in a manner which is most compatible with natural problems. Hence efforts need to be made to qualify the environmental attributes to meet various objectives for future ecological planning, modification and adjustment. The slopes, soil, climate and hydrological conditions have important effects on the cultivation of crops and preference of a particular agricultural system. In Phaltan Tahsil, the climatological factors such as temperature and rainfall are more important than terrain.

2.1.1 Historical Background:

Phaltan is also an important historical city and has a historical background of its own. In ancient literature, Phaltan is known as Palasthan. In Phaltan there are many temples like Jabreshwar, Rameshwar, Mankeshwar, Vithalshiv and Shriram etc. and these temples are testimony for ancient history of Phaltan. The Mahanubhav sect calls Phaltan as the southern Kashi. There are number of temples and myths belonging to this sect in the state. The people of Mahanubhav sect visit Phaltan from the Punjab and other states.

The ancient history of Phaltan is glorious. In ancient literature and legends, there are many references of Phaltan. In the book of Mahanubhav sect named 'Dakshin Kashi' we glean information about ancient Phaltan that Phaltan is the southern Kashi of Mahanubhav sect and lying in between Pune-Phandharpur road approximately 110 km. from both sides. It has pre-historical background. There was a saint by name Phalasthrushi resided at Srikrishna temple. Inside the temple in the square, there lies a well-known as 'Panpaikhani'. It is told that Prabhu Ramchandra visited the temple of shrikrishna and hit a land of the temple by an arrow, which resulted in flow of water. During the region of Shingan Raja of Yadvas of Deogiri, the forest was removed from the bank of Banganga River and he facilitated the growth of population (1210-1247 A.D.). To this area, people called Phalvadi (the area of fruits). Near the temple of Phalasthrushi there exists a tank. Once SinghanRaja took bath in it and his incurable diseases disappeared. By this miracle, he became very glad. He surrounded the water of tank by strong wall stones. On the top of the well, he constructed an umbrella shaped roof. This place is since then known as Chaupalla. This Chaupalla is called as Krishnanath temple. The people of Mahanubhav sect consider this place as the most holy place for them. As the time changes, the name of this place was also changed into Phalanwadi, Phalastan, and Phalapatten and in finally to Phaltan.

Second tradition is related to Lord Rama. It is told that Phaltan area was situated in Dandkaranya during Ramayana period. When Rama was in exile, Sita was thirsty and Rama threw his arrow and there the birth of river Banganga took place. The Banganga is flowing through Phaltan. There is another tradition that from where the water is flown as the source of Banganga River is called the Sitamai hills. On the bank of this river, there was a place called Phalagurushi and later this name was changed into Phaltan. Third myth explains that there were in early time a number of fruit gardens flourishing on the banks of river Banganga and the place were known as Phalsthan from which the name of Phaltan is derived.

2.2 Location and Boundaries:

Phaltan Tahsil, covering the part of the Nira river basin, is one of the economically prosperous Tahsils of Satara District in southern Maharashtra. It lies between $17^{O}58'$ North to $18^{O}9'$ North latitude and $74^{O}10'$ East to $74^{O}45'$

East longitude. As per the 2011 census, Phaltan Tahsil has got a total geographical area of 1190 square km. with 128 villages and one urban settlement. This area is bounded by the Nira River in the northern side. The area is at an elevation of 576 meters (MSL) with northward sloping land drained mainly by the Banganga river, a right bank tributary of the Nira River. Phaltan Tahsil lies in the east of Satara district. It is surrounded by Baramati Tahsil in the north side, in southeast side lies Man Tahsil, in the southern side lies Khatav Tahsil, in the southwest side lies Koregaon Tahsil and in the western side lie Khandala Tahsil and Solapur district to the east.

According to 2011 census the area has 342667 populations out of 176250 are males and 166417 females and density of population is 287 per square kilometres. The State highway, major district and other roads are major routs of transport besides broad-gauge railway route in Phaltan Tahsil. Phaltan is an administrative head quarter of this tahsil. The villages are grouped into four Revenue circles, viz. Phaltan, Barad, Vidani and Taradgaon. (Revenue circles of the Phaltan Tahsil and Fig.-2.3). The administrative headquarter of the tahsil is at Phaltan which is the only one urban centre in the tahsil. The study area experiences semi-arid climate. April, May and June are the hottest months with mean maximum temperature of 40℃. Temperature gradually reduces in December and January with mean minimum temperature 12℃. The medium black and deep black soil appears within study area. The soil fertility encourages growth of various crops like sugarcane, jowar bajara, wheat, maize and vegetables.

Figure-2.1
Phaltan Tahsil

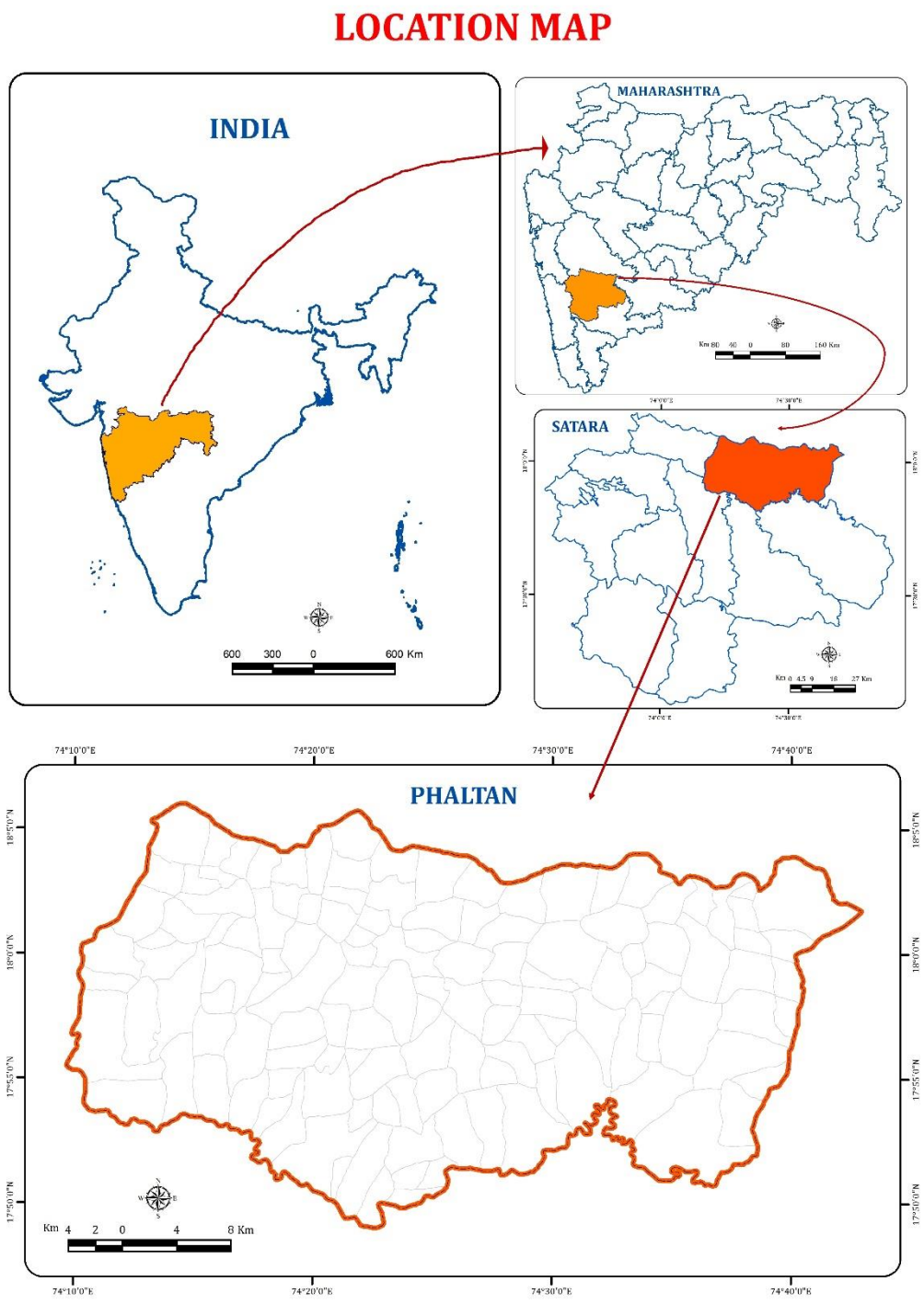
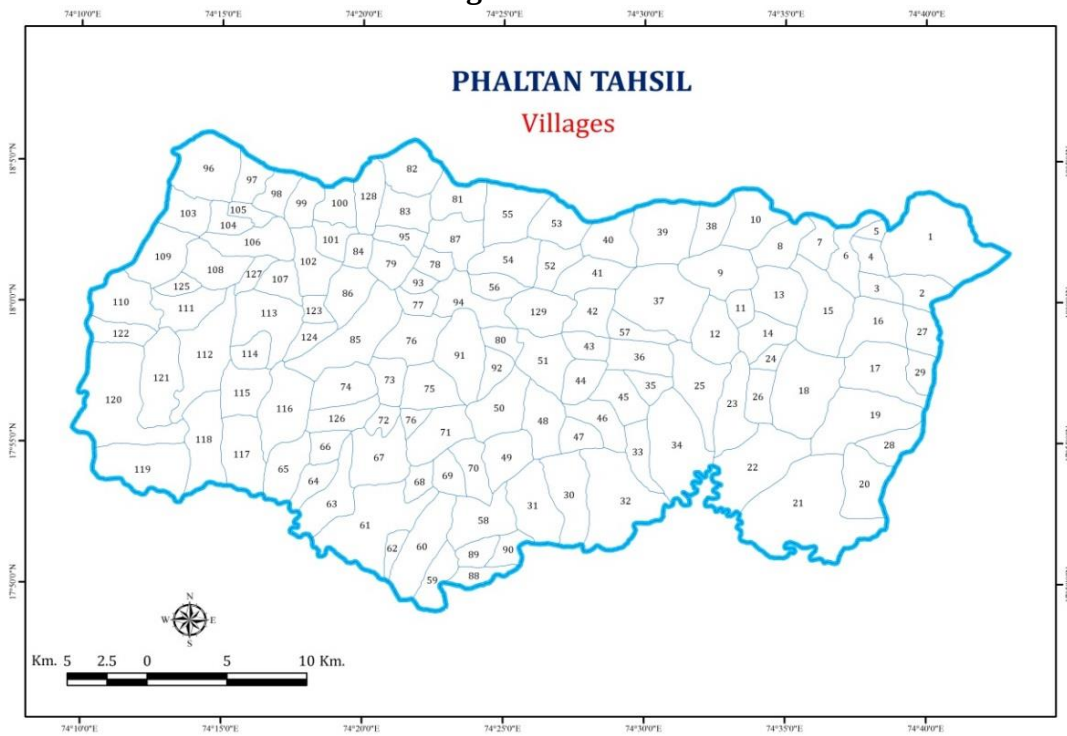


Table-2.1
Name and Code Numbers of the Villages in Phaltan Tahsil

Sr. No.	Name of the Villages	Code No.	Sr. No.	Name of the Villages	Code No.
Phaltan circle		**I**	66	Gunaware	15
1	Waghoshi	64	67	Munjawadi	16
2	Vadgaon	66	**Vidani circle**		**III**
3	Korhale	65	68	Girvi	30
4	Wakhari	71	69	Bodakewadi	31
5	Wathar-nim	75	70	Kurawali-kh	50
6	Dhaval	67	71	Mandavkhadak	49
7	Pirachiwadi	63	72	Nirgudi	47
8	Sherewadi	72	73	Vinchurni	48
9	Surawadi	79	74	Khunte	55
10	Kharadevadi	84	75	Shindevadi	54
11	Ghadgemala	85	76	Chaudharwadi	56
12	Nandal	86	77	Jadhavwadi	51
13	Jinti	81	78	Kolki	43
14	Phartadvadi	95	79	Zirapwadi	44
15	Bhilkati	87	80	Kambleshwar	53
16	Nimbore	78	81	Sastewadi	52
17	Dhavlevadi	77	82	Vidani	37
18	Kashidvadi	93	83	Dudhebavi	34
19	Vadjal	94	84	Tirakwadi	35
20	Dalvadi	70	85	Bhadali-kh	33
21	Upalave	58	86	Sonawadi -kh	36
22	Sawantvadi	89	87	Dhuldeo	42
23	Daryachivadi	90	88	Somathali	40
24	Jadhavnagar	88	89	Algudevadi	41
25	Malvadi	74	90	Sangavi	39
26	Khadaki	73	91	Songaon	38
27	Mirgaon	76	92	Sasakal	46
28	Tathvada	61	93	Dhumalwadi	32
29	Manevadi	62	94	Bhadali-bk	45
30	Zadakwadi	68	95	Sonawadi -bk	57
31	Hol	82	**Taradgaon circle**		**IV**
32	Sakharwadi	83	96	Padegaon	96
33	Veloshi	59	97	Koregaon	103
34	Tardaf	60	98	Tambave	110
35	Miryachiwadi	69	99	Salpe	120
36	Pharadvadi	80	100	Koparde	122
37	Thakurki	92	101	Chambharwadi	125
38	Tawadi	91	102	Hingangaon	112
Barad circle		**II**	103	Sherechiwadi	121
39	Barad	18	104	Adarki-bk	118
40	Shereshindevadi	26	105	Adarki-kh	119
41	Nimbalak	14	106	Aradgaon	111

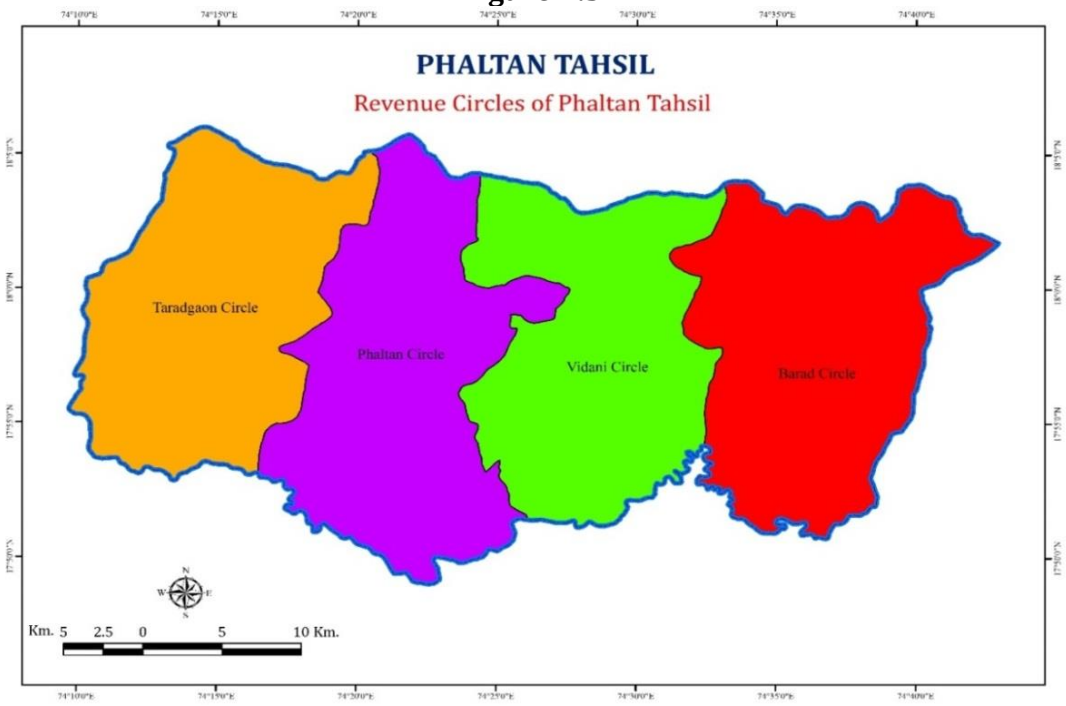
42	Mathachivadi	13	107	Chavanwadi	108
43	Pimparad	12	108	Kapadgaon	109
44	Takalwade	11	109	Mirewadi	126
45	Vadale	25	110	Kusur	97
46	Mirde	22	111	Malevadi	105
47	Naikbomvadi	23	112	Shindemal	104
48	Rajale	9	113	Saswad	113
49	Sathe	8	114	Takubaichiwadi	114
50	Sarde	10	115	Kalaj	123
51	Gokhali	6	116	Khamgaon	128
52	Khatakevasti	7	117	Murum	100
53	Vajegaon	24	118	Tadavale	101
54	Kurawali-bk	19	119	Vitthalvadi	107
55	Dattanagar	28	120	Taradgaon	106
56	Andhrud	20	121	Rawadi-kh	99
57	Javali	21	122	Rawadi-bk	98
58	Rajuri	17	123	Dombalwadi	127
59	Bhavaninagar	29	124	Kapasi	115
60	Asu	1	124	Alajapur	117
61	Dhavalevadi	5	126	Ghadagevadi	102
62	Shindenagar	27	127	Mulikwadi	124
63	Pawarvadi	4	128	Bibi	116
64	Hanamantwadi	2	129	Phaltan	129
65	Jadhavwadi	3			

Figure-2.2



Source: Phaltan Tahsil Agriculture Department.

Figure-2.3



Source: Phaltan Tahsil Agriculture Department.

Table-2.2
Phaltan Tahsil
Circle wise Total Geographical Area

Sr. No.	Name of the circles	Total Geographical Area in sq. k.m.
1	Phaltan	296.88
2	Barad	312.62
3	Vidani	268.62
4	Taradgaon	280.25
5	Phaltan city	31.90
	Total	1190.27

Source: District Census Handbook, Satara District, 2011.

2.3 Physiographic Profiles:

The physical bases, particularly the relief, drainage pattern, geology, climate and soil play vital role in agricultural activity.

2.3.1 Relief:

Phaltan Tahsil presents varied physical features based on the relief features which can easily be divided into three divisions (Fig.-2.4 and 2.5).

a) Hilly area (above 900 meters)

b) Rolling transitional zone (600 to 900meters)

c) Levels plain (below 600 meters)

a) Hilly area (above 900 meters):

The hilly area occupies a smaller part sharing 9.92 percent (118.05 sq.km.) of the tahsil area in the southern part. It's a part of Mahadeo ranges having more than 900 meters elevation (Fig.-2.4) and includes various ranges and Ghats. They are namely Tathwada Ghat in south-western part, Shitabai Dongar in the southern part, Varugad and Shikhar Shingnapur hills in the south-eastern part and Mogarala Ghat situated in the eastern part of Phaltan Tahsil. Moderate to steep slopes are observed from the south to the northward. These hilly areas are for agricultural productivity.

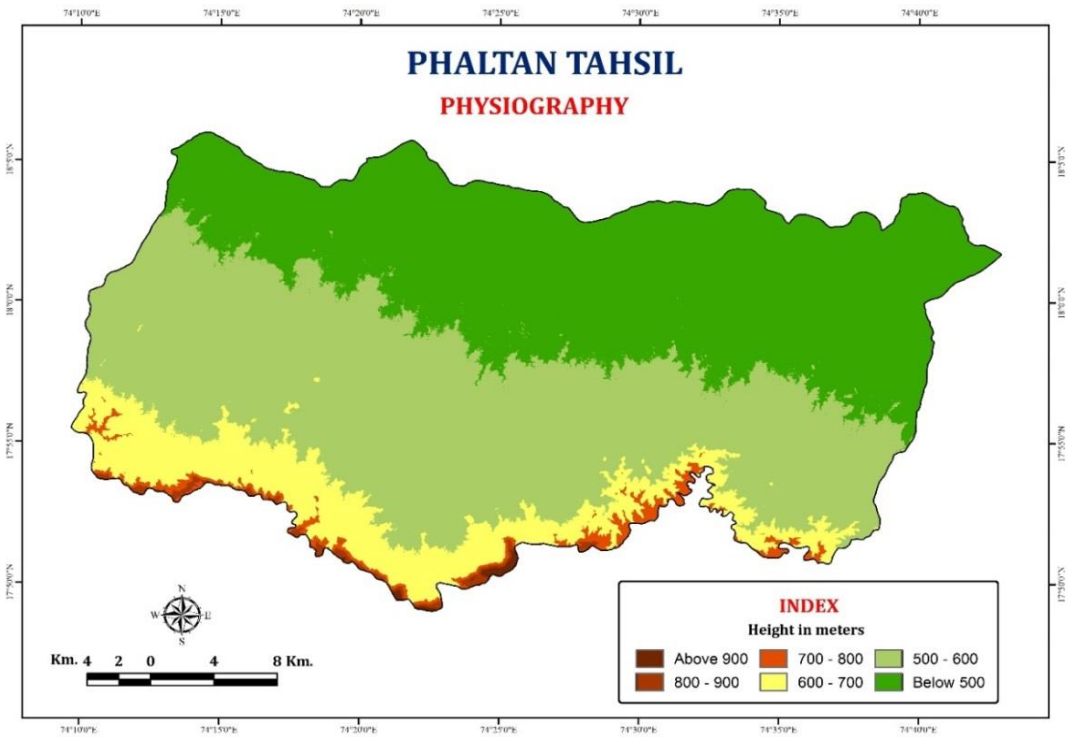
b) Rolling or Transitional zone (600 to 900 meters):

Towards the north of hilly zone, parallel to the Nira River, transitional belts has been characterized by various minor land forms. It occupies 422.77sq.km. (35.52 percent) area. This zone is also medium suitable for agricultural productivity.

c) Levels plain (below 600 meters):

Levels plain is an extensive zone with 649.18 sq.km. (54.55 percent) area and is mainly confined to the northern border and parallel to the Nira river. It has been widened towards the east having fertile soil cover and availability of recurrent water supply from the Nira right bank canal. This zone is highly suitable for agricultural productivity.

Figure-2.4

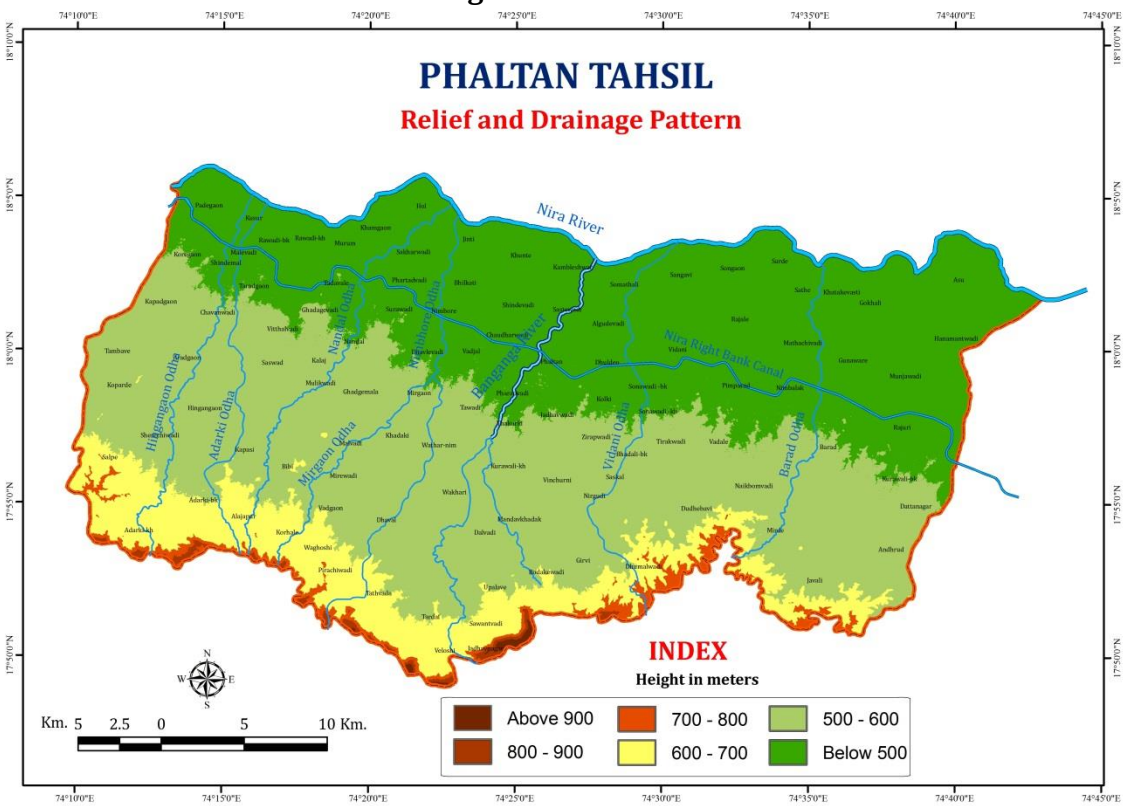


Sources: Topographical Maps, Survey of India.

2.3.2 Drainage pattern:

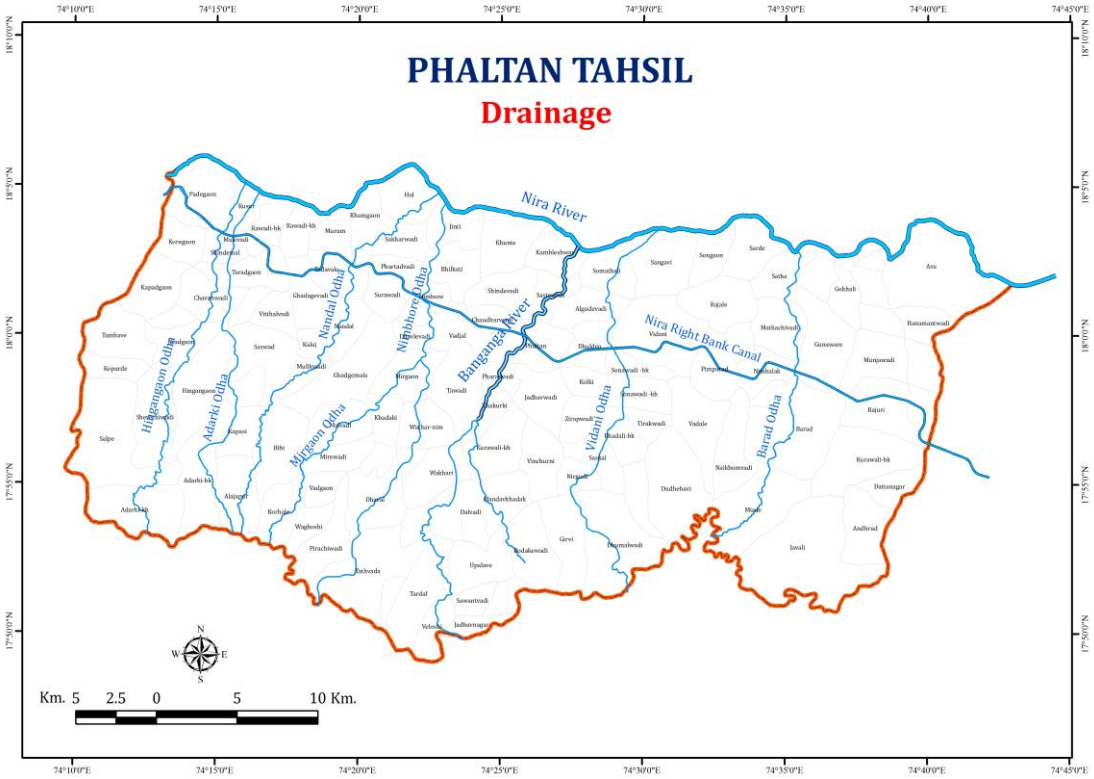
The physical setting of Phaltan Tahsil, a contrast of immense dimensions reveals a variety of landscapes. The drainage pattern in Phaltan tahsil has been influenced due to the variation in the relief. The Nira is the only important river which is the main tributary of the Bhima River, a main left bank feeder of the river Krishna. The Nira ascends in the Sahyadri range near Bhor in Pune district and from there it runs eastward to form the boundary between Pune and Satara district. The river has acquired great economic importance due to the Bhatghar dam and Veer dam from which the Nira right bank and left bank canal supply water to Phaltan and Khandala Tahsil. The River Banganga is one of the feeders of the Nira River. The Banganga originates in the Sitabai hills in Man tahsil having a total length of 50 kms. The river runs the south-eastward to the village Giravi, Dhumalwadi and Velosi. The river bed is sandy and the banks are highly eroded. It joins the Nira River at Somanthali village of Phaltan tahsil. Besides, there are many small streams draining the entire area following towards north. These streams have provided potential sites for agricultural activities in this area (Fig.-2.5 and 2.6).

Figure-2.5



Sources: Topographical Maps, Survey of India.

Figure-2.6



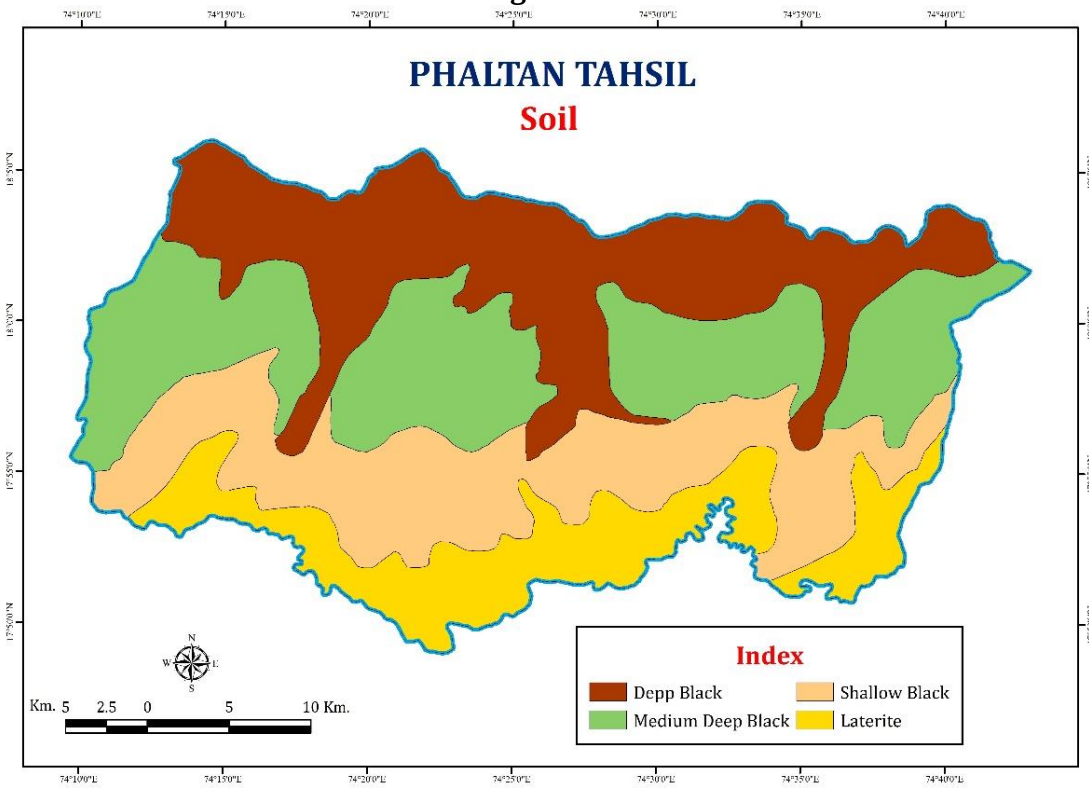
Source: Topographical Maps, Survey of India.

2.3.3 Soils:

There are four groups of soils in the study area and their distributions match up with the relief features. Since it is the part of Deccan trap, black soils are extensively observed (113,356 hectares and 27.61 percent). However they vary in their depth and also according to their subtypes. The deep black soils (above 100 cm.) are close to the river course which are fertile and are dedicated mainly for sugarcane crops. This has been followed by medium black soils (50 to 100 cm.) with 32,873 hectares of area. The shallow black (25 to 50 cm.) soils fall into the transitional zone and have less scope for irrigation. Jowar and Bajara are the two major food crops grown on this type of soil. In the extreme south, Laterite soils are observed. There are four soil types namely Coarse shallow, Medium black, Deep black and Laterite soils occupying 45 percent, 30 percent, 15 percent and 10 percent of land respectively. The Coarse shallow soil is confined to the north and the west, medium black soil is mostly found in the north and deep black soil in low lying areas of the Nira and the Banganga rivers. This area offers favourable condition for irrigation and thereby for establishment of agro-based industries. The black colour of the soil is an indication of high fertility status. Phaltan Tahsil is mainly drained by

the river Nira and the Banganga River, which is the tributary of the Nira River. They are found to be poor in nature and are creating obstacle in the development of agriculture (Fig.-2.7).

Figure-2.7



Source: Topographical Maps, Survey of India.

2.3.4 Climate:

Climate is one of the principal factors of physical environment affecting agriculture, irrigation and water management programs. Climatic conditions are important in determining distribution and performance of crops. Monsoon effects have a significant impact in almost every aspect of our life (Spate and Lear Mouth, 1967). In the present study, the temperature and rainfall which are the two important elements of climate have been considered in detail. The nature of distribution of these elements determines the necessity of rain agricultural productivity as this area falls in the drought prone area of Maharashtra.

2.3.5 Temperature:

Temperature can be regarded as an important component, which indirectly controls rainfall system and water availability for agricultural productivity. The temperature recorded at Phaltan Tahsil headquarter have been incorporated in the present study. Table-2.3 and Fig.-2.8 shows the

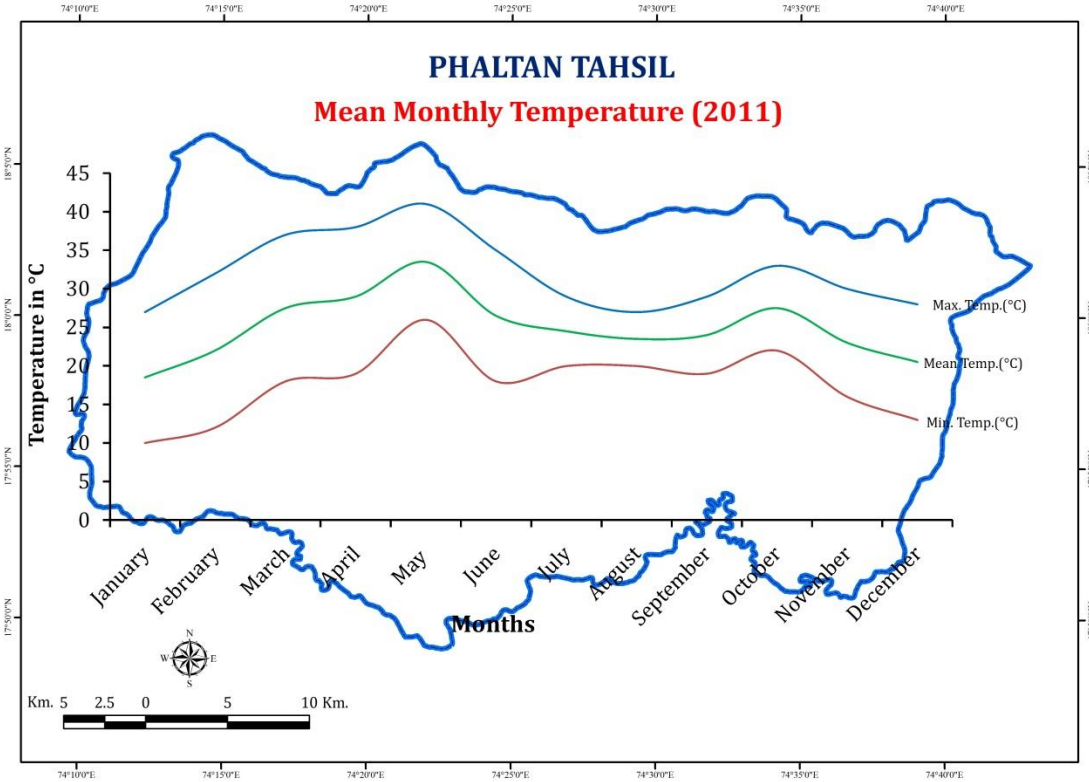
monthly average temperature (Year 2011) which varies from month to month. The months having low temperatures (< 20.5℃) are December, January and February. High temperatures (> 33.5℃) are observed from April till June. The rate of water evaporation is enhanced during the summer season.

Table-2.3
Phaltan Tahsil
Mean Monthly Temperature (2011)

Sr. No.	Months	Max Temp.(°C)	Min Temp. (°C)	Temp. (°C)
1	January	27.0	10.0	18.5
2	February	32.0	12.0	22.0
3	March	37.0	18.0	27.5
4	April	38.0	19.0	29.0
5	May	41.0	26.0	33.5
6	June	35.0	18.0	26.5
7	July	29.0	20.0	24.5
8	August	27.0	20.0	23.5
9	September	29.0	19.0	24.0
10	October	33.0	22.0	27.5
11	November	30.0	16.0	23.0
12	December	28.0	13.0	20.5

Source: Department of Agricultural, Phaltan (2011)

Figure-2.8



Source: Phaltan Tahsil Agriculture Department.

2.3.6 Rainfall:

The seasonal nature and intensity of rainfall are important considerations, which determine water system and consequently the development of agricultural program. Semi-arid area with an annual rainfall in the range of 400 to 600 mm. having hilly area and rolling terrain including a hard plateau region can benefit from the agricultural productivity techniques (Bansil, 1998). For the present investigation, rainfall pattern for a period of 30 years has been considered. The average annual rainfall in the region is found to be 530 mm, which declines west to east.

a) Spatial distribution of rainfall:

It is observed that the average annual rainfall of the region is 530 mm. (2011). However, the rainfall decreases from west to east (500 to 600 mm.). Despite spatiotemporal variation, the monsoon rainfall has created temporal variations.

b) Seasonal distribution of rainfall:

The necessity of rainfall arises when the distribution of rainfall is uneven in time and space as the crops require timely and adequate water supply. Table-2.4 and Fig.-2.9 show seasonal distribution of rainfall in 2011. It is evident from the data that the rainy season has been characterized by relatively high rainfall. The high proportion of rainfall is observed in the month of June (263.40mm.). In hot summer season (March to May) the region has observed moderate rainfall (85.40 mm). The post-monsoon months October and November have also recorded 42 mm. rainfalls which is useful for Rabi crops cultivation. Almost 82.66 percent rainfall occurs in rainy season. In view of the distribution of rainfall, the year can conveniently be divided into four seasons.

i) Rainy season (June to September):

The rainfall is highly concentrated in this season as it receives about 82.66 percent of total annual rainfall (Table-2.5). Although, it is mostly uncertain; it is very much useful for Kharif crops. The intensity of rainfall during this season is important in the context of water availability for agricultural productivity.

ii) Post-monsoon season (October to November):

This period of season is transitional. The south-east monsoon is associated with cyclonic rainfall. The area receives 5.69 percent of total rainfall and it is useful for rabi crops.

iii) Winter season (December to February):

During this season, the region receives almost no rainfall. Sometimes it is characterized by the irregular cyclonic rainfall which is beneficial, although not for rabi crops.

iv) Summer season (March to May):

This part of the year receives insignificant amount of rainfall (11.65 percent). This is associated with thunderstorms. It is very useful for harvesting and conserving rainwater deficit period of March to May.

c) Annual variations in monsoon rainfall and rainy days:

Table-2.4 indicates annual deviation in rainy days from the normal for the last 30 years. The area has observed normal rainfall of about 437.66 mm. for ten years, the annual average rainfall has observed more than the normal range (Fig.-2.10). Then highest rainfall (1017mm.) has been recorded in the year 1998 and also the highest numbers of rainy days (58). In contrast to this, there are some years which are marked by rainfall less than normal. Nearly 20 years have recorded this situation and the year 2003 marked the lowest rainfall (81 mm.) and lowest numbers of rainy days (10 days). Remaining years have recorded normal rainfall. All these temporal variation have close link with the availability of water. The aforesaid analysis reveals that there is immediate need of agricultural productivity in the area.

d) Rainfall intensity and variability:

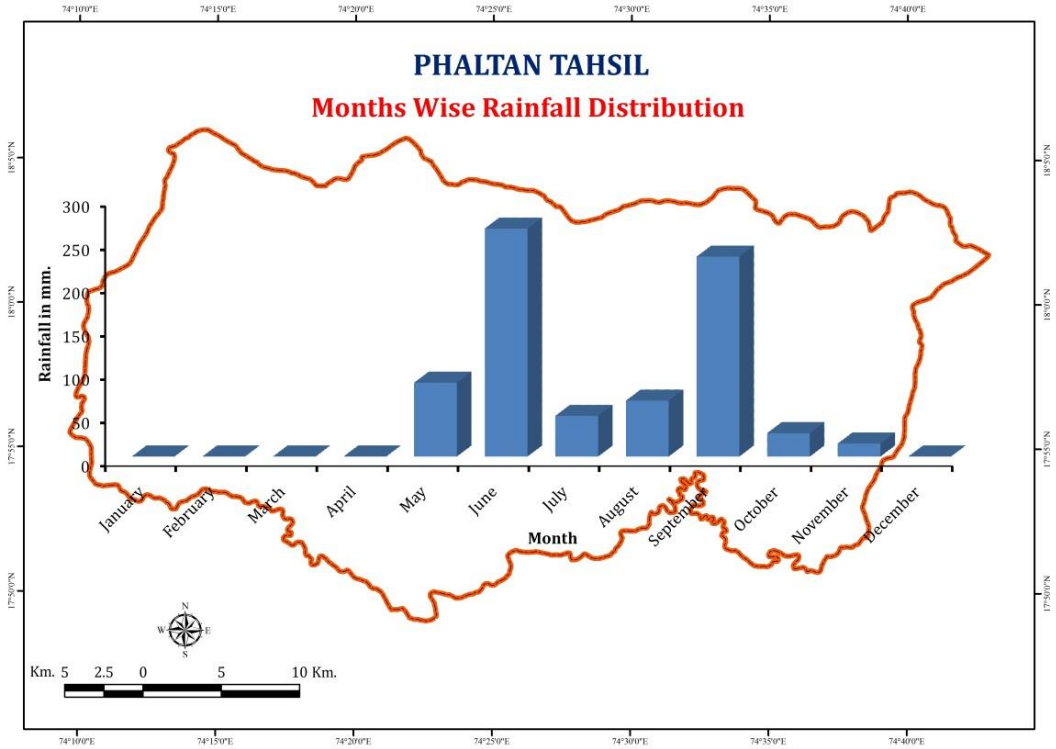
The term intensity is used here in the perspective of rainfall received during 24 hours period. It is important to determine the intensity of soil erosion by rain and the usefulness of rain. Moreover, the intensity of rainfall determines the water system and thereby agricultural productivity potentials of the region. The intensity of rainfall (I) is calculated by employing the formula, I= A/n, set out by Monk house and Wilkinson (1971), where "A" is the total rainfall over a given period of time and "n" is the total number of hours of rain or rainy days. The intensity of rainfall thus calculated varies from 14 to 18mm. per rainy day in the south-western part (Taradgaon and Phaltan revenue circles) of Phaltan Tahsil. On the contrary, the central and eastern parts have less than 15 mm. intensity and falls in rain shadow zone. The rainfall variability also increases from west to east from 25 percent to 30 percent (Shinde, 2000).

Table-2.4
Phaltan Tahsil
Months Wise Rainfall Distribution

Sr. No.	Months	Total Rainfall in mm.
1	January	00
2	February	00
3	March	00
4	April	00
5	May	85.4(11.65)
6	June	263.40(35.93)
7	July	47.00(6.41)
8	August	64.60(8.81)
9	September	231.0(31.51)
10	October	27.0(3.68)
11	November	15.0(2.01)
12	December	00

Note: Figures in bracket indicate percentage of total rainfall 2011.

Figure-2.9



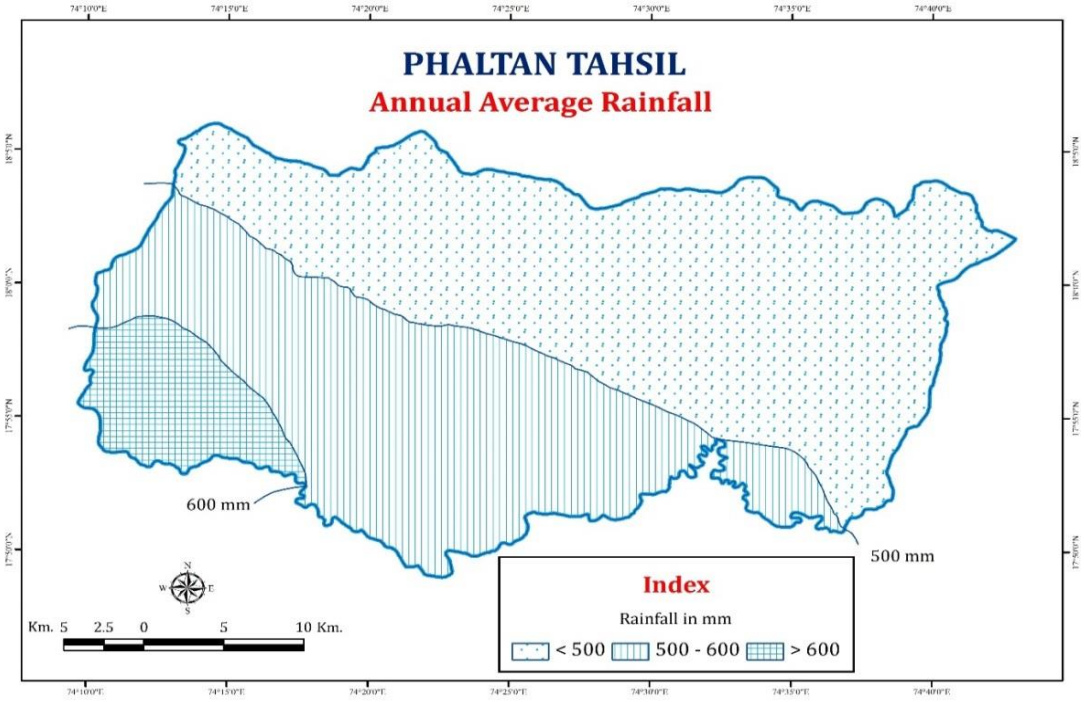
Source: Phaltan Tahsil Agriculture Department.

Table-2.5
Phaltan Tahsil
Seasonal Rainfall Distribution (2011)

June to September (Rainy Season)	82.66%
October to November (Post-Monsoon Season)	5.69%
December to February (Winter Season)	Nil
March to May (Summer Season)	11.65%

Source: Phaltan Tahsil Agriculture Department.

Figure-2.10



Source: Phaltan Tahsil Agriculture Department.

2.3.7 Natural Vegetation:

All the plants growing together in any area form its vegetation. The vegetation of any region is made of a collection of number of plants belongs to few or many different species. The natural vegetation is commonly used to describe the natural plant's growth as distinct from the cultivated plants growth. The natural vegetation is composing three fold divisions of study the forest, grassland and desert. In the area under study, the forest cover is very poor.

It is observed that area under forest had been decreasing in the period of 30 years from 1991 to 2011. Area under forest was 10900 hectares (9.15 percent) in 1991. It was 10892 hectares in 2001 whereas it was 10770 (9.04 percent) in 2011. It means area under forest had decreased by 130 hectares in the period of 30 years. It shows the decrease by 0.11 percent in area under forest. Forest cover in Phaltan Tahsil 1991 was 9.15 percent (10900 hectares) of total area. But it has declined to 9.04 percent (10770 hectares) in 2001. It means more forest land has been brought under cultivation in the study area. It resulted in decrease of forest land.

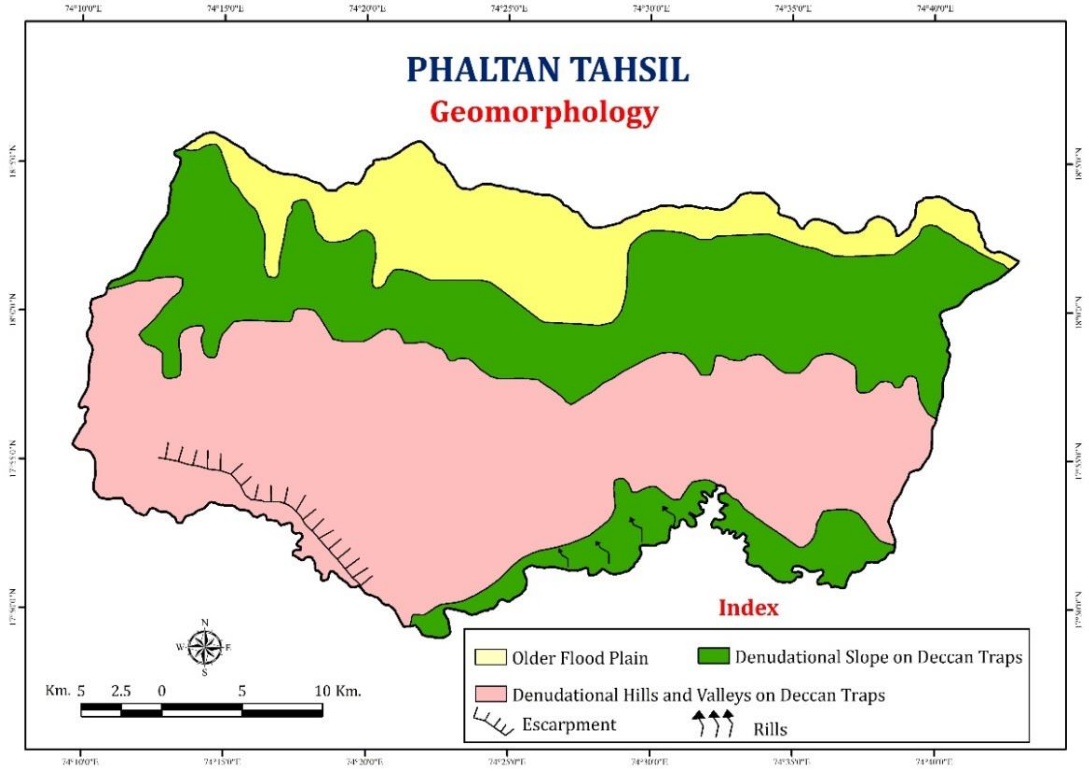
This area is owned by the Forest Department. The forest Department keeps watch to preserve trees and forest area. The natural vegetation is mainly of low scattered trees occurring along the border of the study area. The hot and dry climate has resulted mixed thorny trees, stunted grass and scanty vegetation. Trees like Mango (Magnifera India), Jambhul (Syzygium Cummi), Neem (Azadiracta India), Babhul (Accacia Arabica), Bor (Zizaphus Jujubal), Chinch (Tamaridus India), are obtained scantily throughout the study area. Shrubs like Ghaneri (Lantena), Tarwad (Casia Cuviculata), Rui (Caletropus Gigatio), and 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 bands of agricultural fields

2.4 Geomorphology:

The geological formation of a region determines the relief features and the soils. Phaltan Tahsil belongs to Deccan traps and is located at the western limits of it. Enormous lava flow was poured out through fissures and localized vents during upper cretaceous to lower Eocene period. Because of their spreading over greater parts of peninsular India (Deccan) and because of their step like terraced appearance (Trap) they are called Deccan Traps (Fig.-2.11). They are dominantly having basaltic composition (Desai, 1971). This lava flow formed the plains with a soil of varied thickness. The denudation slope on Deccan traps attains their maximum thickness near Tathwada and Shikhar Shingnapur, which are the sub ranges of the Western Ghats. Due to the trap weathering, there is vast concentration of grayish material and the junctions

keep contouring back at several places along the slope of the hills that cut across the contours (Kulkarni, 1973).

Figure-2.11



Sources: Topographical Maps, Survey of India.

2.5 General Land Use Pattern:

Land use is a geographical concept since it involves specific areas. The land use study in its spatial framework is vital to understand the regional zones of optimum land use areas, degraded areas etc. (Shinde, 1987). The utilization of land for different purposes indicates an intimate relationship between prevailing ecological condition and main land use, in general, and cropping of irrigation besides the other factors such as soil, climate and other agro input. Hence an account of irrigation facilities is taken. In the any geographical region the land under different use has got importance in the economy of the region. In the study area, the land under cultivation is about 58.24 percent out of the total geographical area. The agricultural activity in the study area is very important because the economy of the region depends upon the land under agriculture or cultivation. Overall the land under forest is 9.04 percent. The eastern part is mostly covered by barren and fallow land while the southern part is covered by non-agricultural land and grazing land. The study area is a

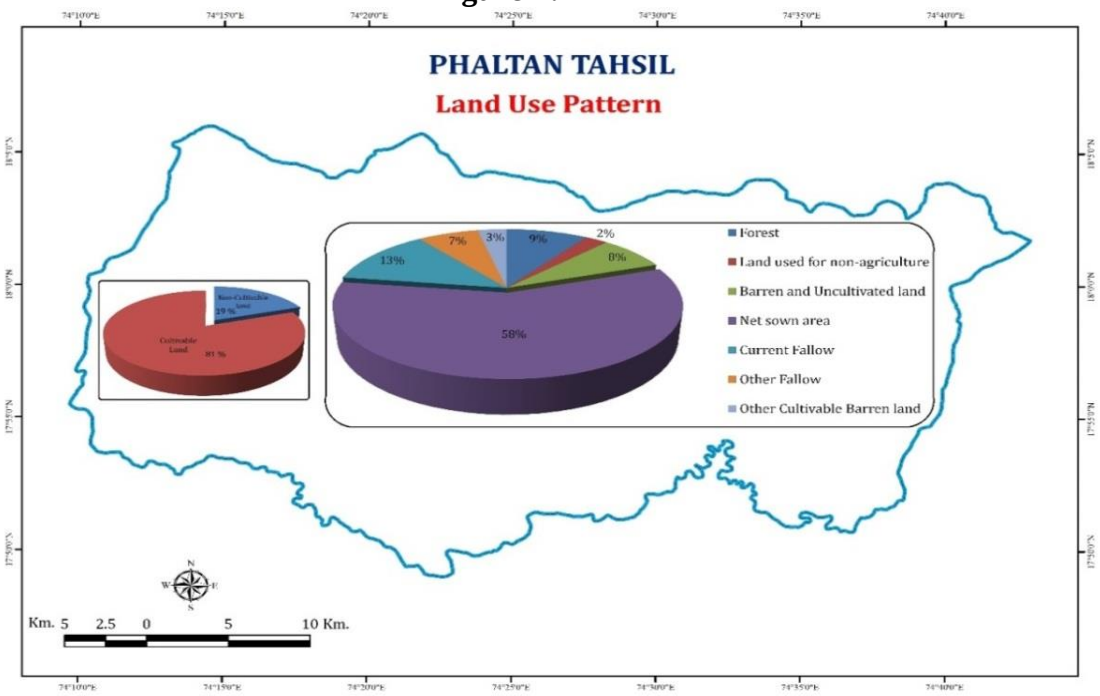
part of Sahyadri Ranges covered by Shambu Mahadeo Ranges. It is observed that the land under cultivation is less in the southern part of study area.

Table- 2.6
Phaltan Tahsil
Land Use Pattern (Area in hectares)

Sr. No.	Land use Category	2011	Percentage
1	**Non-Cultivable land**	**22885**	**19.21**
	1) Forest	10770	9.04
	2) Area not available for cultivation	12115	10.17
	a) Land used for non-agriculture	2990	24.68
	b) Barren and Uncultivated land	9125	75.32
2	**Cultivable Land**	**96144**	**80.79**
	3) Net sown area	69325	58.24
	4) Fallow land	23009	19.35
	a)Current Fallow	14953	64.98
	b) Other Fallow	8056	35.02
	5) Other Cultivable Barren land	3810	3.20
	Total	**119029**	**100**

Source- Phaltan Tahsil Socio-Economic Abstract, 2012.

Figure-2.12



Source- Phaltan Tahsil Socio-Economic Abstract, 2012.

2.6 Irrigation Facility:

Irrigation is regarded as an integral part of healthy infrastructure and is one of the basic ingredients of agricultural activities. It transforms the subsistence agriculture landscape gradually into commercial one and thereby making agriculture economy market oriented (Pawar, 1989). Hence due

significance is given to irrigation in the following paragraphs. The source of irrigation in the study area is largely affected by the physical features such as topography, geology, soils, presence of ground water and climatic conditions. Presently, the area has three different sources of irrigation viz. well, canal and tank. The different modes of irrigation are characterized by the change in their ranking order. As per the records in 2011 (Table-2.7), the wells ranked first (65.67 percent) followed by the canals (29.43 percent) and lastly tanks (4.88percent). Such hierarchical position had existed during 1991. The well irrigation is dominant may be due to percolation from the Nira Right bank canal system and water percolating tanks as well. There are over 9074 working wells in the study area, and about 10080 bore wells (2001).

Table-2.7
(Phaltan Tahsil
Sources of Irrigation (Area in hectares)

Sr. No.	Source of Irrigation	1991 (A)	2001 (B)	2011 (C)	Percent change	Percent change
1	Wells	24580.38 (59.34%)	41629.84 (60.58%)	47341 (65.67%)	1.24	5.09
2	Canals	14755.30 (35.62%)	22520.53 (32.77%)	21220 (29.43%)	-2.85	-3.34
3	Tanks	2086.84 (5.04%)	4566.37 (6.65%)	3523 (4.88%)	1.61	-1.77
Total		41422.52	68716.74	72084	2.85	5.09

Source: Based on data collected from Tahsil Office of Phaltan

2.7 Transportation and Communication:

Transportation and Communication is an index of social and economic development in a particular area. It is because most of the economic and social activities are positively influenced by the network system available in that area. In terms of railways, the Phaltan Tahsil is quite fortunate to have a sizable length of total railway lines. It has a total length of 20 kilometers railway line (Broad gauge). The roadways are another important means of transportation for the social and economic development in a particular area. Unlike railway, roads provide door to door services in terms of connectivity. Phaltan Tahsil is better off since it has a total road length of 1256.58 kilometers which include 91.20 kilometers of major state highway. Apart from this, the major district roads have a length of 360.18 kilometers, while other district roads occupy 166

kilometers. The village roads are comparatively having a sizable distance comprising over 639.20 kilometers of length connecting all the villages in the Tahsil.

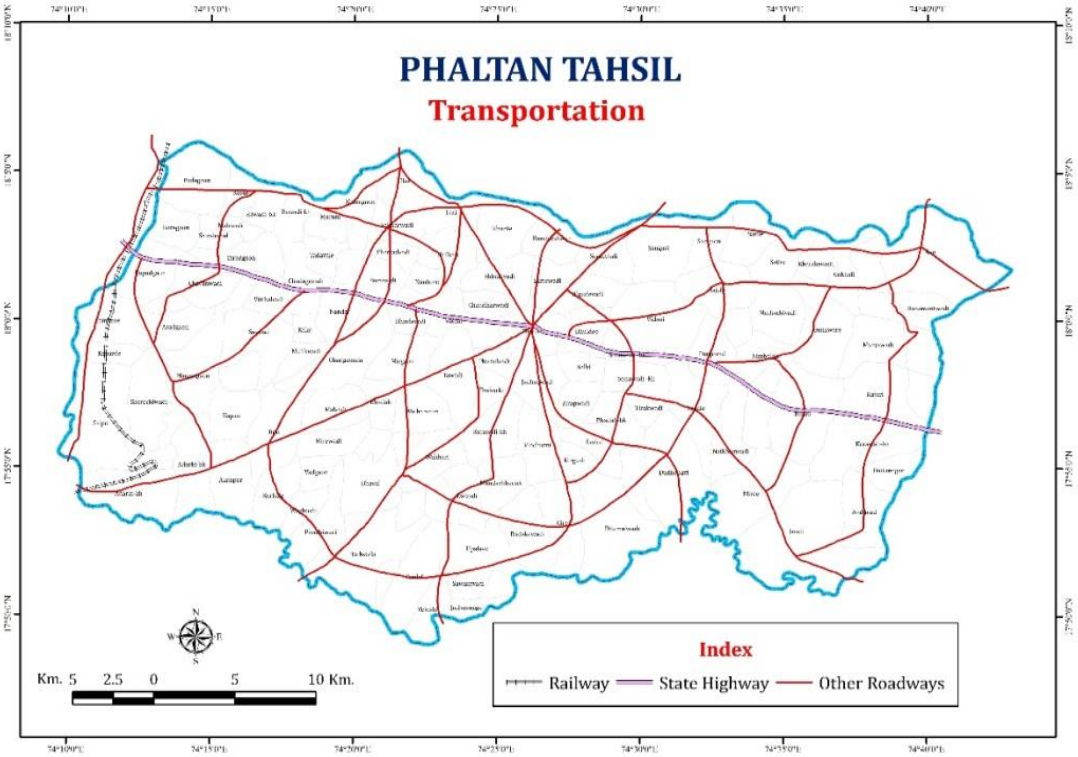
Table-2.8
Phaltan Tahsil
Transport Routes (2010-2011)

Sr. No.	Name of Transport Route	Length (Km.)	Percentage
1	Broad-gauge Railway	20.00	1.57
2	State Highways	91.20	7.14
3	District Roads	360.18	28.21
4	Other District Roads	166.00	13.00
5	Village Roads	639.20	50.07
Total		1276.58	100

Source: Superintendent Engineer, P.W.D. Phaltan.

From the above table it can be seen that the village roads cover almost half of the total length of roadway in Phaltan Tahsil. It is followed by Tahsil a road which is slightly less about 1/3rd of the total road length. The state highway occupies around 7 percent of the total road length while major state highways have little less than 2 percent of the total road length. Transportation network is directly correlated with the exploitation of the natural resources, as well as economic and human resources. Regarding communication, 128 villages have postal and as well as telephones services. On an average 7166 population is served by 32 Post Offices. In addition, there are mobiles phones and 6972 land line working in the Tahsil.

Figure-2.13



Source: Superintendent Engineer, P.W.D. Phaltan

2.8 Demographic Profile:

Population is the point of reference from which all the other elements are observed and from which they all collectively, derive significance and meaning (Triwartha, 1970). The growth in population and expansion of economic activities has led to increasing demand for diverse purposes (Gujar and Shukla, 1998). Simultaneously the literary structures also affect the adoption of any innovation. The demographic profile of Phaltan Tahsil is discussed below in terms of total population, population growth and density of population, literacy, sex ratio and occupational structure.

2.8.1 Population:

Phaltan is the third most populated Tahsil in Satara district. The growth rate of population from 1991 to 2011 was 25.31 percent, due to the agro-industrial development. The study area consists of 128 villages and one urban center it has has 2, 73,451 populations in 1991 and 2011 census has 3, 42,667 population. The average density of population is 287 persons per sq.km.in the area (2011). The rural population accounts to 282,495 whereas urban

population stands at 60,172 (Table-2.9). It accounts to about 10 percent of the total population of Satara district.

2.8.2 Population Growth:

(a) Rural population:

It has been observed that the absolute number of rural population has increased in each decade after 1961 but the variation has nearly been uniform. According to census 2011, rural population of Phaltan Tahsil is 82.45 percent of the total population.

(b) Urban Population:

Phaltan city is the only Tahsil headquarter in this study area. In 1961 urban population was 13.56 percent of total population and it has increased in every decade by about 1 percent. In 2011, it is increased by 1.33 percent in comparison to 1991. In 2011 census, the urban population is 17.55 percent of total population (Table-2.9).

Table-2.9
Phaltan Tahsil
Decade wise Growth of Population from 1961 to 2011.

Years	Total	Change	Rural	Percent	Urban	Percent
1961	140102	-	121099	86.44	19003	13.56
1971	186627	+46526	159853	85.65	26774	14.35
1981	224018	+37391	190159	84.88	33859	15.11
1991	273451	+49433	229084	83.77	44367	16.22
2001	314410	+40959	263610	83.84	50800	16.16
2011	342667	+29040	282495	82.45	60172	17.55

Source: Census of India, 19961 to2011.

2.8.3 Density of Population:

To simplify the complexities of aerial distribution, an attempt has been made by introducing density lines of 100 persons per square kilometer to show the patterns of distribution of population in Phaltan Tahsil.

i) Low Density Area:

This area lies between ranges of below 250 density lines. It includes Phaltan Revenue circle (241). Due to undulating topography, poor and shallow yellow-brown soils associated with low rainfall (below 500mm),it has

discomforted the human settlement and thereby transforming it into a drought prone area. Hence, the density of population is very low in the study area.

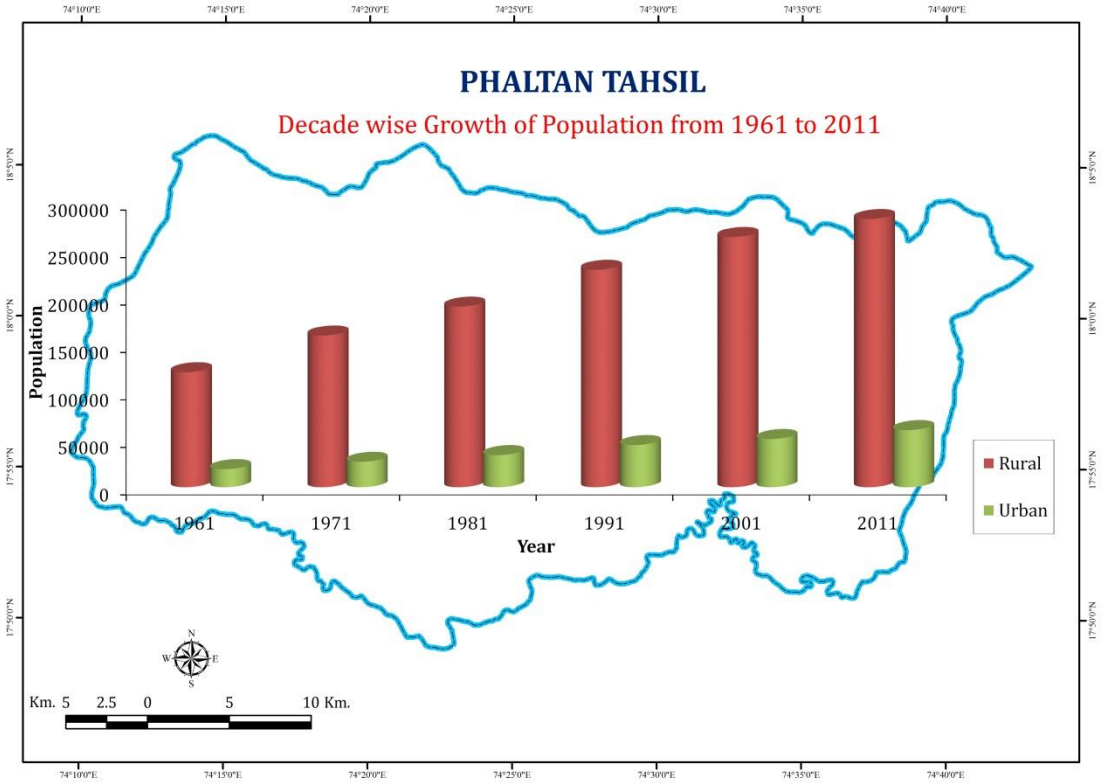
ii) Medium Density:

This includes revenue circles of Barad (275), Vidani (296) and Taradgaon (253). It comprises of the nearest parts of the Nira river plains and same parts of canal irrigation.

iii) High Density:

This includes small portions of the Tahsil, mainly urban center of Phaltan city (1633). It is because of facilities of education, good living standard, job opportunities etc.

Figure-2.14



2.8.4 Literacy:

As a matter of expediency, literacy is defined as the ability to read and write one's name in one's own mother tongue. In India, all those persons who can both read and write a simple message with understanding in any language are classified as literate. However, according to 1991 Census, all children below the age of 6 years are treated as illiterates even though they may be going to school and can read and write some words. Literacy is a qualitative attribute for development of an area (Chandana and Sindhu, 1980). In Phaltan

and Taradgaon Revenue circles, a very high literacy rate (above 70 percent) is found. Moderate literacy rate (between 60 to 70 percent) is observed in Phaltan and Vidani circles, and low literacy rate (below 50 percent) is noted in Barad Revenue circle.

2.8.5 Sex Ratio:

In Phaltan Tahsil, there are 944 females for every 1000 males. Generally, rural areas have a higher proportion of females than the urban areas. But, according to 2011 Census, the sex ratio figures for rural and urban area were 936 and 979 respectively when compared to the state average of 925. It may be noted that the rural sex ratio of the Tahsil is lower and urban sex ratio is comparatively higher than the corresponding state sex ratios.

2.8.6 Occupational Structures:

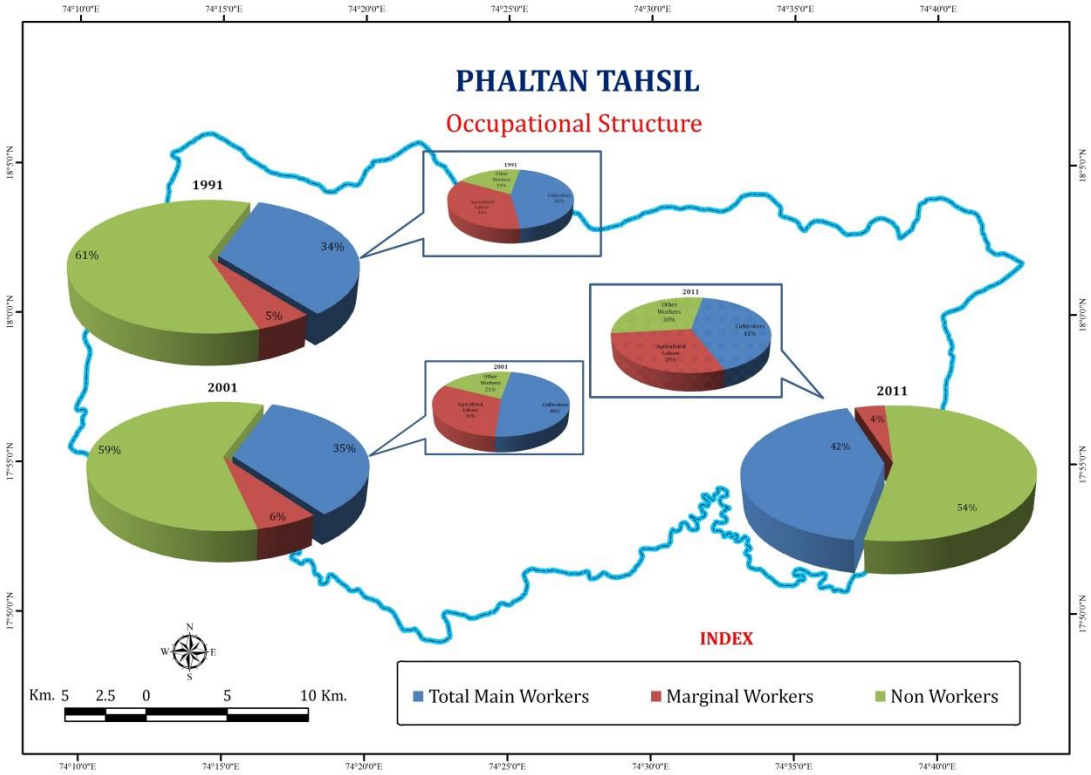
Out of the total main working population of 144718 nearly 42.23 percent are cultivators (59887) as the area is dominated by agricultural activities (Appendix-G). Among the cultivators, the agricultural labours account to 29.08 percent (42,096). In general, cultivator's concentration is high in the northern part and decreases towards the East and the Northern part of the study area. Other workers population is 29.54 percent (42,735) of the total working population (Fig.-2.15).

Table-2.10
Phaltan Tahsil
Occupational Structure

Sr. No.	Category	Population					
		1991	Percent	2001	Percent	2011	Percent
1	Total population	273451	100	314410	100	342667	100
2	Total Main Workers	92510	33.83	108462	34.49	144718	42.23
	i) Cultivators	41738	45.11	52463	48.36	59887	41.38
	ii) Agricultural Labour	32800	35.45	33869	31.24	42096	29.08
	iii) Other Workers	17972	19.44	22130	20.40	42735	29.54
3	Marginal Workers	15269	5.58	20346	6.47	13395	3.90
4	Non Workers	165672	60.59	185602	59.04	184554	53.87

Source: District Census Handbook, Satara District, 1991, 2001and 2011.

Figure-2.15



Source: District Census Handbook, Satara District, 1991, 2001and 2011.

2.9 References:

1. Bansil P.C., (1998), "Water management in India", Concept Publishing Company, New Delhi.

2. Bunting B. T., (1967), "The Geography of Soil", Hutchinson, London.

3. Chandana R.C. and Sindhu M.S., (1980),"Introduction to population Geography", Kalyani Publishers, New Delhi.

4. Desai S. D., (1971), "The Geology of Deccan Trap Formation of Sourashtra", Journal of the Sayajirao University of Baroda, vol. 14, page 1–11.

5. Gaikawad, V.P., (2008), "A Geographical Analysis Of Rainwater Harvesting Potentiality In Phaltan Taluka of Satara District (M.S.)", Unpublished M. Phil. Dissertation, Shivaji University, Kolhapur.

6. Government of Maharashtra (1973), "The Report of the fact finding Committee for survey of Scarcity Areas", M. S. Bombay.

7. Government of Maharashtra, Directorate of Economic & Statistics (1991, 2001, 2011), Socio-Economic Review & District statistical abstract of Satara district.

8. Gujar R.K. & Lakshmi Shukla, (1998), "Water resources, Environment and the people", Pointer Publishers, Jaipur.

9. Husain M., (1979), "Agricultural Geography", Inter India Publication, New Delhi, Page –116.

10. Jasbir Singh,(1974),"An Agricultural Atlas of India-A Geographical Analysis", Vishal Publication, Kurukshetra, India.

11. Jasbir Singh and Dhillon, (1994), "Agricultural Geography", Rawat Publication, Jaipur.

12. Kulkarni S. R., (1973), "A post Deccan Trap Volcanic Brcia flow at Satara", Brecia flow at Satara Bulletin of Earth Science, vol–2, pp. 45-48.

13. McHarg, (1966), "To heal the Earth",Island press,Washington,Pp.203-242.

14. Monkhouse F.J. and Wilkinson H. R, (1971), "Maps and Diagrams", London, Methuen & Co. Page–195.

15. Pawar C. T. and Shinde S. D., (1979), "Well irrigation in unplanned district of south Maharashtra region, A Spatio-temporal perspective", Geographical Review of India, vol. 41, No. 4, Page 134-320.

16. Pawar, C.T, (1989), "Impact of irrigation: A Regional Perspective", Himalaya Publishing House, Bombay, Page-13.

17. Spate and Learmouth, (1967), "Understanding Monsoon to know its vagaries, Monsoon", Geographical review American Geographical Society Journal, Vol.57, No.3.

18. Shinde S. D., Jadhav M. G., More K. S. and Pawar C. T., (1987), " Land use pattern and land use capability studies in south Maharashtra's Western Ghats", Major Project Report, sponsored by Dept. of Environment and Wild Life, Govt. of India, New Delhi.

19. Shinde S. B. (1981), "Some Aspects of Agriculture of Satara District: A Geographical Analysis", unpublished Ph.D. Thesis, Shivaji University, Kolhapur.

20. Singh and Dhillon, (1998), "Agricultural Geography", Tata McGraw – Hill Publications, New Delhi.

21. Singh and Sadhu, (1991), "Agricultural Problems in India", Himalaya Publishing House, Bombay, Page–59.

22. Triwartha G. T. (1970), "A case for population Geography", A Reader, Ed. Demka, Rose and Schemell, McGraw Hill, New York.

CHAPTER-III
GENERAL LAND USE PATTERN

CHAPTER-III
GENERAL LAND USE PATTERN

3.1 Introduction:

We find considerable regional variations in the general land use of area due to land form diversities as well as rainfall distribution in the study area. It is necessary to change from generalities to particularities in the study area, in which agriculture is the only means of getting livelihood for most of people in the area. These studies are basic for future planning. Studies on land use pattern have received a much attention from Indian Geographers in the past and continue to draw their attention. Now the patterns are being minutely investigated at the regional or micro regional rather than at the national level. Due to the recent extension of irrigation and other facilities, the North-Western India and some parts of South India have received comparatively more attention from the research workers. It is in Uttar Pradesh and Bihar, where research publications on this aspect of agriculture appear to be more numerous than in other part of country. The reason for this is that the abundance of agricultural resources and their various uses in the region is facilitated by congenial environment and capability of the people to adopt themselves to changes in the environmental determinants. Indian geographers have long been drawn to study the problems of land use in the country with object to look for ways and means for scientific utilization of land. These studies range from inventories of land use surveys to isolated topical or regional descriptive accounts of land use variations both in space and time. A rational appraisal of land and its scientific utilization has become very significant. Such studies are possible when the whole complex of land use is studied at the district or tahsil or even village level by considering the local physical and socio-economic conditions (Ali Mohammed, 1978). For evolution, management and conservation of natural resources of an area land use mapping is important. Land use, land cover inventories became necessary factor in land resources evolution and environmental studies (NRSA).

At this juncture, it would be better to know the meaning of land use. Land use means man's intervention on the surrounding to get his basic needs. In other words, land use means the surface use of land to fulfil human needs. Each geographer has tried to define the term land use in his/her own way.

Land use is any type of permanent or cyclic human intervention on the environment to fulfil human needs and the land use capability or land suitability is the potential capability of given track and to support different types of land use under given cultural and socio-economic conditions (Vink A.P.A., 1975). Land is present given by the nature to the human being so it is the basic resource of human society. Land use is the surface use of all developed and vacant land on a specific point at a given time and space. This takes one back to the village, farm and the farmer to the fields, garden pastures, fallow lands and forests and to the isolated farm steam (Freeman T.W., 1968). The study of land utilization in its spatial context is necessary to know the area of optimum land use and degraded areas, the comprehensive study of land utilization has greater value to ensure better returns from the land to meet future needs for food, and industrial raw materials and for successful planning of agricultural growth, organized urbanization, regional development and thereby to increase the process of development in the country. It is also useful for planners to the possibilities and limitations of further spatial development to avoid or restrict undesirable trends of land exploitation to adjust the forms of land use to the capability and to direct the expansion of intensive land use into suitable areas (Nageshwar Rao and Vaidyanathan, 1981).For human survival, land is essential because it supplies means with living space, with food and with number of raw materials which are used in the fulfilment of his needs. But as necessary the land component plays very important role in conditioning and transforming his physical environment (Barlowe, R.1963).

Nowadays the study of land utilization in India has become very important to find ways for scientific cultivation of land to raise the food production. The study of land use is important in agriculturally dominated, over populated developing regions throughout the world. Due to its relationship with different human phenomena, its importance also heightened during the population pressure and decreasing man and land ratio, growing demand for food and raw materials the requirement for optimum use of land in an integrated manner has assumed greater relevance. That's why scientific, regional, intensive and proper utilization of every parcel of land has become necessary. Planning of land on micro level, relied on land use surveys is the

first step in putting our lands to the optimum use. The nature and intensity of land use is closely related to the technology adopted by man. Extension of agricultural land with the help of technology may cause considerable changes in land use.

Geography studies the spatial relationship between these aspects as well as planning. This is because land use changes to meet available demands of the land by the society in its new ways and conditions of life. The technological change or a change in the size of composition and needs of the community may inspire the demands for the new uses of land. Some changes are short linked whereas other presents a more constant (Jackson J.N, 1963).

The main aim is to focus the spatiotemporal pattern of land utilization in the study area. The tahsil becomes as a study unit and the land use categories are based on the census classification. The present chapter is about the pattern of agricultural general land utilization during the period of 1991 to 2011.

3.2 Meaning of Land Use:

At this juncture, it is essential to the definitions of land use.

The study of land use pattern is first concern to geographers to know the relationship between man and natural environmental (Tripathi and Vishwakarma, 1988). Land use is an important study particularly relevant to agricultural geography. J. L. Buck is of opinion that land utilization is the satisfaction which the farm population derives from the type of agriculture develop the provision for future production and contribution to national needs. Land use is also related to conservation of land from one major use to another general use (Nanavati, 1951). Land use is a geographical concept because it involves specific areas. The study of land use become a very important part of geography and has acquired a place of pride in the field of applied geography. Symons feels (1978) the land use study forms the sphere head for the advance of geography into the applied sciences as maps of land use have been recognized as essential tools of regional planning and development. According to Lillesand and Kiefer (1987), the term land use relates to the human activities associated with specific piece of land, factures present on the earth surface. Land use research can be described as leading with problem situation where people in a given locality are in the process of transformation from activities with certain land requirement. Kumar Jainendra, (1986) defined land

use as the surface utilization of all developed and vacant land on a specific point, at a given time and space. In short, land utilization is the use made of the land by man, as surveyed and mapped in series of recognized categories. Land use study acquired grater academic and practical importance especially after the brilliant contribution by Baker (1926) in United State of America, Stamp L.D. in Great Britain. It is Stamp L.D. who introduced evolution of land survey in Britain in his book entitled. "The Land Use of Britain- Its use and Misuse",this book generated a lot of regional and systematic survey of land use of whole of Britain.

Chowdaian (2001) has pointed that land use and utilization is not one and the same. Land use is the actually made of any parcel of land, house, industrial location etc. are land use categories, whereas term residential, industrial, agricultural, refers to land utilization and mainly deals with the problems related to society and the region as a whole. Land utilization is therefore, dynamic concept because it undergoes certain changes because of change in socio-economic needs and with the adoption of innovation. Hence, study of land use is a topic of continuous interest. In India, many geographers have paid attention on different aspects of land use studies at regional, district and micro level. Some of the eminent researchers who have carried out research work on different aspects of land use studies are Chatterjee (1952), Shaffi (1961, 1966 and 1968), PrakashRao (1959), Singh Jasbir (1974), Roy (1968) and Mishra (1990).

The definition of land use shows that the study of land utilization is of greater value in finding out the past use of land and its future trend. Only through the study of past land utilization, one can be capable to predict its future use and involves land use planning of a particular region. It has got much importance due to increasing population of India.

3.3 Classification General Land Use:

After study of the meaning of land use, it is important to deals with classification of land use. A land use classification means the systematic arrangement of land on the basis of certain similar characteristics mainly to identify and understand their fundamental utilities intelligently and effectively. The land use pattern is complex and dynamic. The present pattern of land use is the result of long continued operations of the whole range of environmental

factors. But modified study of land utilization in China concludes from a survey of 16786 farms in 168 localities of eight agricultural regions. Seven types of land utilization of China are given. The land pattern shows the spatiotemporal sequence of area under different uses. It also reveals that net available land for cultivation which is an important factor because it is the base for agricultural planning (Arsud, 2000) the international geographical classification of world use along with colour scheme is mainly suited to local condition. The classification is as follows. The World land use survey was drawn up by UNESCO.

1. Settlement and associated non-Agricultural land (Dark and Light Red)
2. Horticulture (Deep Purple)
3. Tree and perennial crop (Light Purple)
4. Crop land: continental rotation cropping (Dark Brown), Land rotation (Light Brown).
5. Improved permanent pasture (Light Green).
6. Unimproved permanent pasture (Yellow).
7. Wood lands: dense (Dark Green), open (Medium Green), scrub (Olive Green), swampy forest (Blue Green).
8. Swamps and marshes (Blue).
9. Unproductive land (Grey).

Some land is for a specific use depending mostly on the physical characteristics of land to its suitability for particular use is related. Five major categories of land use are noted in the season and crop report for Maharashtra state which is as follow

1. Area under forest
2. Land not available for cultivation including
    i) Barren and uncultivated land.
    ii) Land put to non-agricultural uses.
3. Other pastures and grazing land including.
    i) Cultivable waste land.
    ii) Permanent pasture and grazing land.
    iii) Land under miscellaneous trees and groves.
4. Fallow lands including
    i) Current fallow.

ii) Other fallow.

5. Cropped area including
   i) Net sown area (NSA).
   ii) Area sown more than once.
   iii) Gross cropped area (GCA).

Censuses of India have classified land utilization in nine different categories. But in the present study these have been grouped into five major land use categories as the percentage of area under individual categories is relatively insignificant. On the basis of the statistical data abstracted from sources referred of Satara district may be divided into five major land use categories.

1. Area under forest
2. Area not available for cultivation
3. Other uncultivated land excluding fallow land
4. Fallow land
5. Net sown area.

3.4 Temporal Variation in Land Use Pattern:

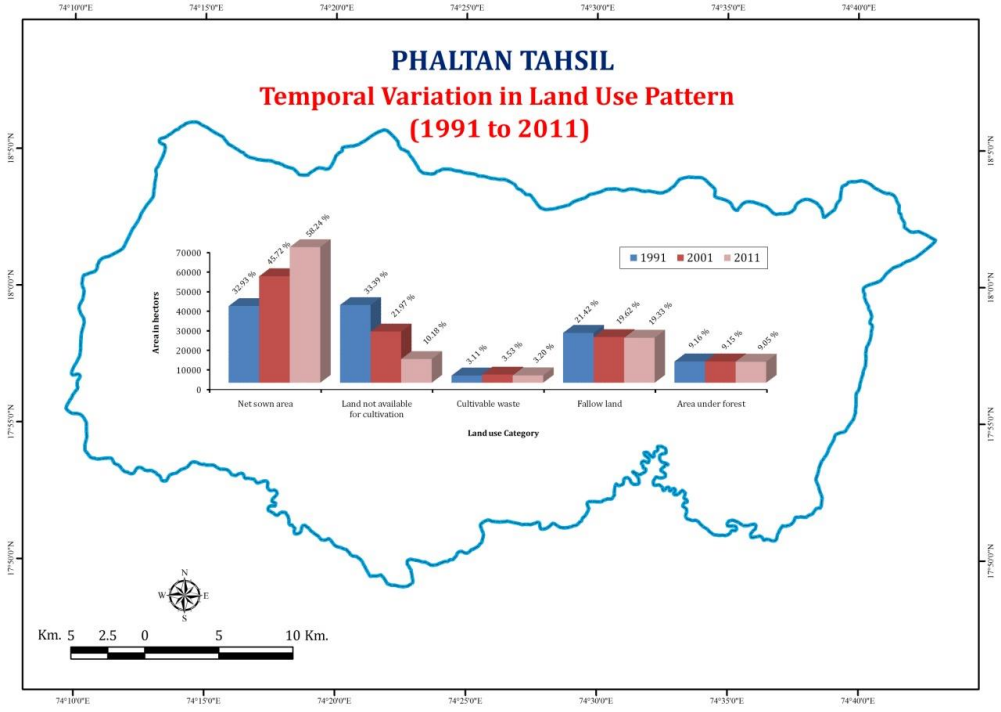
Table-3.1
Phaltan Tahsil
Land use Pattern

(Area in hectares)

Sr. No.	Land use Types	1991	2001	2011
1	Net sown area	39199 (32.93)	54425 (45.72)	69325 (58.24)
2	Land not available for cultivation	39740 (33.38)	26151 (21.97)	12115 (10.19)
3	Cultivable waste	3697 (3.10)	4205 (3.53)	3810 (3.20)
4	Fallow land	25493 (21.41)	23356 (19.62)	23009 (19.33)
5	Area under forest	10900 (9.15)	10892 (9.15)	10770 (9.04)
	Total	119029	119029	119029

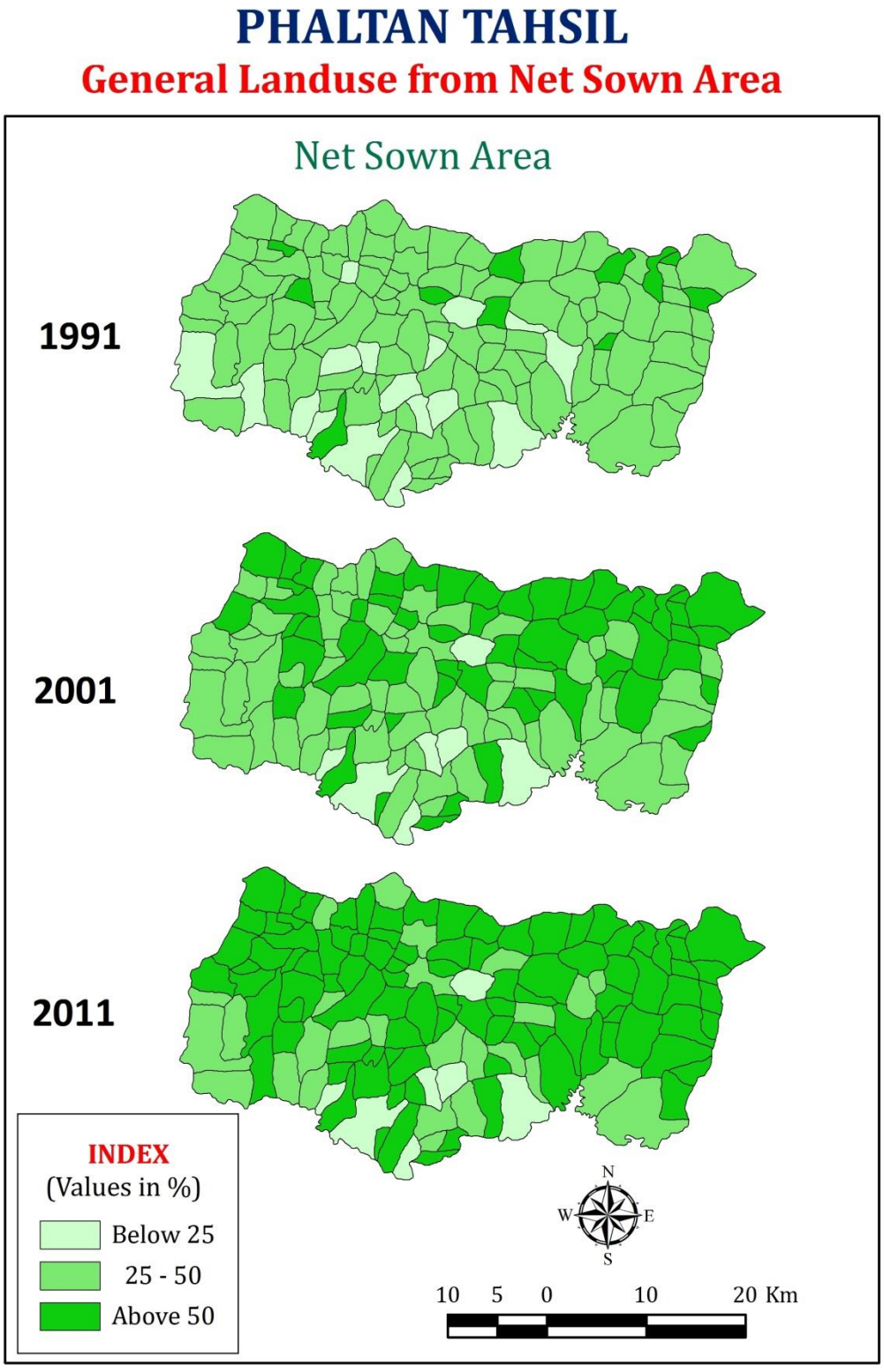
Source: Socio-economic Abstract, Satara District (1991 to 2011).
Note: Figures in bracket indicate percentage of Land use.

Figure-3.1



Temporal variation is the change in general land use in a given period of time. This temporal variation is a result of changes in different inputs. The general land use studied for Thirty years (1991 to 2011) in order to find out general land use change (Fig.-3.1 and Table-3.1). In 1991, total net sown area in Phaltan Tahsil was 32.93 percent. After Thirty years there is increase in total net sown area in Phaltan Tahsil. In 2011 net sown area has reached to 58.24 percent its shows the increase of 25.31 percent. The lowest net sown area during study period was identified in 1991 accounting 32.93 percent while the highest net sown area recorded in 2011 is 58.24 percent. Land not available for cultivation in study area shows ups and down during study period. Initially, it was recorded 33.38 percent in 1991 and then decreased to 11.41 percent and suddenly further decreased up to 11.78 in 2011. There are fluctuations in land not available for cultivation. The highest percent is 33.38 percent in 1991 and the lowest recorded 10.19 percent in 2011. This category includes barren and uncultivable land. The overall percent of land not available for cultivation varies from 10 to 34 percent.

Figure-3.2



The cultivable waste land shows around 3 to 4 percent of total land. It shows fluctuation from 3.10 to 3.53 percent during thirty years. The waste land is gradually increasing from 1991 to 2001. The lowest percent of cultivable waste land recorded 3.10 percent in 1991 while highest was 3.53 percent in

2001. The cultivable waste includes the permanent pastures, grazing land, land under miscellaneous trees, groves etc. the fallow land consists of current fallow and other fallow land. Fallow land in the study area is recorded 21.41 percent in 1991 and it has decreased up to 19.33 percent in 2011 over a period of thirty years. It is also observed that this land is gradually increased from 1991 to 2011 and after wards it has decreased by 19.33 percent. It is decreased because of farmers want to use land for growing crops in the study area. 9.15 percent area has identified under forest in 1991 and it is gradually decreasing to 0.11 percent during study period in the study area.

3.5 Spatial Variation in Land Use Pattern:

Table-3.2
Phaltan Tahsil
Land Use Pattern (Area in hectares)

Sr. No.	Land use Category	Area in 1991	Percent	Area in 2001	Percent	Area in 2011	Percent	Change 1991to 2001	Change 2001 to 2011
I	**Non Cultivable land**								
	1)Forest	10900	9.15	10892	9.15	10770	9.04	-0.79	-0.11
	2)Land not available for Cultivation	39740	33.38	26151	21.97	12115	10.17	-11.41	-11.80
	a)Area under non Agriculture	19720	49.62	11015	42.12	2990	24.68	-7.50	-17.44
	b)Barren and Uncultivated land	20020	50.37	15136	57.87	9125	75.32	7.5	17.45
II	**Cultivable Land**								
	3) Net sown area	39199	32.93	54425	45.72	69325	58.24	12.79	12.52
	4) Fallow land	25493	21.41	23356	19.62	23009	19.33	-1.79	-0.29
	a)Current Fallow	14700	57.66	14922	63.88	14953	64.98	6.22	11.00
	b)Other Fallow	10793	42.33	8434	36.11	8056	35.02	6.22	-1.09
	5)Other uncultivated land	3697	3.10	4205	3.53	3810	3.20	0.43	-0.33
	Total	119029	100	119029	100	119029	100		

Source- Socio Economic Abstracts 1992, 2002, 2012, Land Revenue Record, Phaltan Tahsil, Phaltan.

3.5.1 Net Sown Area:

Net sown area in 1991 was 39199 hectares while it was 69325 hectares in 2011. Net sown area increased in 2011. It shows increase of 12.52 percent similarly the net sown area in 2011 was 69325 hectares. It means there was slight increase by 12.52 percent in net sown area. The net sown area is steadily increasing since 1991 to 2001 (Fig.-3.3). It is seen from figure that 32.93 percent area under cultivation in 1991 and it has been stepped to 45.72 percent

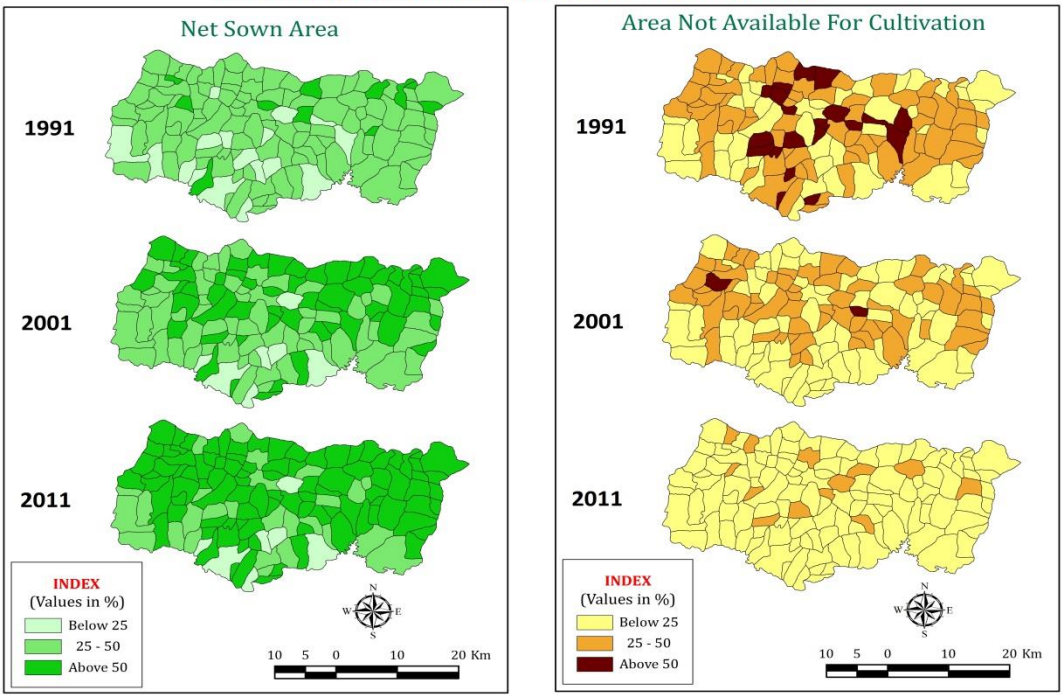
(54425 hectares) area under cultivation in 2001, registering an increase by 12.79 percent. This increase in the net sown area may be attributed to increasing awareness of improved agricultural techniques and introduction of the use of new improved seeds by farmers. Figure shows spatial distribution of net sown area in the study area. In 1991, net sown area in the study area shows steady decline towards the southern parts of the study area. It is because of lack of irrigation in that part. It is obvious from figure- 3.3 that in the north and the north-western part villages have dominant net sown area due to irrigation facility, fertile soil and transport facilities in the study area (Fig.-3.3). The highest net sown area is recorded at Vajegaon (more than 95 percent) in the eastern part of the study area. Due to deep black soil and irrigation facility whereas the lowest net sown area has been identified at Dhumalwadi village (9.96 percent). 80 to 90 percent of net sown area is found in forty-seven villages in three patches in the north-east, the north-west and the northern parts of the study area. Because of deep black soil, plain topography with gentle slopes and the increased facility of irrigation in the study area.

Sixty nine villages of three extensive patches have been identified in the east. In the third patch in the northern part of the study area having 70 to 80 percent net sown area on medium relief had been found. Another two isolated patches are concentrated in the south, and the south-east parts ranging between 50 to 70 percent under net sown area consist of seventeen villages. Seven villages have been identified 40 to 50 percent net sown area in the southern parts in Phaltan Tahsil. The spatial distribution of net sown area for 2001 is shown in Fig.-3.3. In 2001 the highest net sown area is observed at Vajegaon (95.95 percent) in the eastern and the lowest at Dhumalwadi village (22 percent) in the southern part. There are twenty two villages having more than 90 percent net sown area in the study area. These villages are spread into three patches concentrated in the north on deep and fertile soil and also in the east on coarse shallow soil. Sixty-nine villages having 70 to 90 percent net sown area have found distributed all over the study area. Thirty-three villages having 60 to 75 percent net sown area are found in patchy pattern. Two major patches are found in the north and the southern parts.

Figure-3.3

PHALTAN TAHSIL

Net Sown Area and Area Not Available For Cultivation



Seven villages in the south-eastern and the south-western part having net sown area between 40 to 50 percent appearing in isolation. The study area shows an increase of 12.79 percent net sown area during two decades 1991 to 2001. The volume of change has record of more than 30 percent of net sown area in twenty two villages in the study area. This significant increase in net sown area may be due to more land which was under trees and shrubs brought subsequently under cultivation. Therefore, other types of land have continuously declined from 1991 to 2001 (Table-3.2). Other type of land previously considered cultivable waste is being used by the farmers for cultivation of various crops. Moreover, increasing awareness and mounting pressure of population on land use pattern has brought this land under cultivation. Twenty villages have substantially increased their net sown area by more than 10 to 30 percent. These villages consist of four patches that lie in the south, the south-east and the north-eastern parts in Phaltan Tahsil.

3.5.2 Land Not Available For Cultivation:

It is interesting to note the increase in area not available for cultivation in Phaltan Tahsil in period of thirty years from 1991 to 2011. Land not available for cultivation was 26151 in 2001. In 1991 land not available for

cultivation was 33.38 percent. In 2001, it had decreased to 21.97 percent while in 2011 it had decreased by 11.41 percent. Similar trend had been seen from 2001 to 2011. In other words there was decrease of 11.80 percent in ten years. After thirty years land not available for cultivation was decreased by 11.80 percent. This category is sub divided into two types, one is land put to non-agricultural uses and the other is barren and uncultivated land. The land put to non-agricultural use includes land under settlement gaonthan, roads, railways, streams, canals and rivers. Barren and uncultivated land consisting of rock exposure, small hills and potkharaba. 'Potkharaba' means land having inherent bad quality which requires huge cost for bringing it under cultivation. Phaltan Tahsil covers 33.38 percent (39740 hectares) area under land not available for cultivation in 1991 and 21.97 percent (26151 hectares) in 2001. This land is marked by gradual decrease from the south to the north. Village Dhumalwadi has found 21.65 percent while Vajegaon have 4.05 percent land not available for cultivation in the study area. Dhumalwadi is located at extreme south and Dhavalewadi is situated in the western part in the study area (Fig.-3.3), less than 10 percent of land not available for cultivation in the central, south-west and south-eastern parts of the study area. Twenty two villages fall in the range of 10 percent land not available for cultivation in the study area. While forty-seven villages fall in the range of 20 to 30 percent of land not available for cultivation in the study area. This area is marked out in the south-east, south, and south-western parts in the study area.

Land not available for cultivation in 2001 is displayed in Figure-3.3. There are two villages Dhumalwadi and Dhavalewadi in the study area in which more than 30 percent land not available for cultivation. Dhumalwadi which has (78.35 percent) land not available for cultivation is located in the south and Dhavalewadi village which has situated (71 percent) in the west. Seven villages have land not available for cultivation between 20 to 30 percent. Whereas nine villages having 60 to 70 percent Land not available for cultivation and fourteen villages having less than 40 percent Land not available for cultivation are in the south-east and south-western parts of the study area. The Land not available for cultivation indicates decreasing trend in fifty-six villages whereas fourteen villages have increasing trend and no change is seen in 22 villages. Mandavkhadak village has recorded the highest

decline of 30 percent during the study period. This land unlike fallow land in study area has declined in Phaltan Tahsil because this track is hilly and not suitable for cultivation by the prevalent techniques of agricultural practices.

3.5.3 Cultivable Waste:

Cultivable waste land was gradually increasing during 1991 to 2011. It was 3697 hectares in 1991 and 4205 hectares in 2001. It was increased by 508 hectares in 2001. It was increased by 0.43 percent in 2001. It was 3.10 percent in 1991 whereas it was 3.53 percent in 2001. It was 3810 hectares (3.20 percent) in 2011. It was decreased by 0.33 percent in 30 years from 1991 to 2011. The cultivable waste land includes other uncultivated lands as well as fallow land. The category cultivable waste is divided into three types. They are permanent pastures, grazing land and cultivable waste. The permanent pastures and grazing lands include all land; such pastures are under grass cover, government and private land or permanent pastures which are reserved as a village common grazing ground or vast tract of protected land. Total area under cultivable waste was 49.62 percent (19720 hectares) in 1991 (Table-3.2). All villages have been identified under cultivable waste of less than 15 percent are distributed scattily within the area (Fig.-3.4). The land under cultivable waste in Phaltan Tahsil covered 42.12 percent (11015 hectares) in 2001. The distribution under cultivable waste in 2001 in the study area reveals two major patches in the south and the south-east highest recorded cultivable waste of (33 percent) found in Veloshi village. The cultivable waste having 10 to 20 percent land is found in twenty two villages (Fig.-3.4). These villages are confined to two patches in the south and the south-eastern parts. One hundred fifteen villages of the study area have cultivable waste less than 40 percent in the study area. The area under cultivable waste land in Phaltan Tahsil registered decrease (7.50 percent) during study period.

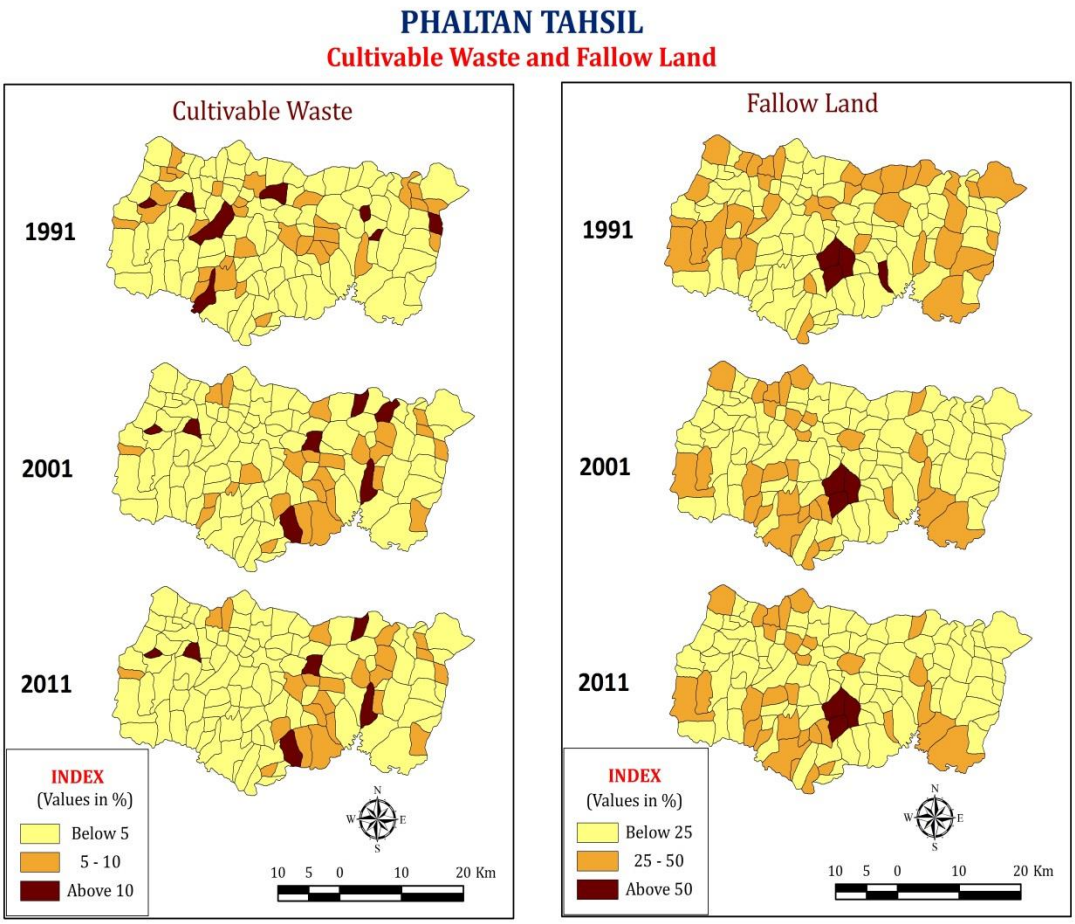
3.5.4 Fallow Land:

In case of fallow land there was decreasing trend in period of 30 years. In 1991 fallow land was 25493 hectares (21.41 percent). In 2001 it was 23356 hectares (19.62 percent) whereas it was 23009 hectares (19.33 percent) in 2011. After 30 years, there was decrease in follow land in Phaltan Tahsil by 0.29 percent. The fallow land is divided into three sub-types such as (a) Permanent fallow, (b) Current fallow (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 one year 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 and in deftness. Figure- 3.4 represents spatial distribution of fallow land in Phaltan Tahsil accounting for 21.41 percent (25493 hectares) in 1991.

The concentration of this land lies in the north and the eastern part in the study area. The highest fallow land was recorded at Dhavalewadi village which lies in the west and the lowest was recorded at Sastewadi village. Shindewadi village in the north having 3 percent land in this category. The total area under fallow land accounting 2001 for 19.62 percent in Phaltan Tahsil. The highest fallow land is found at Bodakewadi village of 27 percent in the south. This fallow land well distributed all over the study area.

Figure-3.4

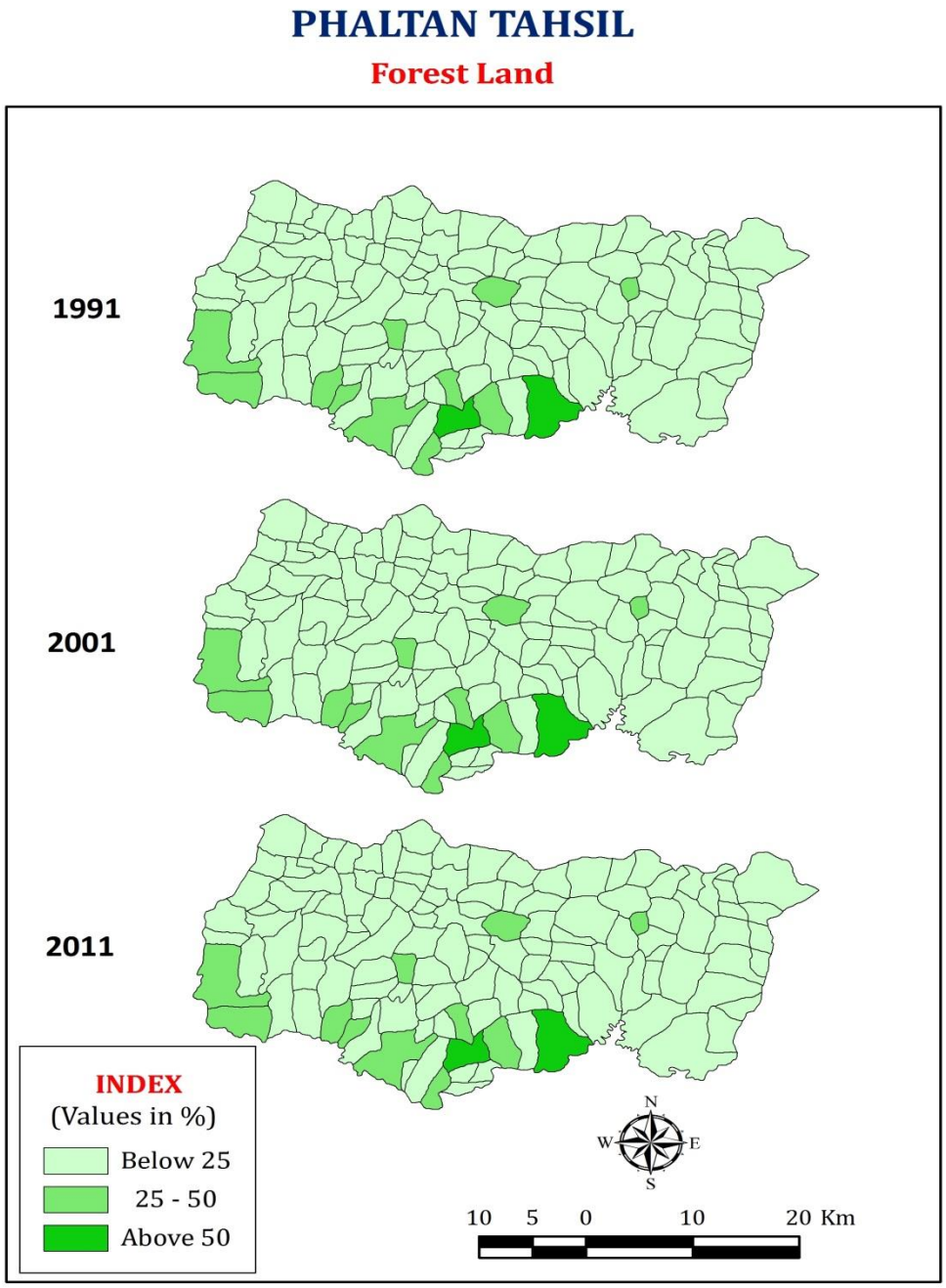


3.5.5 Forest Land:

Area under forest had been decreasing in the period of thirty years from 1991 to 2011. Area under forest was 10900 hectares (9.15 percent) in 1991. It was 10892 hectares in 2001 whereas it was 10770 (9.04 percent) in 2011. It means area under forest had been decreased by 130 hectares in the span 30 years. It shows the decrease by 0.11 percent in area under forest. Forest cover in Phaltan Tahsil 1991 was 9.15 percent (10900 hectares) of total area. But it has declined to 9.04 percent (10770 hectares) in 2001. The total decline is 0.11 percent. Velosi and Tathwada which are situated in the south-western parts in study area have the highest percent under forest in 1991 (30 percent). This fact suggests that forest land has been brought under cultivation. Moreover, there is loss of forest in the study area by various interference (Fig.-3.5).

Jadhavwada which has 22 percent land under forest is located in the southern parts of study area. Ten village have 20 to 30 percent forest cover in thestudy area while less than 10 percent forest land has been identified in one hundred five villages in Phaltan Tahsil. Forest cover is declining slowly and it was 3.57 percent in 2001. This declining trend is seen in Bodakewdi 29 percent, Manewadi has 25 percent and Girvi has only 21 percent. These villages have more than 20 percent under forest land in study area (Fig.-3.5). the volume of change is seen in Dudhebavi village where the change is of 19 percent.

Figure-3.5



.

3.6 References:

1. Adnaik N. S., (2005), "Spatio-Temporal Changes in Agricultural Productivity in the Drought Prone Region in Maharashtra State: A Geographical perspective", Unpublished Ph.D. Thesis submitted to Shivaji University, Kolhapur, Pp.91-102.

2. Ali Mohammed, (1978), "Studies in Agricultural Geography", Rajesh Publications, New Delhi, pp-1-6.

3. Arsud, S. S., (2000), "Characterizing Agro Climatic Environment of Bhima Basin"; Unpublished Ph.D. Thesis, University of Pune.

4. Baker, O. E., (1926), "Agricultural Regions of North America", Economic Geography, Vol. 2, Pp. 459-493.

5. Barlowe, R, (1963), "Land Resources Economics", Prentice Hall, Englewood Cliffs p.1.

6. Chatterjee, (1952), "Land utilization survey of Howrah Districts", Geographical Review of India. Vol. 14, No, 13.

7. Chowdaian C., (2001), "Productive land and its Misuse: A comparative analysis of Big, Small and Marginal farmers in Mysore District", The Deccan Geographer, vol. 39. No.1-p-76

8. Freeman T.W., (1968), "Geography and planning", Hutchinson. University Library, London p.74.

9. Jackson J.N. (1963), "Survey for Town and country planning", Hutchinson University Library, London.p-109.

10. Kashid Dhanaji Lahu., (2011), "Study of Agricultural Productivity in Sindhudurg District, A Geographical Analysis", A Thesis Submitted To Shivaji University, Kolhapur.

11. Kumar J., (1986), "Land use Analysis: A case study of Nalanda District", Bihar Inter-India Publications, New Delhi.

12. Lillesand, T, M. and Kiefer R.W., (1987), "Remote sensing and Image Interpretation", John Wiley and Sons, p-74.

13. Mishra B. N.,(1990), "Land utilization and management in India", Chugh Publication, Allahabad.

14. NageshwaraRao K. and Vaidyanathan R., (1981), "Land use capability studies from Arial Photo-Interpretation -A case study from Krishna Delta", India Geographical Review of India, Vol.43, No.3 pp-226-236.

15. Nanavati M.B. and Anjaria J. J., (1951), "The Indian Rural Problem", Vora and co. Bombay.

16. Patil, A. A., (2002), "Changes in Agricultural productivity in Upper Bhima and Upper Krishna Basin in Maharashtra-A Geographical Analysis", Unpublished Ph.D. Thesis submitted to Shivaji University, Kolhapur p.94-102.

17. PrakashRao ., V. L. S., (1959), “The Role of Geographers in Land use Planning”, Bombay Geographical Magazine vol. VI-VII, No.2, pp.39-44.
18. Roy B. K., (1968). Op cit.
19. Shaffi M., (1961), “Land utilization in western U. P.”, published by Aligarh Muslim University, Aligarh.
20. Singh J., (1974), “An Agricultural Atlas of Indian-A Geographical Analysis”, Vishal Publications, Kurukshetra.
21. Symons, Leslie (1978), “Agricultural Geography”, G. Bell, London
22. Tripathi R.S and Vishwakarma J.P.,(1988), “Land use cropping pattern and development levels in Banda district (U.P.)”, The Deccan Geographer vol. XXVI No.2-3 pp. 417-27.
23. Vink, A.P.A., (1975), “Land use in Advancing Agricultural Springer Verlag Berlin”, Heidelberg, New York.
24. Vaidya, B.C., (1997), “Agricultural land use in India: A study of Yashoda Basin”, Manak publication Pvt. Ltd, New Delhi.

CHAPTER-IV
AGRICULTURAL LAND USE PATTERN

CHAPTER-IV
AGRICULTURAL LAND USE PATTERN

4.1 Introduction:

We know physical and human environment dominantly control agriculture in any region. The physical factors such as relief, soil, climate, water bodies, which set a broad limit for the agriculture and human factors viz the economic condition of farmers, demand of crops in market, price of crop in market, technological level of farmers, length of occupation etc. affect agricultural pattern of area. Such factors affect farmer's decision to take the particular crops in the agriculture. In the present chapter the spatial distribution of overall cropping pattern and temporal variation have been outlined and followed by the discussion of the area under different individual crops. The cropping pattern is the proportion of the area under various crops at the point of time. Agricultural land use and mainly the cropping pattern which reveals the development of the region, based on natural and social environment. The data regarding crops have been collected through socio-economic and statistical abstract of Satara District and Agricultural Department of Phaltan Tahsil. The collected data is converted into percentage of the gross cropped area. The percentage is arranged into class categories. Maps are prepared and finally displayed the spatial distribution of land use in Phaltan Tahsil.

The study of temporal variation for the crops in the study area has been computed for thirty years period (1991 to 2011). Temporal variation is the change in proportion of area under different crops at three different times. The amount of area involved in change for every areal unit is calculated for individual crop and the crops of leading increase and decrease are marked and mapped in every circle providing a comparative view of the direction of change. Jowar, Bajara, Wheat, Sugarcane, Maize, Fruits, Vegetables, Sunflower, Pulses and Fodder crops are the major ten crops grown in the study area. Kharif season begins in the month of June or July and ends in September. Bajara and Maize are the major kharif crops in Phaltan tahsil. Rabi season commences from September or October and ends in April month. Pulses, Oil seeds, spices, vegetables and fodder crops are grown in Rabi season. There are three cropping seasons in the study area, namely kharif, rabi and summer. Kharif season begins in June or July and ends in September or October

whereas Rabi season starts from September or October and ends in February or March. Summer season starts from March and end in May. Jowar, Bajara, Tur, Gram, Udid, Groundnut and Soybeans are the major kharif crops grown in the study area. While Jowar, Wheat, Gram, Maize, Sunflower are Rabi crops. The fruits such as, mango, banana, grapes and pomegranate etc. are grown in the study area. Similarly Sugarcane, Maize and Onion are grown in the study area in kharif and Rabi seasons in Phaltan tahsil.

4.2 Temporal Variation in Agricultural Land Use:

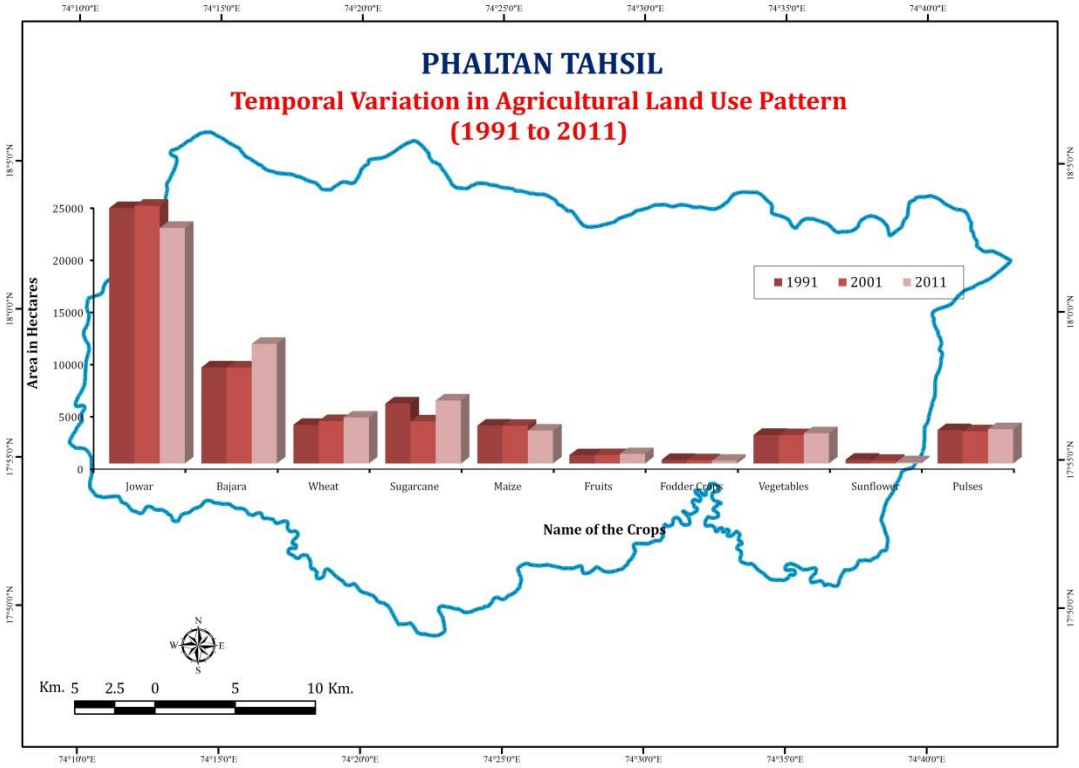
The cropping system is an important component of any farming system. It is the proportion of area under various crops at a point of time. The crop rotation is the process of growing different crops in succession on a piece of land in specific period of time with an objective of getting maximum profit using minimum investment without impairing the soil fertility. The cropping pattern in region shows changing areal extent. This change takes place because of variations in amount of rainfall, irrigation, capital, fertilizers, pesticides, and cost of production, commodity prices, diseases, management and variety of seeds, technical knowledge and labour availability. Table-4.1 and Fig.-4.1 shows the temporal variation of ten crops from 1991 to 2011 in the study area. Jowar is one of the major crops used as food, fodder and for production of alcoholic beverages and bio-fuels. Most varieties of jowar are drought tolerant and heat tolerant. They are especially important in arid regions. Jowar is cultivated in autumn and winter seasons.

Table-4.1
Phaltan Tahsil
Temporal Variations in Agricultural Land Use Pattern

Sr. No.	Name of The Crops	1991		2001		2011	
		Area (Hect.)	Percent To NSA	Area (Hect.)	Percent To NSA	Area (Hect.)	Percent To NSA
1	Jowar	24478	45.15	24691	46.79	22567	40.95
2	Bajara	9212	16.99	9202	17.44	11457	20.79
3	Wheat	3703	6.83	4060	7.69	4399	7.98
4	Sugarcane	5750	10.65	4025	7.67	6046	10.97
5	Maize	3625	6.68	3610	6.84	3158	5.78
6	Fruits	802	1.47	819	1.55	910	1.65
7	Fodder Crops	339	0.62	299	0.56	258	0.46
8	Vegetables	2743	5.06	2720	5.15	2898	5.25
9	Sunflower	360	0.66	248	0.47	116	0.21
10	Pulses	3197	5.89	3085	5.84	3287	5.96
	Total	54209	100	52759	100	55096	100

Source: Revenue Record, Talathi office, Phaltan.
Note: Figures indicate percent to net sown area.

Figure-4.1



The total increase in the cultivation of jowar from 1991 to 2001 is 1.64 percent only whereas 40.95 percent area is increased under jowar crop in 2011. In 1991 bajara also occupies 16.99 percent in the study area and it has slightly increased in 2001 by 0.45 percent. In 1991 the area under cultivation wheat was 3707 hectares. It was 6.83 percent while it was 4060 hectares in 2001 and it was 7.69 percent. It was increased by 0.86 percent in 2001. In 2011 the land under cultivation of wheat was 4399 hectares and it was 7.98 percent. It reveals, there is increase of 0.29 percent in cultivation of wheat in 2011. In 1991, sugarcane cultivation is cultivated on 10.65 percent of land while in 2001 it covers 7.67 percent land. From 1991 to 2011 the total increase of sugarcane in Phaltan tahsil is 0.32 percent. The irrigation facility has enhanced during the study period and therefore sugarcane cultivation has increased more than two fold in the study area. It has risen up to 7.67 percent in 2001. In 1991, Pulses were cultivated on 5.89 percent of area. In 2011 there was total increase of 0.07 percent in the cultivation of pulses in the study area. In the study area, fruits were cultivated on 1.47 percent area in 1991 and over a period of 30 years, it has increased to 0.18 percent. In 1991 the fruits were cultivated in the study area on 1.47 percent of total area under cultivation. It is

noticed that over a period of 30 years, there is minor increase of 0.18 percent in the cultivation of fruits. On other hand there is decrease in the cultivation of fodder crops in the study area in the span of 30 years from 1991 to 2011. In 1991, the area under cultivation of fodder crop was 0.62 percent while it was 0.46 percent in 2011. It shows the decrease in the cultivation fodder crops by 0.62 percent. During the period of 30 years, the demand of vegetables was increasing and to mitigate the demand of increasing population of Phaltan Tahsil. The area under cultivation of vegetables also increased by 0.19 percent. In 1991 the area under cultivation of vegetable was 5.06 percent while in 2011 it was 5.52 percent. The decrease trend in the cultivation of sunflower is noticed in the span of 30 years. In 1991, 0.66 percent area was under cultivation of sunflower where as it was 0.21 percent in 2011. The decrease of 0.45 percent in area under cultivation of sunflower. Maize cultivation is well-suited with low labour costs and medium rainfall as it is labour intensive to cultivate and it requires ample water. From 1991 to 2011 wheat, bajara, pulses, sugarcane, vegetables and fruits have increased whereas jowar, maize, sunflower and fodder crops area have decreased during study period in the study area.

Figure- 4.2

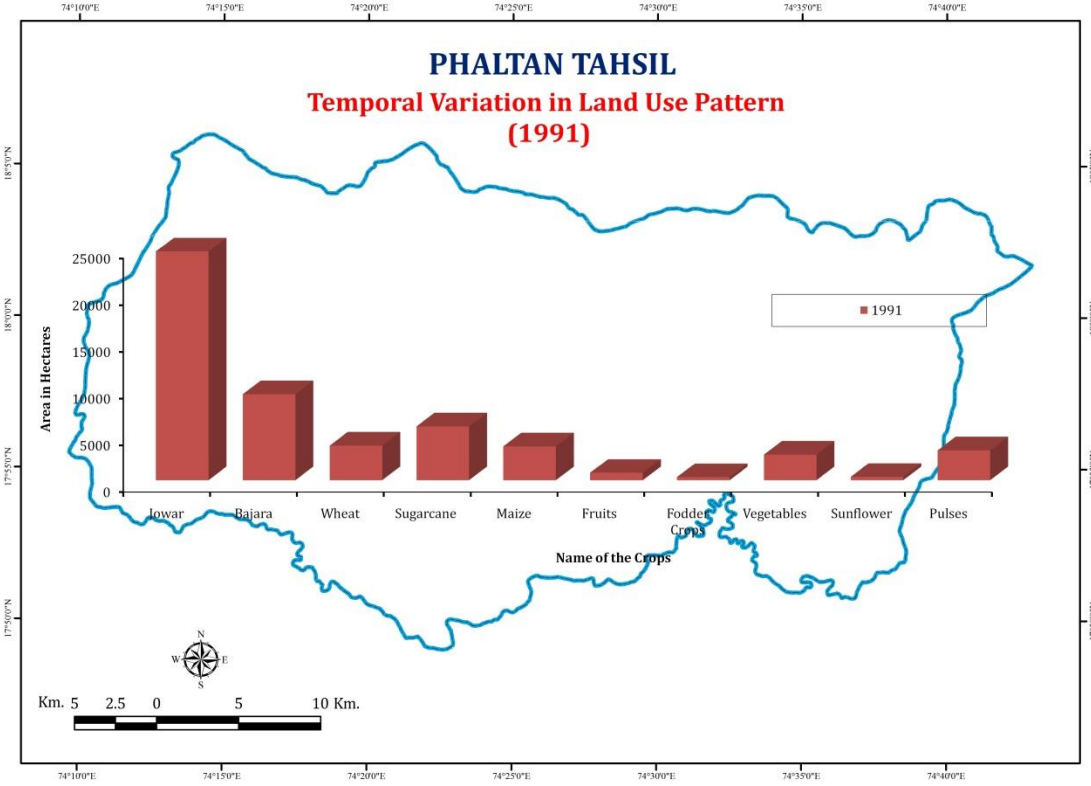


Figure- 4.3

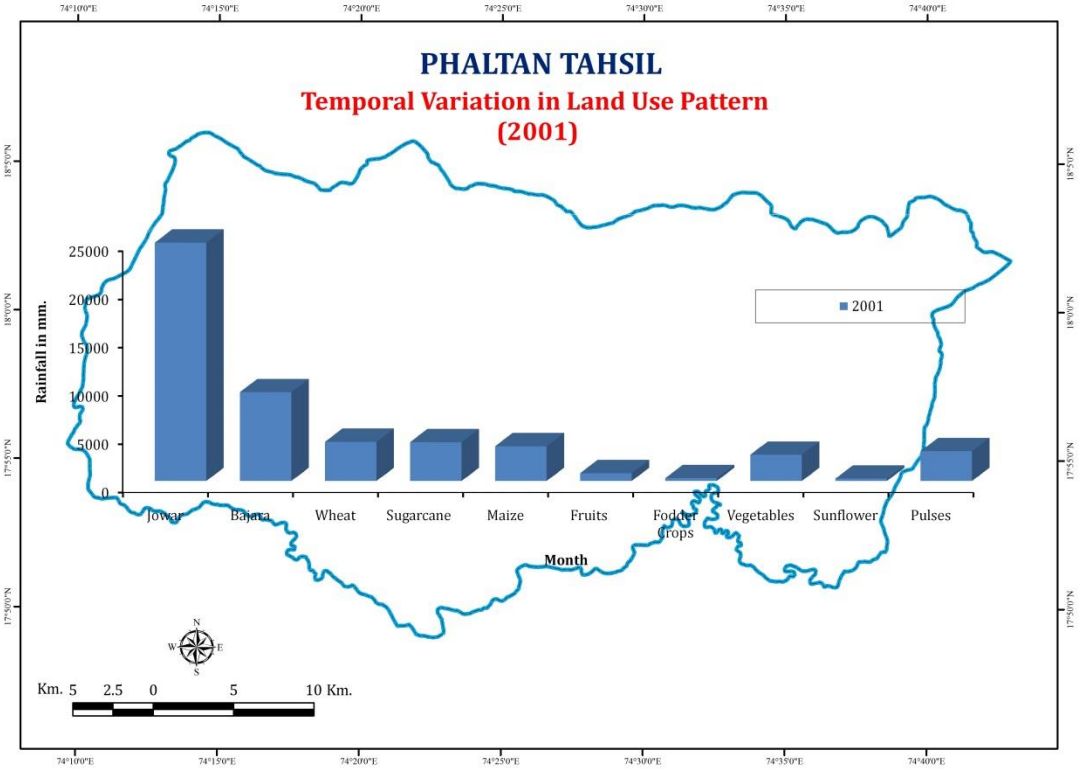
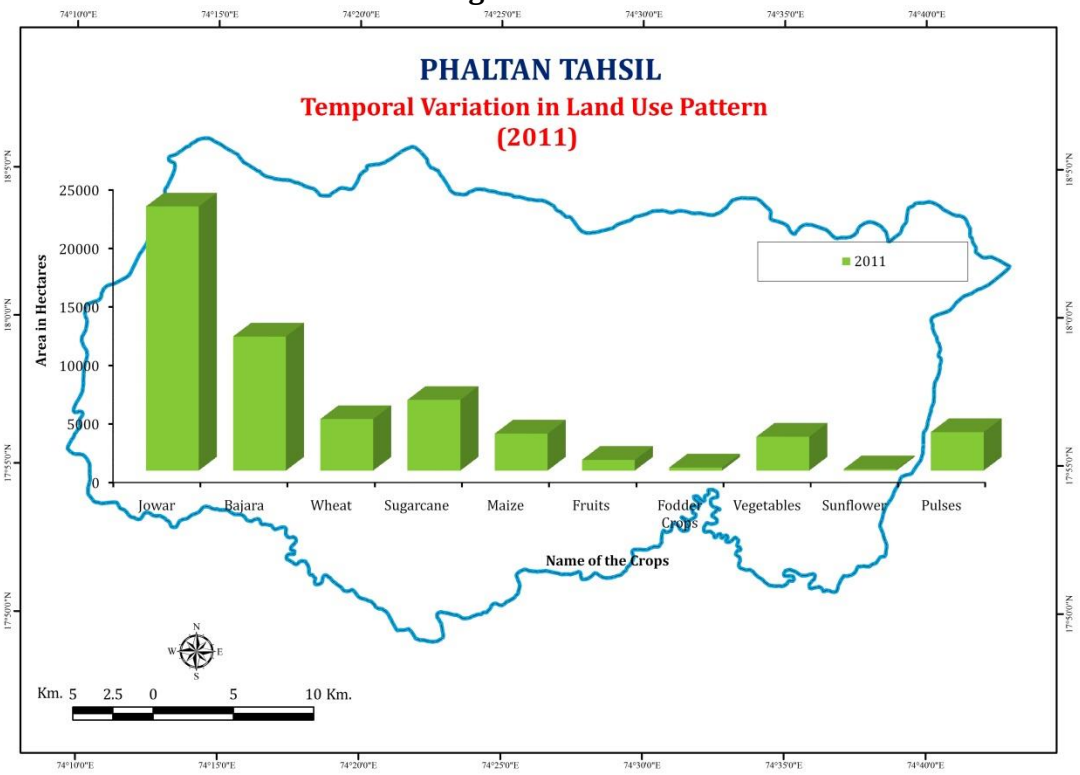


Figure- 4.4



4.3 Spatial Analysis of Agricultural Land use:

Agriculture is the main economic activity in the study area and 68 percent population is engaged in agricultural activities in the study area. Jowar, bajara, wheat, sugarcane, fruits, vegetables, fodder crops, sunflower, pulses

and maize are major crops grown in the study area. Uneven relief, soil types, rainfall variations, irrigation facilities, temperature, transport network, market centres and farmers attitudes are responsible for the variations of crops cultivation in the study area. The spatial distribution of agricultural land use is explained in the foregoing text.

Table-4.2
Spatial Analysis of Agricultural Land use
Phaltan Circle

Sr. No.	Name of The Crops	1991		2001		2011	
		Area (Hect.)	Percent To NSA	Area (Hect.)	Percent To NSA	Area (Hect.)	Percent To NSA
1	Jowar	6500	56.91	6475	55.93	6550	55.75
2	Bajara	1147	10.04	1320	11.40	1176	10.01
3	Wheat	789	6.90	850	7.34	993	8.45
4	Sugarcane	890	7.79	910	7.86	987	8.43
5	Maize	320	2.80	380	3.28	312	2.65
6	Fruits	205	1.79	190	1.68	220	1.87
7	Fodder Crops	85	0.78	81	0.69	70	0.59
8	Vegetables	615	5.38	620	5.35	685	5.83
9	Sunflower	120	1.05	70	0.60	38	0.32
10	Pulses	750	6.56	680	5.87	717	6.10
	Total	11421	100	11576	100	11748	100

Vidani Circle

Sr. No.	Name of The Crops	1991		2001		2011	
		Area (Hect.)	Percent To NSA	Area (Hect.)	Percent To NSA	Area (Hect.)	Percent To NSA
1	Jowar	6247	48.66	6345	52.30	4698	36.61
2	Bajara	1315	10.24	1322	10.89	2751	21.44
3	Wheat	1080	8.41	1125	9.27	1193	9.29
4	Sugarcane	1250	9.73	713	5.87	1414	11.06
5	Maize	1020	7.94	1070	8.82	902	7.02
6	Fruits	207	1.65	220	1.87	240	1.87
7	Fodder Crops	104	0.81	95	0.78	38	0.29
8	Vegetables	733	5.70	710	5.85	770	6.00
9	Sunflower	92	0.71	80	0.65	14	0.10
10	Pulses	790	6.15	450	3.70	811	6.32
	Total	12838	100	12130	100	12831	100

Barad Circle

Sr. No.	Name of The Crops	1991		2001		2011	
		Area (Hect.)	Percent To NSA	Area (Hect.)	Percent To NSA	Area (Hect.)	Percent To NSA
1	Jowar	4902	36.63	5220	40.08	4930	35.36
2	Bajara	1500	11.20	1550	11.90	1852	13.28
3	Wheat	1005	7.51	1080	8.29	1238	8.88
4	Sugarcane	2490	18.60	1585	12.17	2605	18.68
5	Maize	1680	12.55	1647	12.64	1509	10.82
6	Fruits	190	1.41	195	1.49	220	1.57
7	Fodder Crops	30	0.27	14	0.14	25	0.17
8	Vegetables	710	5.30	685	5.26	715	5.19
9	Sunflower	59	0.44	51	0.39	40	0.28
10	Pulses	815	6.09	995	7.64	805	5.77
	Total	13381	100	13022	100	13939	100

Taradgaon Circle

Sr. No.	Name of The Crops	1991		2001		2011	
		Area (Hect.)	Percent To NSA	Area (Hect.)	Percent To NSA	Area (Hect.)	Percent To NSA
1	Jowar	6829	41.21	6651	41.48	6389	38.53
2	Bajara	5250	31.68	5010	31.25	5678	34.25
3	Wheat	829	5.00	1005	6.26	975	5.88
4	Sugarcane	1120	6.75	817	5.09	1040	6.27
5	Maize	605	3.65	513	3.26	435	2.66
6	Fruits	200	1.25	214	1.33	230	1.38
7	Fodder Crops	120	0.72	109	0.67	125	0.75
8	Vegetables	685	4.13	705	4.39	728	4.39
9	Sunflower	89	0.53	47	0.29	24	0.14
10	Pulses	842	5.08	960	5.98	954	5.75
	Total	16569	100	16031	100	16578	100

Source: Revenue Record, Talathi office, Phaltan.
Note: NSA= net sown area.

4.3.1 Distribution of Jowar:

In Phaltan Tahsil jowar is one of major widely grown staple foods. It is grown in both monsoon and winter seasons. Soil types and amount of rainfall are controlling factors for the distribution of jowar in the study area. Jowar is specially known as dry land crop. Jowar occupies 45.15 percent land in the study area for 1991. Jowar is mainly produced in Phaltan circle and Taradgaon circle. Phaltan circle has 56.91 precent area under jowar cultivation which is the highest precent while Barad circle has 36.63 percent area under jowar cultivation which is the lowest percent in the study area. In the western part of

the study area jowar was grown on 41.21 percent of land in 1991. But it is found that the land under jowar cultivation is decreased by 2.95 percent. Similarly in Vidani circle jowar was cultivated on 48.66 percent of area in 1991. But in 2011 it was grown on 36.61 percent area. It means the land under cultivation of jowar is decreased by 12.05 percent in 2011 in Vidani circle.

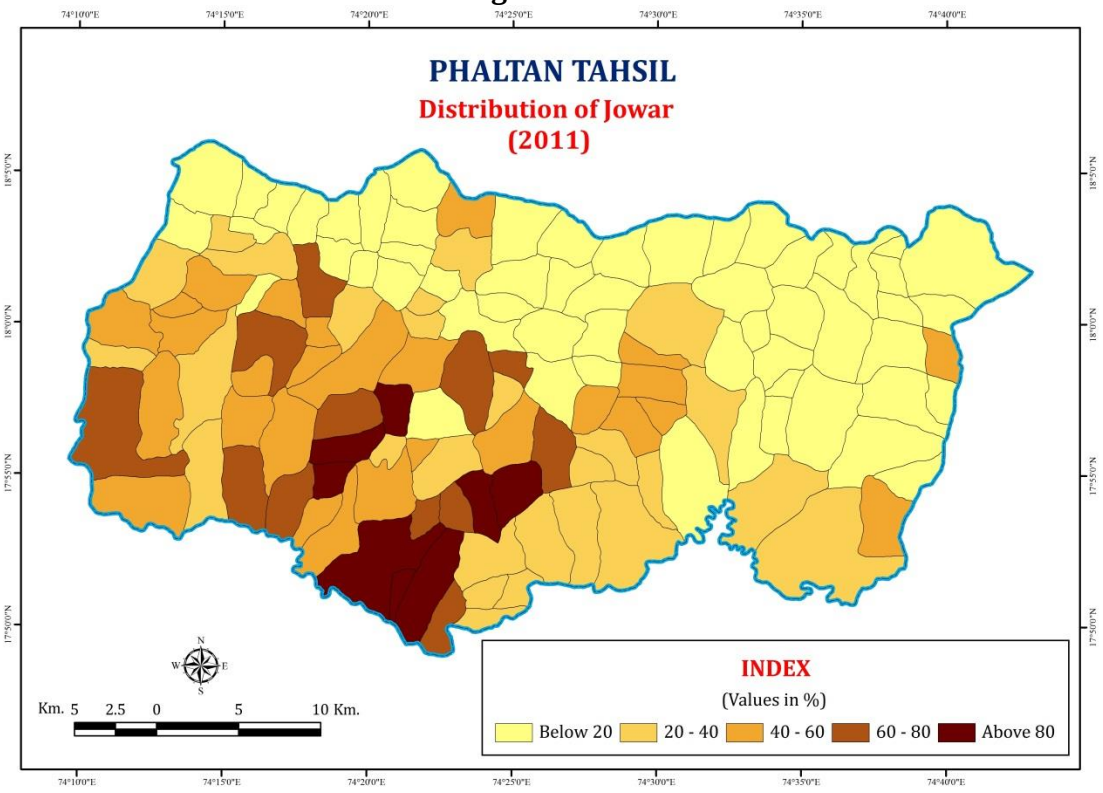
Due to of the study area has uneven topography; low rainfall and less fertile soil affect jowar distribution in the southern part of Phaltan Tahsil. In the 1991, the spatial distribution of jowar is shown in Figure-4.5. In this year the largest area under jowar is identified in Phaltan circle accounting 56.91 percent. The other three circles lies in the eastern and the western part namely Vidani circle, Barad circle and Taradgaon circle having 30 to 50 percent area under jowar cultivation. Barad circle occupies 35.36 percent and remaining circles in the western part show less than 40 percent land under jowar cultivation. The area under jowar cultivation in the study area shows mixed trend in some circles. Vidani circle 52.30 percent area has maximum increase followed by Barad circle 40.08 percent and Taradgaon circle 41.48 percent area in the study area whereas Vidani circle 36.61 percent, Barad circle 35.36 percent, Taradgaon circle 38.53 percent and Phaltan circle 55.75 percent shows negative trend. During the study period the area under cultivation of Jowar has decreased due to less rainfall in this area. Other reason for decreasing the area under Jowar cultivation is that the farmers get more income from the cultivation of the sugarcane and other cash crops and the irrigation facilities became available for the cultivation of sugarcane and cash crops. It is due to irrigation facilities in the study area cropping pattern has changed during 1991 to 2011 overall trend is slightly decreased by 4.20 percent. Figure-4.5 shows distribution of cultivation of Jowar in Phaltan Tahsil.

Table-4.3.1
Phaltan Tahsil
Volume of Change in Jowar

Sr. No	Name of The Circles	1991	2001	Volume of Change	2011	Volume of Change
		Percent To NSA	Percent To NSA	1991 to 2001	Percent To NSA	2001 to 2011
1	Phaltan	56.91	55.93	-0.98	55.75	-0.18
2	Vidani	48.66	52.30	3.64	36.61	-15.69
3	Barad	36.63	40.08	3.45	35.36	-4.72
4	Taradgaon	41.21	41.48	0.27	38.53	-2.95

Source: Revenue Record, Talathi office, Phaltan.
Note: NSA= net sown area.

Figure-4.5



4.3.2 Distribution of Bajara:

Bajara is drought resistant crop cultivated in kharif season in the study area. For better growth of bajara the rainfall should be between 50 to 100 cm. This crop is grown on arid, red shallow, black and lighter soil types. Less amount of rainfall is required for growth of bajara and it matures within three to four months. Soil types, relief and rainfall amount are essential quantise in the study area for distribution of bajara. Bajara is main staple food in the study area along with jowar and wheat. Bajara is grown on 9212 hectares accounting

16.99 percent area in the study area for 1991 Table-4.1 and Fig.-4.6). Taradgaon circle has the highest percent 34.25 area under cultivation of bajara. It is followed by Vidani circle which has 21.44 percent and Barad circle has only 13.28 percent area under cultivation of Bajara. These three circles altogether contributes more than 15 percent net sown area. Phaltan circle shows 10 to 12 percent area under bajara cultivation in hilly area because it does not found suitable land for bajara cultivation (Fig.-4.6).

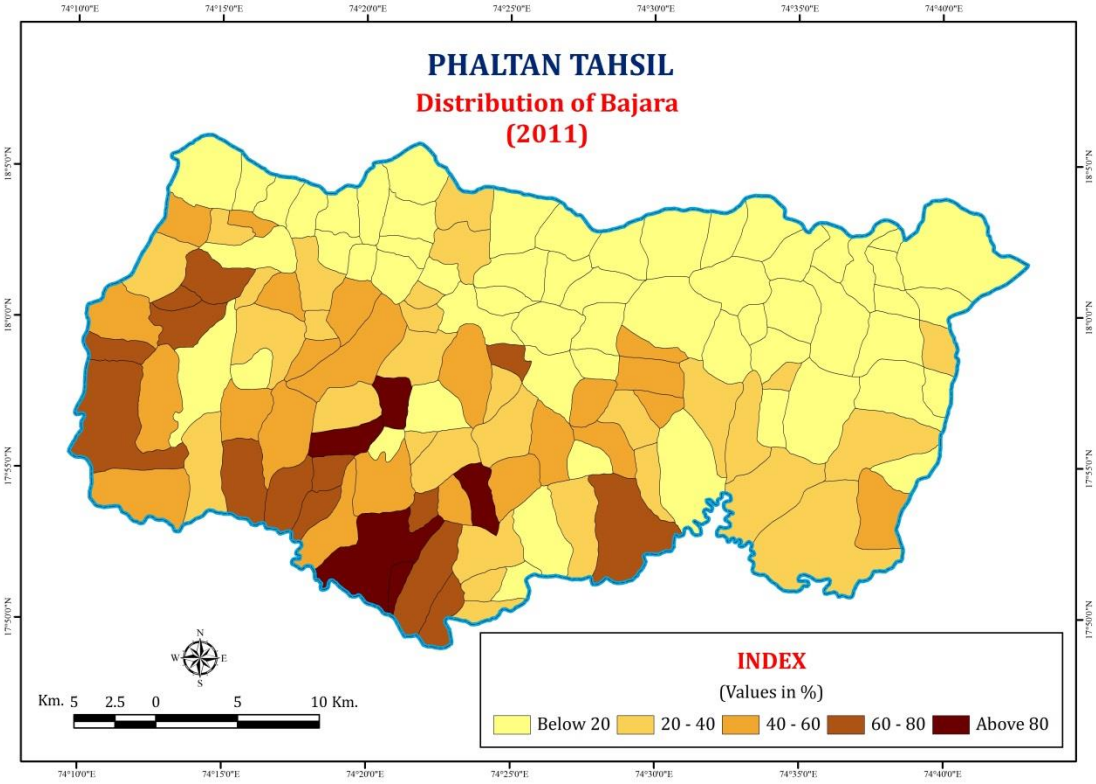
Bajara covers 16.99 percent area in 1991 and it has increased to 20.79 percent during study period. It has been noticed that the area under cultivation of Bajara Taradgaon circle was 34.25 percent and in 2011. Barad circle has 13.28 percent area under bajara cultivation in 2011. During span of 1991 to 2011, there is an increase of 3.80 percent of area under cultivation of Bajara in the study area. The maximum increase of 9.55 percent has observed in Vidani circle followed by Taradgaon circle which has 34.25 percent, Barad circle has increase of 2.08 percent. The decreasing trend of 0.03 percent has seen in Phaltan circle because of availability of irrigation introduced in the study area. Presently, farmers are found cultivating cash crops instead of bajara on irrigated land in the study area. In other circles of Phaltan Tahsil the area under cultivation of Bajara has been reduced due to insufficient rainfall in the area but the irrigation facilities increased in Vidani circle and the soil of this circle is suitable for cultivation of Bajara. So area under cultivation of Bajara increased in Vidani circle. Figure 4.6 shows distribution of cultivation of Bajara in Phaltan Tahsil.

Table-4.3.2
Phaltan Tahsil
Volume of Change in Bajara

Sr. No	Name of The Circles	1991	2001	Volume of Change	2011	Volume of Change
		Percent To NSA	Percent To NSA	1991 to 2001	Percent To NSA	2001 to 2011
1	Phaltan	10.04	11.40	1.36	10.01	-1.39
2	Vidani	10.24	10.89	1.65	21.44	10.55
3	Barad	11.20	11.90	0.70	13.28	1.38
4	Taradgaon	31.68	31.25	-0.43	34.25	3.00

Source: Revenue Record, Talathi office, Phaltan.
Note: NSA= net sown area.

Figure-4.6



4.3.3 Distribution of Wheat:

Wheat distribution is mainly influenced by soil types, topography, irrigation and rainfall. Wheat is a Rabi crop it needs dry and mild climate and moderate irrigation facility for its growth. Sandy loam and moisture retentive soil is more suitable for wheat cultivation. This crop develops in four to five months. In initial period, wheat requires 25^{O}C to 35^{O}C temperatures and at the time of harvesting it needs 22^{O}C to 30^{O}C temperatures. The soil and climate in Phaltan Tahsil is suitable for wheat cultivation. Wheat is generally sown in November and is harvested in February and March. Wheat was sown on 6.83 percent area in the study area in 1991. Figure 4.7 shows the spatial distribution of wheat in Phaltan Tahsil in 1991. The highest land under wheat in 2011 is found in Vidani circle it is 9.29 percent. It is followed by Barad circle which is 8.88 percent, Phaltan circle has 8.45 percent and Taradgaon circle accounts for 5.88 percent. It is noticed that the circles located in the northern part in the study area have 2 to 4 percent area under wheat cultivation. It is also found the western hilly region in Phaltan circle has less than two percent area under wheat cultivation due to undulating topography and unsuitable climate for wheat cultivation (Table-4.3.3).

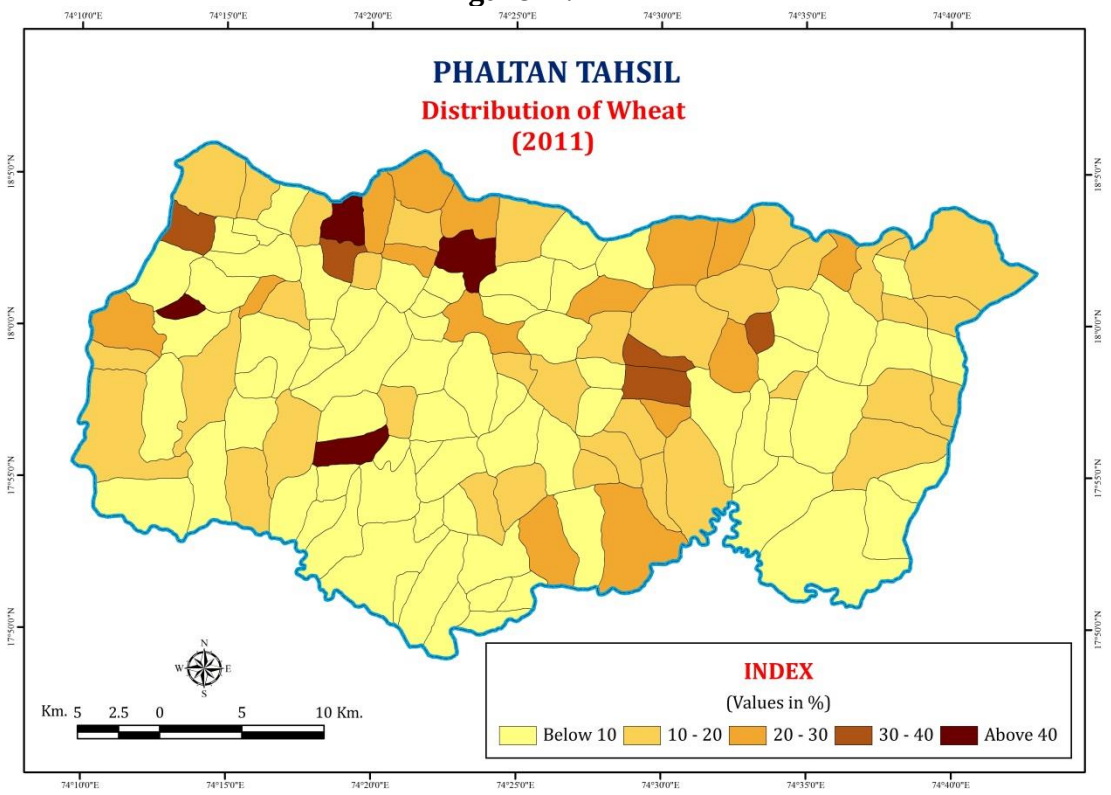
Area under wheat cultivation was 7.98 percent in the study area for 2011. Vidani circle has the highest area under wheat cultivation which is 9.29 percent. In period of 30 years the wheat cultivation is increased in Phaltan circle by 1.15 percent, in Barad circle it is increased only by 0.59 percent while in Taradgaon circle and Vidani circle it is increased by 0.88 percent and 0.02 percent respectively. This data is shown in fig.-4.7. 1991 to 2011 the lowest change wheat cultivation is identified in Taradgaon circle it is 5.88 percent. On other hand The wheat cultivation is increasing trend by 1.11 percent in Phaltan circle and remaining circles also show increasing trend in Vidani circle. Due to favourable climate and soil, the area under cultivation of Wheat is increased in Phaltan, Vidani and Barad circles. On other hand the area under cultivation of Wheat is decreased in Vidani circle due to shortage of labour and natural climates in the area. It is shown in fig.-4.7.

Table-4.3.3
Phaltan Tahsil
Volume of Change in Wheat

Sr. No	Name of The Circles	1991	2001	Volume of Change	2011	Volume of Change
		Percent To NSA	Percent To NSA	1991 to 2001	Percent To NSA	2001 to 2011
1	Phaltan	6.90	7.34	0.44	8.45	1.11
2	Vidani	8.41	9.27	0.86	9.29	0.02
3	Barad	7.51	8.29	0.78	8.88	0.59
4	Taradgaon	5.00	6.26	1.26	5.88	-0.38

Source: Revenue Record, Talathi office, Phaltan.
Note: NSA= net sown area.

Figure- 4.7



4.3.4 Distribution of Sugarcane:

Sugarcane is an important cash crop in Maharashtra. It requires tropical climate, temperature between 20^{O}C to 30^{O}C and the rainfall between 1000 to 1500 mm is for the growth of sugarcane. Sugarcane is the major crop in the study area. Sugarcane was cultivated on 10.65 percent area in 1991 on irrigation in the northern and the eastern parts of the study area. In Barad circle 18.60 percent area was under sugarcane cultivation followed by Phaltan circle which was 7.79 percent and it was 9.73 percent Vidani circle covers largest area under sugarcane cultivation.

It is found that due to irrigation availability in drought-prone area in eastern part of the study area. Sugarcane cultivation has increased by 10.97 percent in 2011. Barad circle and Vidani circle are found to be the most dominant area in sugarcane cultivation which account for 18.68 percent and 11.02 percent respectively. The remaining circles have less than nine percent area under sugarcane cultivation. Taradgaon circle and Phaltan circle show negligible increase percent under the sugarcane cultivation. It is found that in the study area under sugarcane cultivation has increased land by 3.30 percent from 2001 to 2011. Similarly the increasing trend is found in Vidani circle and

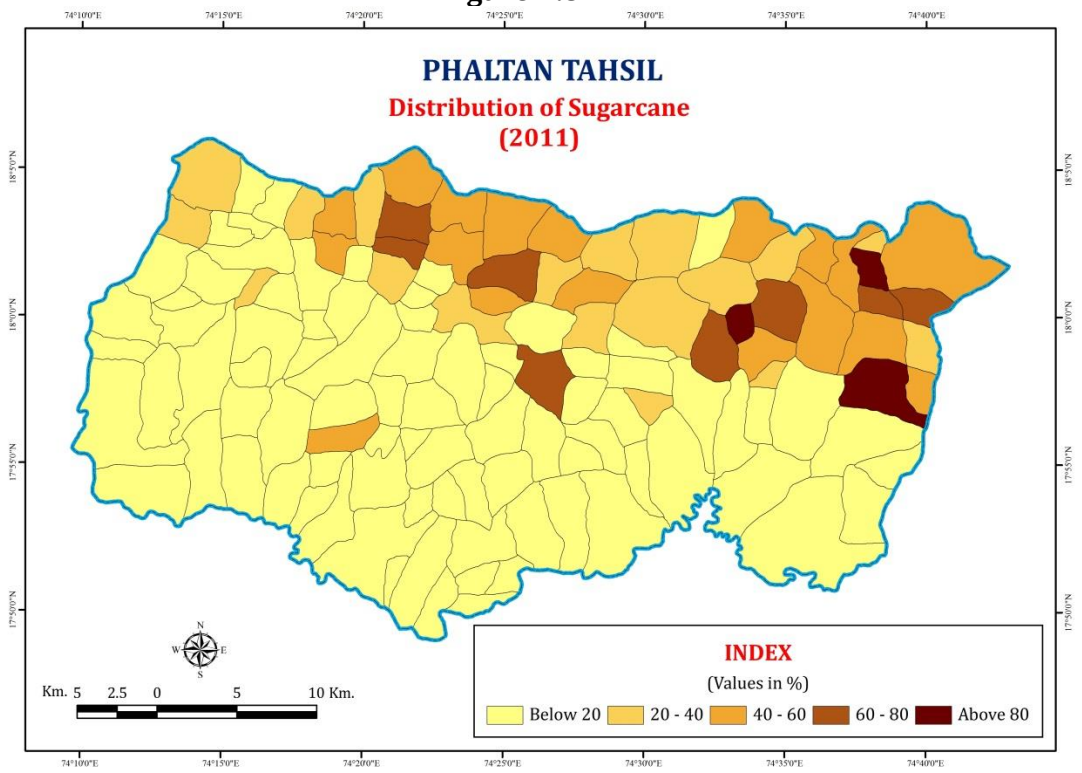
Phaltan circle due to availability of irrigation facility. It is increased by 11.02 percent and 8.40 percent in Vidani circle and Phaltan circle respectively. The area under cultivation of sugarcane has been increased during the study period because of less labour charges for cultivation and harvesting of sugarcane cultivation. The permanent water supply of canal and wells, more rates given by sugar factories to sugarcane in the study area. Another factor is that Sugarcane is cash crop so more and more farmers cultivating sugarcane in their lands. It is shown in fig.-4.8.

Table-4.3.4
Phaltan Tahsil
Volume of Change in Sugarcane

Sr. No.	Name of The Circles	1991	2001	Volume of Change	2011	Volume of Change
		Percent To NSA	Percent To NSA	1991 to 2001	Percent To NSA	2001 to 2011
1	Phaltan	7.79	7.86	0.07	8.40	0.54
2	Vidani	9.73	5.87	-3.86	11.02	5.15
3	Barad	18.60	12.17	-6.43	18.68	6.51
4	Taradgaon	6.75	5.09	-1.66	6.27	1.18

Source: Revenue Record, Talathi office, Phaltan.
Note: NSA= net sown area.

Figure-4.8



4.3.5 Distribution of Maize:

Maize is commonly referred to as ‘corn’ and it is a member of grass family. Maize is staple crop and provides food to human and fodder to livestock. Maize is a tropical crop and it is grown in both kharif and rabbi seasons. It survives better under the condition of high temperature of $27^{O}C$. It requires average annual rainfall between 500 to 700 mm. Maize is drought resistant and remains dormant during the period of drought and starts active growth when the moisture in soil improves. Maize thrives well in medium black to heavy soils. Rabi maize is produced between Septembers to December while kharif maize is produced between June to September. The improved variety of seeds are producing high yield per hectares. Maize was cultivated in Phaltan Tahsil on 3625 hectares in 1991. In other words it was grown on 6.68 percent. In 2011, it was cultivated on 5.78 percent of the net sown area of Phaltan Tahsil.

The decreasing trend is seen in cultivation of Maize in Phaltan Tahsil during the span 30 years from 1991 to 2011. It is decreased by less than 2 percent. The area under cultivation of Maize is decreased in all circles of Phaltan Tahsil. In 1991 Maize grown on 2.80 percent in Phaltan circle while it was cultivated on 2.65 percent in 2011. It is decreased by 0.63 percent similarly it is decreased by 0.92 percent, 1.73 percent, 1.03 percent in Vidani circle, Barad circle and Taradgaon circle respectively in period of 30 years. Due to following reasons the area under cultivation of Maize has been reduced.

1. The expenditure for the cultivation of Maize has been increasing.
2. The fertility of the land decreases due to cultivation of maize.
3. The income from this crop is very less.
4. The number of cattle in the area reduced so cultivation of maize as fodder crop is reduced.

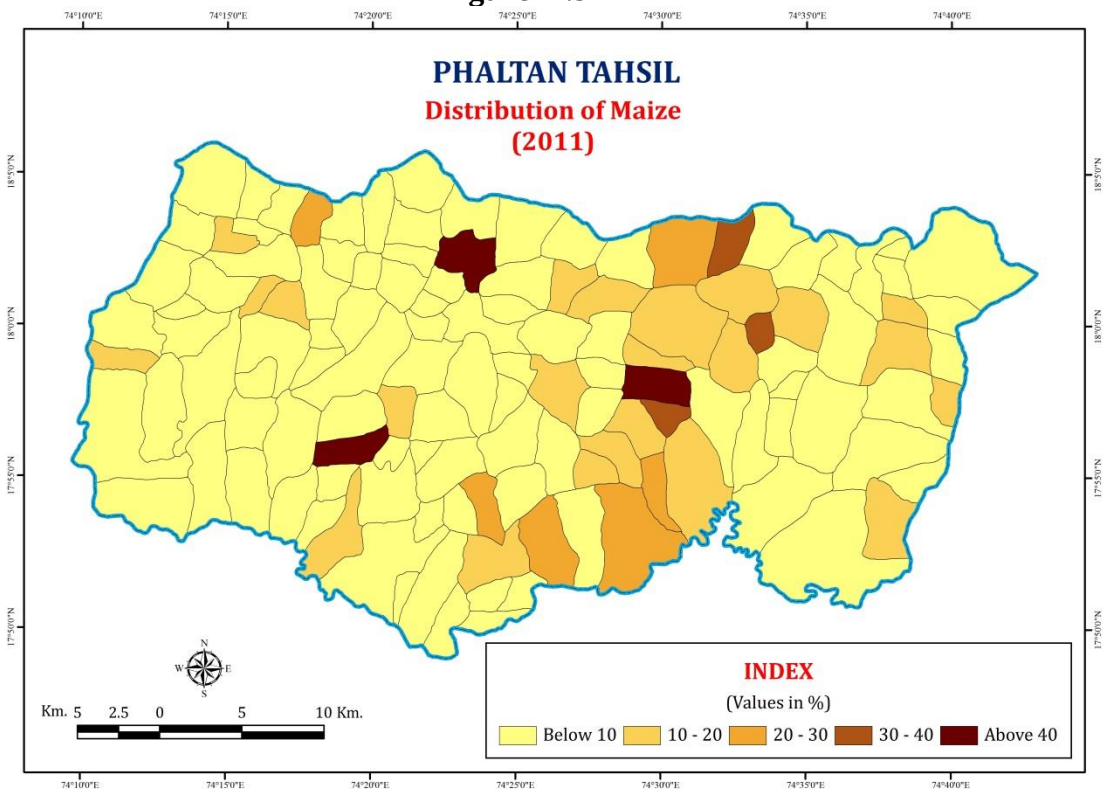
Figure 4.9 shows distribution of cultivation of Maize in Phaltan Tahsil.

Table-4.3.5
Phaltan Tahsil
Volume of Change in Maize

Sr. No.	Name Of The Circles	1991	2001	Volume of Change	2011	Volume of Change
		Percent To NSA	Percent To NSA	1991 to 2001	Percent To NSA	2001 to 2011
1	Phaltan	2.80	3.28	0.48	2.65	-0.63
2	Vidani	7.94	8.82	0.88	7.02	-1.80
3	Barad	12.55	12.64	0.09	10.82	-1.82
4	Taradgaon	3.65	3.20	-0.45	2.62	-0.58

Source: Revenue Record, Talathi office, Phaltan.
Note: NSA= net sown area.

Figure- 4.9



4.3.6 Distribution of Fruits:

Due to government's incentive for cultivation of fruits in farmers in Phaltan Tahsil have increased area under cultivation of fruits. Fruits such as Banana, Grapes, Safota, Guava and Mango are cultivated in the study area. The cultivation of fruits occupies 1.65 percent of net sown area in the study area. In 2011 Phaltan circle is leading in production fruits. It occupies the highest land under fruit crop and Taradgaon circle in the west has the lowest land under fruit crop. The spatial distribution of fruits in Vidani circle and

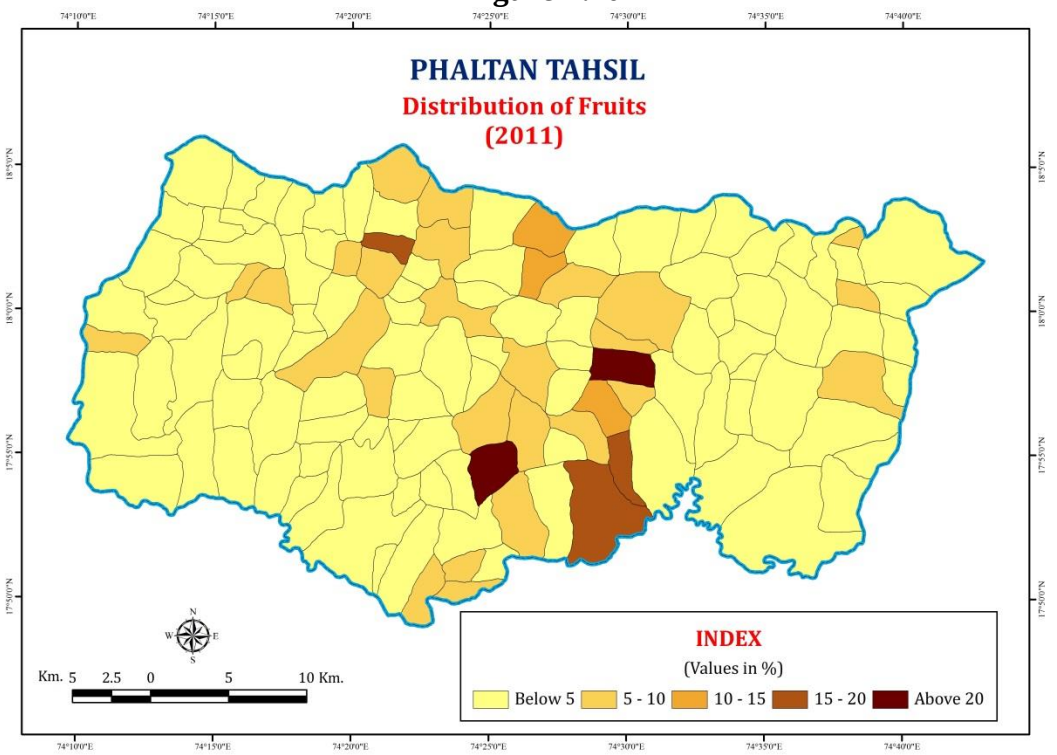
Barad circle is 1 to 2 percent area under cultivation. From 1991 to 2011 the area under cultivation fruits is slightly increased by 0.18 percent. The maximum increase is identified in Phaltan circle and Vidani circle. It is followed by Barad circle which is 1.57 percent. In Taradgaon circle it is 1.38 percent. The area under cultivation of Fruits is increasing slowly because of increasing cost of production and increasing expenditure on pesticide and insecticide. But the cultivation of fruits is increasing after 2001 because good transportation to market place and better income from this crop. Figure- 4.10 shows distribution of cultivation of Fruits in Phaltan Tahsil.

Table-4.3.6
Phaltan Tahsil
Volume of Change in Fruits

Sr. No.	Name of The Circles	1991	2001	Volume of Change	2011	Volume of Change
		Percent To NSA	Percent To NSA	1991 to 2001	Percent To NSA	2001 to 2011
1	Phaltan	1.79	1.64	-0.15	1.87	0.23
2	Vidani	1.61	1.81	0.20	1.87	0.06
3	Barad	1.41	1.49	0.08	1.57	0.08
4	Taradgaon	1.20	1.33	0.13	1.38	0.05

Source: Revenue Record, Talathi office, Phaltan.
Note: NSA= net sown area.

Figure-4.10



4.3.7 Distribution of Fodder Crops:

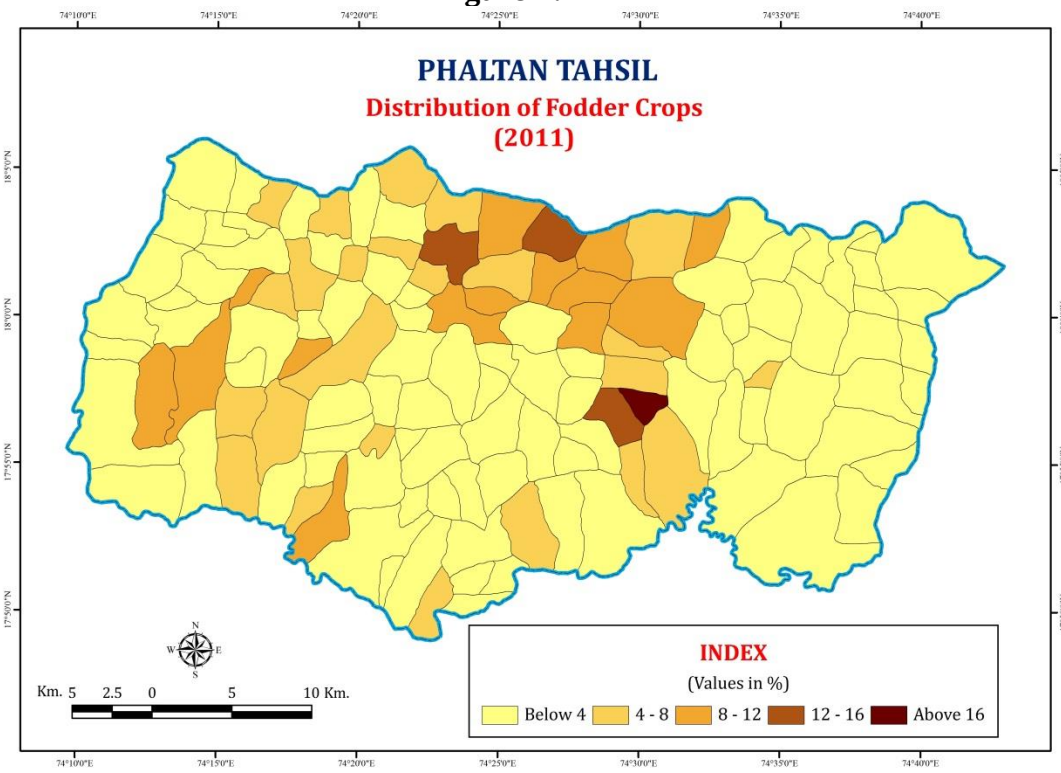
The fodder crops in Phaltan tahsil include kadwal and green grass. This crop is confined to the north and the eastern parts in the study area which has livestock dominance. These fodder crops are grown with jowar, bajara, sugarcane and wheat. In 1991, the cultivation of fodder crops in Vidani circle is 0.81 percent and while Phaltan circle accounts for 0.74 percent. Tardgaon circle has the highest percent area under this crop which is 0.75 percent of net sown area. In 1991, fodder crops are sown on 339 hectares accounting for 0.62 percent area in the study area. Vidani circle has 0.81 percent area under cultivation of fodder crops. In 1991 it has followed by Phaltan circle which is 0.74 percent, Taradgaon circle has0.72 percent. Barad circle has 0.22 percent the lowest area under cultivation of fodder crops. In 1991 fodder crops had sown on 0.62 percent of net sown area while it was grown on 0.46 percent of net sown area in 2011. It means the area under cultivation of fodder corps has been decreased by 0.16 percent. In 2011, maximum area under cultivation of fodder crops is in Taradgaon circle and Phaltan circle the lowest area under cultivation of fodder crops is Barad circle in 2011. After 2001 the area under cultivation of fodder crop in Phaltan and Vidani circle has been decreasing trend due to less number of cattle in the area, less rainfall and continuous drought like condition in the area. But in Barad and Tardgaon circle slight increase in the cultivation of Fodder crop, because of new dairies in the area. The farmers are buying the cattle to increase their supplementary income from milk. The fig.-4.11 displays the data regarding fodder crops.

Table-4.3.7
Phaltan Tahsil
Volume of Change in Fodder crops

Sr. No.	Name of The Circles	1991	2001	Volume of Change	2011	Volume of Change
		Percent To NSA	Percent To NSA	1991 to 2001	Percent To NSA	2001 to 2011
1	Phaltan	0.74	0.69	0.05	0.59	-0.10
2	Vidani	0.81	0.78	-0.03	0.29	-0.49
3	Barad	0.22	0.10	-0.12	0.17	0.07
4	Taradgaon	0.72	0.67	-0.05	0.75	0.08

Source: Revenue Record, Talathi office, Phaltan.
Note: NSA= net sown area.

Figure-4.11



4.3.8 Distribution of Vegetables:

Market, irrigation and road accessibility are important factors in distributional pattern of vegetable cultivation in the study area. Vegetables are grown on 5.25 percent of net sown area in the study area. Brinjal, Bhendi (Lady Finger), Radish, Cabbage, Cauliflower, Methi, Spinach, Onion and Bitter-gourd Capsicum, Chilly, Rich-gourd, Peas, Ghewada, Tomato and Cucumber etc. are grown in the study area. Vegetables being perishable commodity are cultivated near market in the study area. The highest percentage under vegetables cultivation is in Vidani circle in the northern part it is 6.00 percent area in 2011. The lowest area under this crop is in Taradgaon circle it is 4.39 percent in 2011. In 1991, the area under cultivation of vegetables was 5.06 percent of net sown area in Phaltan Tahsil. But in 2011total area under cultivation of vegetables is 5.25 percent of net sown area. It shows the increasing trend in cultivation of vegetables is in Vidani circle and the lowest area of 4.39 percent under cultivation of vegetables is found in Taradgaon circle. Vegetables cultivation is mainly influenced by proximity of Phaltan urban centres. The fluctuating trend in cultivation of Vegetable is seen in study area during study period. The vegetable is a perishable crop.

1. The distance from farm to market is far so there is a problem of transportation of vegetables to market place in time.

2. The fluctuating rate of vegetables in the market is another reason for its cultivation.

3 The farmers have to face the problem of insufficient rainfall the continuous drought like condition. These factors have affected the cultivation of vegetables in study area.

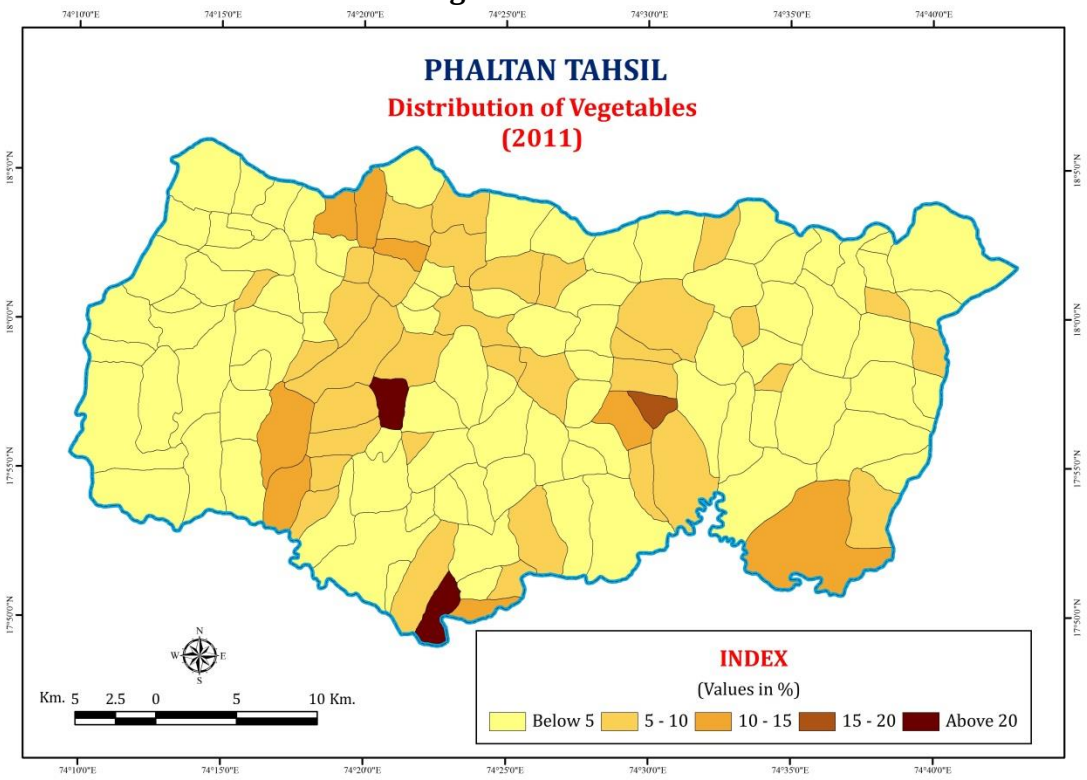
Figure 4.12 shows the data regarding cultivation vegetables in Phaltan Tahsil.

Table-4.3.8
Phaltan Tahsil
Volume of Change in Vegetables

Sr. No.	Name of The Circles	1991	2001	Volume of Change	2011	Volume of Change
		Percent To NSA	Percent To NSA	1991 to 2001	Percent To NSA	2001 to 2011
1	Phaltan	5.38	5.35	-0.03	5.83	0.48
2	Vidani	5.70	5.85	0.15	6.00	0.15
3	Barad	5.30	5.26	-0.04	5.12	-0.14
4	Taradgaon	4.13	4.39	0.26	4.39	0.00

Source: Revenue Record, Talathi office, Phaltan.
Note: NSA= net sown area.

Figure- 4.12



4.3.9 Distribution of Sunflower:

Sunflower is major oil seed crop. It is mostly grown in rain fed area. Kharif and Rabi seasons are suitable for its growth. The table concerned represents the area under sunflower, which is also below one percent total cropped area. In 1991, only 0.66 percent of area was under cultivation of sunflower in net sown area. But it is tremendously decreased to 0.21 percent in 2011. Less than two percent area under sunflower cultivation had been recorded in Phaltan and Vidani circles in 1991. In 2011, Sunflower covers 116 hectares in Phaltan Tahsil 0.21 percent of the net sown area. In 1991, the highest percent area under sunflower cultivation was in Phaltan circle it was the lowest area under cultivation of sunflower was Taradgaon circle it is 0.53 percent of the net sown area. From 1991 to 2011 the overall decreasing trend is recorded in Phaltan Tahsil. Due to irrigation facilities in the study area cropping patterns has been changed in Phaltan Tahsil.

The area under sunflower cultivation has been decreased due to larger area has come under jowar, sugarcane, wheat and bajara cultivation in the study area. A sunflower is commonly grown as an inter-crop with jowar, bajara and wheat in the study area. The area under cultivation of Sunflower has decreasing trend during the study period in Phaltan Tahsil. It has following reasons.

1. The climatic condition required for the cultivation of Maize is not consistent.
2. The income from sunflower is always fluctuating due to demand and supply of sunflower in the market.
3. The cultivation of sunflower decreases fertility of soil.

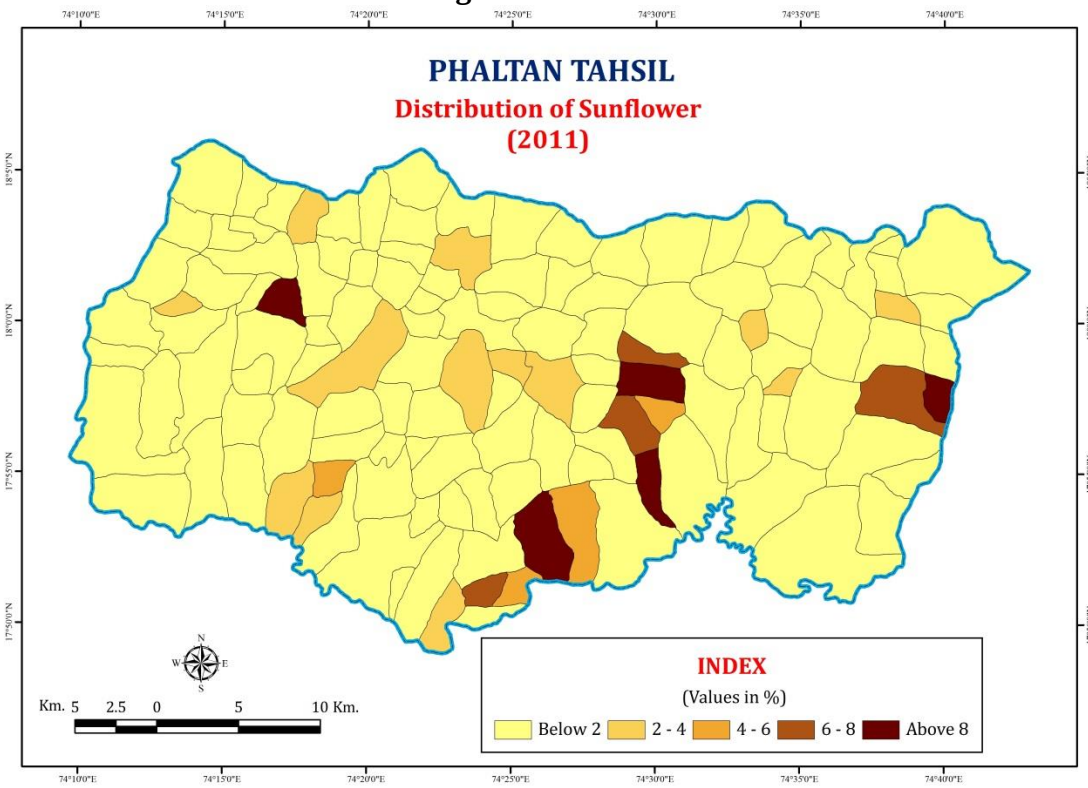
Figure-4.13 illustrates the trends of sunflower cultivation in Phaltan Tahsil.

Table-4.3.9
Phaltan Tahsil
Volume of Change in Sunflower

Sr. No.	Name of The Circles	1991	2001	Volume of Change	2011	Volume of Change
		Percent To NSA	Percent To NSA	1991 to 2001	Percent To NSA	2001 to 2011
1	Phaltan	1.05	0.60	-0.45	0.32	-0.28
2	Vidani	0.71	0.65	-0.06	0.10	-0.55
3	Barad	0.44	0.39	-0.05	0.28	-0.11
4	Taradgaon	0.53	0.29	-0.24	0.14	-0.15

Source: Revenue Record, Talathi office, Phaltan.
Note: NSA= net sown area.

Figure- 4.13



4.3.10 Distribution of Pulses:

Gram, Tur, Udid, Moong, Hulga, Chvali and Kulith are the major pulses grown in the study area. These crops are not grown on a large scale in the study area. In 2011, it is cultivated only on 5.96 percent of net sown area of Phaltan Tahsil. In 1991, Phaltan circle shows highest percent area under cultivation of pulses. It was 6.56 percent of net sown area and Taradgaon circle shows lowest percent area under cultivation of pulses. It was 5.08

percent. The other three circles lie in the east and the western part namely Vidani, Barad and Taradgaon circles had 5 to 6 percent area under cultivation of pulses. In 2011, Vidani circle has 6.32 percent and remaining circles in the western part show less than 7 percent land under cultivation of pulses. A less than three percent area under cultivation of pulses is observed at hundred villages in widely spread out in the study area. There is absence of this crop in the southern part in the study area because sugarcane and wheat have cultivated on the larger area. The area under cultivation of Pulses in study area has fluctuating trend because of following reason

1. The distribution of rainfall in kharif season in every year is not even
2. The cost of labour is increasing every year.
3. The inferior quality of soil affects the production of pulses so area under cultivation of pulses decreases.

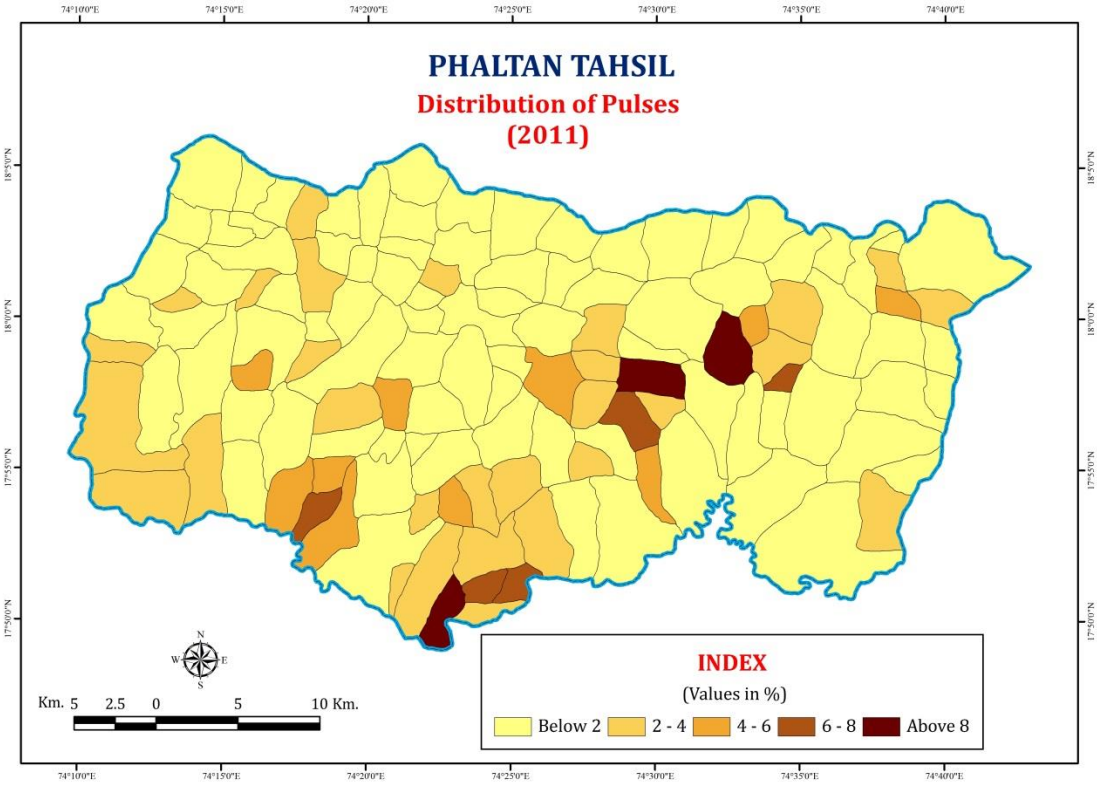
Fig.-4.14 shows distribution of cultivation of pulses in Phaltan Tahsil.

Table-4.3.10
Phaltan Tahsil
Volume of Change in Pulses

Sr. No.	Name of The Circles	1991	2001	Volume of Change	2011	Volume of Change
		Percent To NSA	Percent To NSA	1991 to 2001	Percent To NSA	2001 to 2011
1	Phaltan	6.56	5.87	-0.69	6.10	0.23
2	Vidani	6.15	3.70	-2.45	6.32	2.62
3	Barad	6.09	7.64	1.55	5.77	-1.87
4	Taradgaon	5.08	5.98	0.90	5.75	-0.23

Source: Revenue Record, Talathi office, Phaltan.
Note: NSA= net sown area.

Figure-4.14



4.4 References:

1. Ali, M., (1978), "Studies in Agricultural Geography", Rajesh Publication, New Delhi, P. 69-71.

2. District Socio-economic Review and Statistical Abstract, Satara District, 1989,2001,2011,2012.

3. http://www.indiastat.com

4. http/www.mah.nic.in

5. http//www.wikipedia.com

6. Husain, M., (1979), "Agricultural Geography", Inter India Publication, 105, Anandnagar, Delhi, P. 62-63, 83-87.

7. Jadhav, M.G., (1984), "Sugarcane Cultivation, A regional survey", Himalaya Publishing House, Bombay, P.8

8. Patil, S., (2012), "Spatio-Temporal analysis of Agricultural Land use pattern in Pune Dist", Unpublished Ph.D Thesis Submitted to T.M.V. Pune. Pp 65, 66.

9. Sapre, S.G. and Deshpande V. D., (1964), "Inter district Variation in Agricultural Efficiency in Maharashtra State", Indian Journal of Agricultural Economics, pp. 242-252.

10. Sing, J., Dhillon, S., (1976), “An Agricultural Geography of Hariyana”, Kurukshetra, Vishal Publications, pp. 131,135,138,159,187-190.
11. Report on Agricultural Census, (1991 to 2011), “Maharashtra State, Part I And II”.
12. Wagh A.S., (2009), “Irrigation and its impact on cultivated area: A case study of Satara District”, (1984-85 to 2004-05), Un published M.Phil. Dissertation Submitted to T.M.V. Pune. PP. 09 to 25.

CHAPTER-V
CROP COMBINATION AND DIVERSIFICATION REGIONS

CHAPTER-V
CROP COMBINATION AND DIVERSIFICATION REGIONS

5.1 Introduction:

After showing the spatio-temporal study of general and crop land use of in the area in previous Chapter-III and IV, it is necessary to appraise the crop regions in the study area. It is noticed that the geographical factors such as soils, irrigation, nature of relief, use of chemical fertilizers, pesticides, proximity to market, price fluctuation and attitude of farmers affect the cropping pattern in the study area. Keeping these circumstances in mind, it becomes essential to make rigorous study for farming regions. The crop cultivation within the area reveals strength and weakness of crop regions. Individual crop of the area provides a true 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 utilised. The data was obtained from Tahsil Agriculture Office, Phaltan and District Census Handbook of Satara District for the year 2010-2011. Data of ten crops has been converted into percentages to net sown area and this percent of crops was utilised for computing crop ranking to appraise relative strength of individual crop in Phaltan Tahsil.

5.2 Crop Ranking:

Ranking of crop reveals the relative strength of ten crops percent at village level. They are taken into account for computing crop ranking. These ten crops are Jowar, Bajara, Wheat, Sugarcane, Maize, Fruits, Fodder Crops, Vegetables, Sunflower and Pulses which are shown in Table-5.1. The cultivation of these crops is the outcome of soil types and irrigation in addition to farmer's decision in the study area. The ranking obtained for all these crops shows the relative significance of individual crop in cropping pattern. The obtained rankings of crops and number of village have indicated in Table-5.1 (Appendix-F).

Table-5.1
Phaltan Tahsil
Crops Rank Frequency

Sr. No.	Crops	Crop Ranking and Numbers of villages									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1	Jowar	53	25	04	15	11	10	07	03	-	-
2	Bajara	28	58	19	11	07	03	01	01	-	-
3	Wheat	-	30	42	28	10	09	05	02	02	-
4	Sugarcane	47	-	13	18	11	06	03	17	06	07
5	Maize	-	11	21	19	33	17	15	06	02	04
6	Fruits	-	01	08	09	18	32	25	18	09	08
7	Fodder crops	-	02	03	09	13	12	19	22	40	08
8	Vegetables	-	-	11	13	15	22	28	28	10	01
9	Sunflower	-	-	02	01	03	06	07	10	42	57
10	Pulses	-	01	05	05	07	11	18	21	17	43

Source: Computed by Researcher.

5.2.1 First Ranking:

Table-5.2 and Fig.-5.1 show the first ranking crops in Phaltan Tahsil. Three crops have been detected as first ranking crops. These three crops are Jowar, Bajara and Sugarcane. Figure-5.1 displays the distribution of first ranking crops in the Phaltan Tahsil. Jowar crop reveals the first rank in the study area. Its cultivation is found in the north central part in 53 villages on 43.75 percent of total village in Phaltan Tahsil. This crop covers 30332.67 hectares in Phaltan Tahsil. Sugarcane appears in the northern part in the study area on deep soil along the Nira River and the Nira right bank canal. The favourable climate in the area with fertile black soil is responsible for cultivating sugarcane. Sugarcane is another crop which has first ranking. It is found to have the largest coverage of 26823.55 hectares in forty-seven villages occupying 38.69 percent area in the study area. Sugarcane belt is concentrated in the northern parts in the study area.

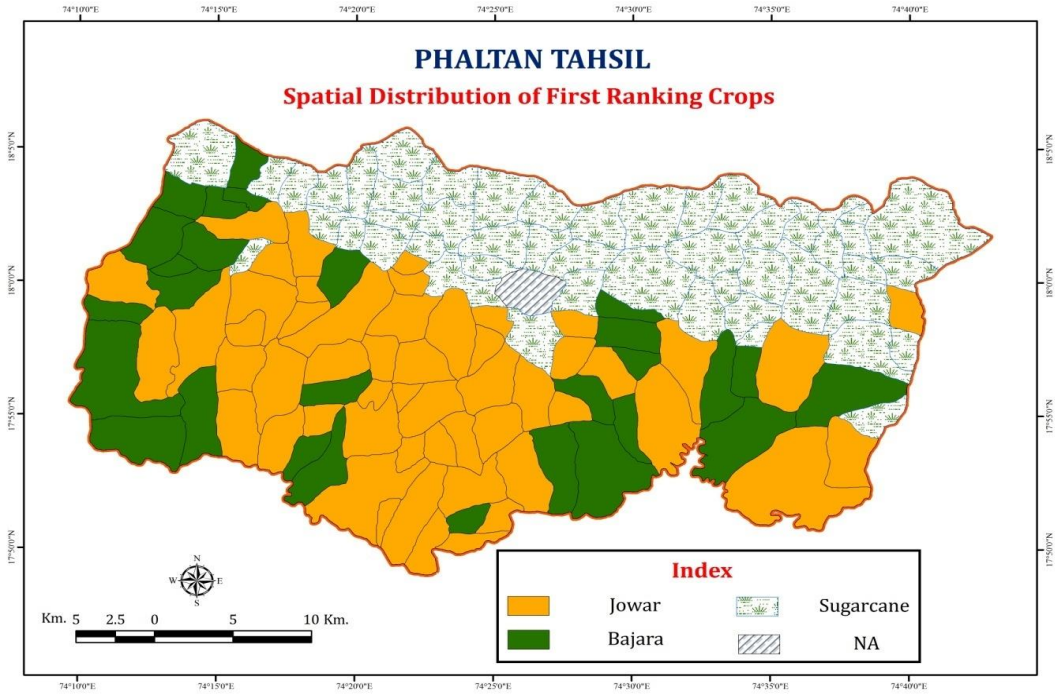
Bajara is identified as the third major crop standing in the study area. Bajara is grown on 12165.65 hectares in twenty-eight villages on 21.87 percent of total villages in the study area. It is to the south, the eastern and the middle part of the study area. This crop is grown on 17.56 percent of total net sown area in less rainfall area on coarse shallow soil.

Table-5.2
Phaltan Tahsil
Crops, Villages and Area in First Ranking

Sr. No.	Crops	Number of Villages	Percent to total villages	Area in hectares	Percent to total area
1	Jowar	53	41.40	30332.67	43.75
2	Bajara	28	21.87	12165.65	17.56
3	Sugarcane	47	36.73	26823.55	38.69
	Total	128	100	69321.87	100

Source: Computed by Researcher.

Figure-5.1



5.2.2 Second Ranking:

Second ranking crops have increased with compare first ranking crop. Table-5.3 and Fig.-5.2 indicate distribution of second ranking crops in the Phaltan Tahsil. There are seven crops Jowar, Bajara, Wheat, Maize, Fodder crops, Fruits and Pulses have been included in second rank. Among these seven crops, Jowar grown in 25 villages in the study area. It is included in second ranking. Its distribution in in the area is patchy in nature covering 12532.65 hectares it is cultivated on 18.07 percent of total net sown area. Wheat is included second ranking which is grown in thirty villages. It has

23.43percent of total net sown area. Wheat appears in the northern part in the study area on deep soil along the Nira River and the Nira right bank canal. The favourable environment in the area is responsible for growing wheat on fertile black soil. Bajara is found as second ranking crop in 58 villages occupying 32345.16 hectares. It is grown on (46.65 percent of total net sown area. Three major patches of bajara are seen in the study area. One patch comprising of fifteen villages is found in south-west on coarse shallow soil.

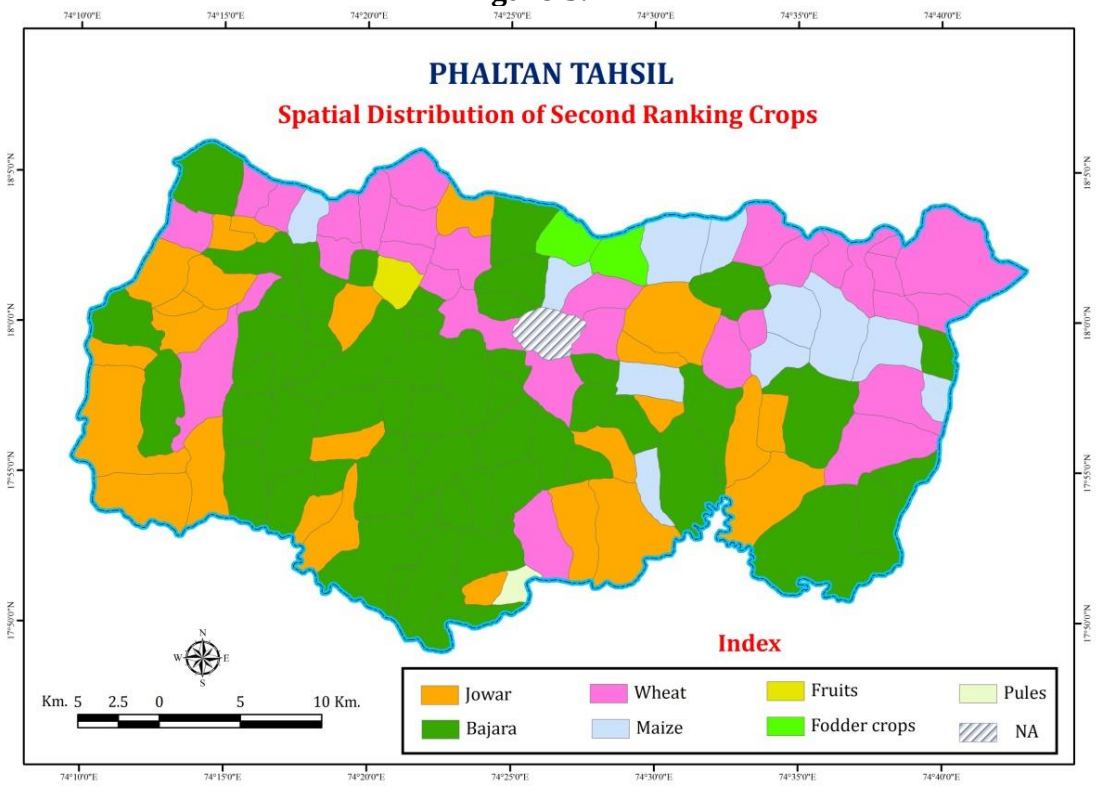
Another patch of fifteen villages in the central part of the study area is found under cultivation of Bajara. Remaining village's bajara cultivation is concentrated in the north-eastern part in the study area. Maize ranks as second crop in eleven villages. These villages are concentrated in the western part of the study area. It is grown on 10.68 percent of total net sown area in the study area. Hence these villages show livestock dominance and dairy farming. Fodder crops are cultivated in the north and the western part in two villages on irrigation. It is cultivated on 2.07 percent of total net sown area. Fruits ranks second status in single village on 700 hectares it is grown on 0.78 percent of total villages in Phaltan Tahsil. Pulses cultivation is identified in the western parts in non-irrigated area Daryachiwadi village of the Phaltan Tahsil. It is shown on 410.30 hectares; it is cultivated on 0.59 percent of net sown area. The Table-5.3 and fig.-5.2 display crops, villages and area in second ranking.

Table-5.3
Phaltan Tahsil
Crops, Villages and Area in Second Ranking

Sr. No.	Crops	Number of Villages	Percent to total villages	Area in hectares	Percent to total area
1	Jowar	25	19.53	12532.65	18.07
2	Bajara	58	45.33	32345.16	46.65
3	Wheat	30	23.43	14493.01	20.90
4	Maize	11	8.59	7404.65	10.68
5	Fodder crop	02	1.56	1436.10	2.07
6	Fruits	01	0.78	700.00	1.04
7	Pulses	01	0.78	410.30	0.59
	Total	128	100	69321.87	100

Source: Computed by Researcher.

Figure-5.2



5.2.3 Third Ranking:

Ten crops have entered in the third ranking in the Phaltan tahsil which is shown in Fig.-5.3. These crops are Jowar, Bajara, Wheat, Sugarcane, Maize, Fruits, Fodder Crops, Vegetables, Sunflower and Pulses. Among these crops, Fodder crops are the dominant crop in this rank. Fodder crops include green grass and kadwal. It is included in third rank. It is identified in three villages over 1587.43 hectares. It's percent is 2.28 of net sown area. Its areal extent sprawls over the north, the central and the eastern part in dairy dominating area. Wheat holds the third rank in forty-two villages having 32.81 percent of total villages. The distribution of wheat in the study area is found in three patches. Twenty-one villages are found in the north-western part in the study area. Another patch comprising of nine villages is situated in the eastern part and twelve villages are located in the northern part of the study area. Jowar is another crop indicating third rank in the study area. Its cultivation is found in the western and the northern part in four villages on 1.93 percent of total area which is displayed Table-5.4 and Fig.-5.3. This crop is grown in 1342.71 hectares. Bajara is cultivated on coarse shallow soil. Another three villages cultivated this crop are situated in the central part revealing isolation.

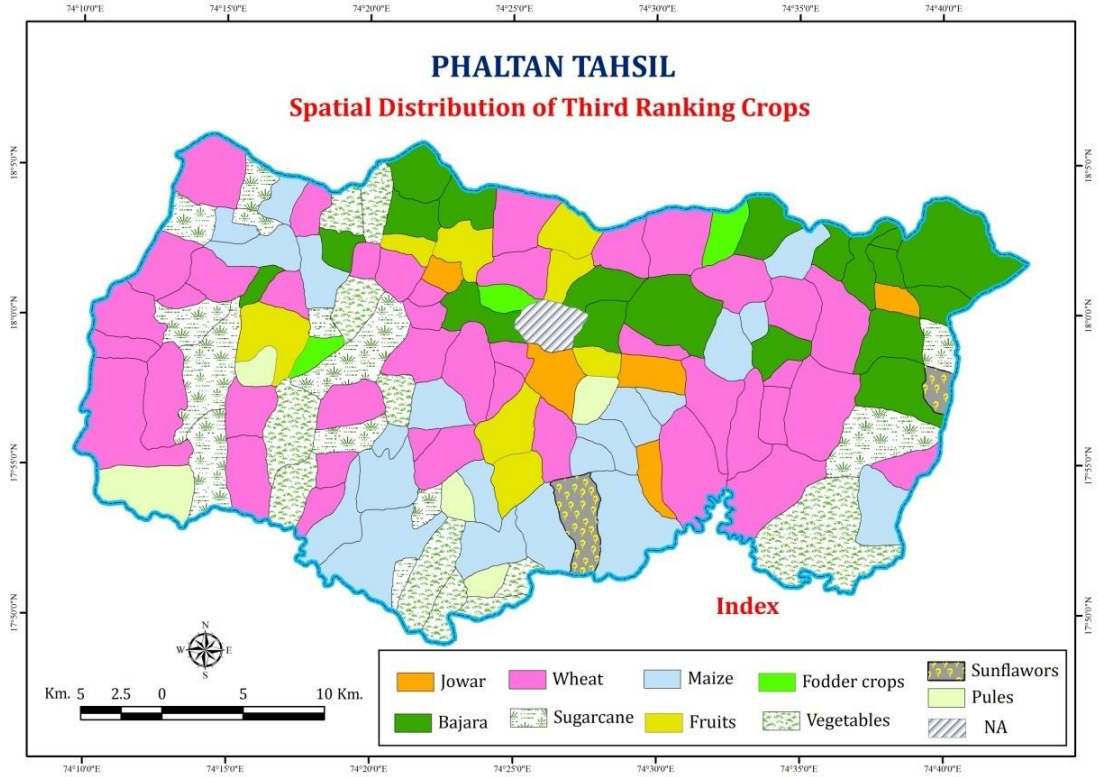
Sugarcane ranks third in Phaltan Tahsil in thirteen villages. These villages are unevenly distributed within the study area. Wakhari, Kharedewadi, Manewadi, Zadakwadi villages are found in the west Vajegaon, Kurawali, Rajuri and Sangavi lie on the eastern part of the study area. The sugarcane is grown in surrounding area of sugar factory located at Phaltan and Sakharwadi. A crop of fruit is associated with fertile soil and having irrigation facilities. Pulses are identified as third ranking crop in villages occupying 2165.58 hectares. Pulses are grown in Sawantwadi, Zirapwadi, Miryachiwadi and Takubaichiwadi villages situated in the western part of the study area. Maize has the largest coverage among third rank position in twenty-one villages on 10103.38 hectares. It has grown on 14.57 percent of total area in the study area. Vegetables ranks third and is limited to eleven villages on 8.59 percent of total villages in the western part of Phaltan Tahsil.it covers 5340.65 hectares having 7.75 percent of net sown area. Sunflower ranks third position in two villages namely Munjawadi and Bhavaninagar on 2283.58 hectares. It is on 3.29 percent of net sown area. This data is shown in Table-5.4 and Fig.-5.3.

Table-5.4
Phaltan Tahsil
Crops, Villages and Area in Third Ranking

Sr. No.	Crops	Number of Villages	Percent to total villages	Area in hectares	Percent to total area
1	Jowar	04	3.12	1342.71	1.93
2	Bajara	19	14.84	10746.73	15.50
3	Wheat	42	32.81	24246.13	34.97
4	Sugarcane	13	10.15	6577.38	9.48
5	Maize	21	16.40	10103.38	14.57
6	Fruits	08	6.25	4928.30	7.10
7	Fodder crops	03	2.34	1587.43	2.28
8	Vegetables	11	8.59	5340.65	7.75
9	Sunflower	02	1.60	2283.58	3.29
10	Pulses	05	3.90	2165.58	3.13
	Total	128	100	69321.87	100

Source: Computed by Researcher.

Figure-5.3



5.2.4 Fourth Ranking:

Fourth ranking crops give much varied distribution both in space and the number of crops involved. This is illustrated in Fig.-5.4 and Table-5.5. There are ten crops Jowar, Bajara, Wheat, Sugarcane, Maize, Fruits, Fodder crops, Vegetables, Sunflower and Pulses which have entered in the fourth ranking crops in the study area. Wheat has the largest coverage among fourth rank position in twenty-eight villages on 15980.09 hectares. It is sown on 23.05 percent of net sown area. The cultivation of wheat is spread into three patches lying in the central, the northern and the western part on deep black and medium black soil. Jowar is associated with deep black soil and irrigation facilities. Jowar ranks fourth and is confined to fifteen villages. It is cultivated in 11.71 percent of total village in the study area. It covers 6397.58 hectares having 9.22 percent of net sown area. Vajegaon, Kurawali, Dattanagar, Rajuri, Hanmantwadi and Jadhavwadi are found in the east of Phaltan Tahsil. While Vadajal, Phartadvadi, Bhilkati, Hol, Sakharwadi, Padegaon and Kusur are found in the north-western part of the Phaltan Tahsil.

Bajara cultivation is spread over the southern parts in patchy forms in 7872.73 hectares having 11.35 percent of net sown area in eleven villages. Sugarcane ranks fourth position in eighteen villages on 11424.92 hectares in

the area (Fig.-5.4). The cultivation of sugarcane is extended into three patches lying in the east, the north and the south-western part on deep black and medium black soils. The sugarcane is grown in neighbouring area of sugar factory situated at Phaltan and Sakharwadi.

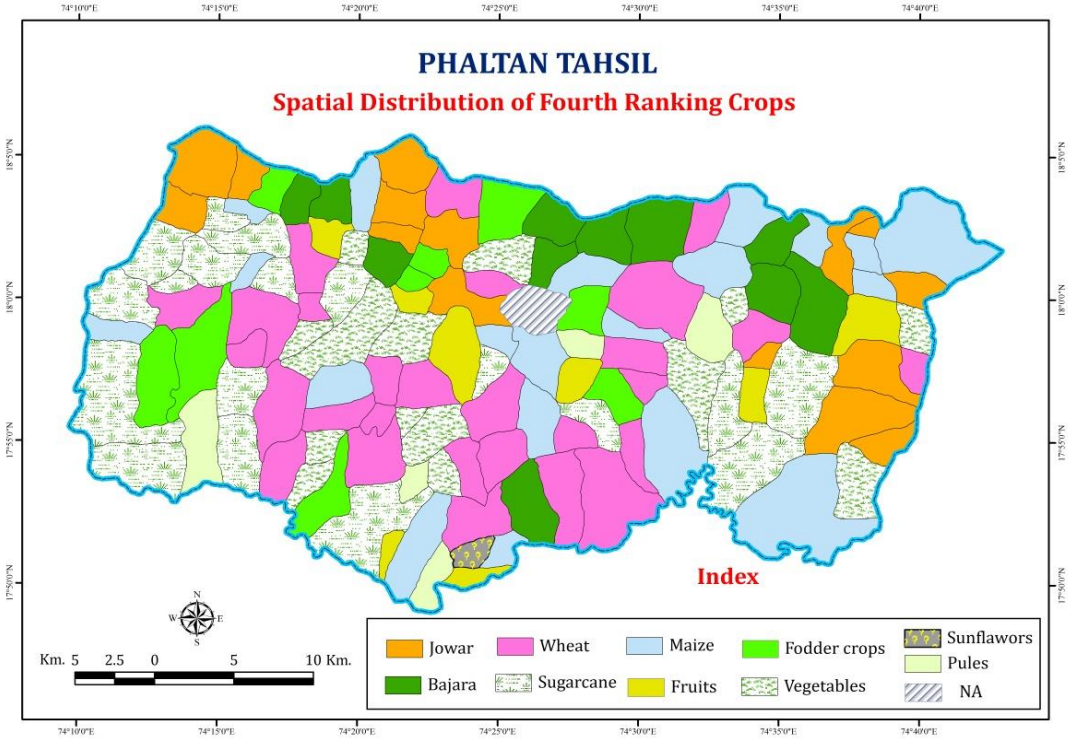
Fodder crops ranked as fourth in nine villages which are distributed throughout the in the area. Fodder crops are grown on 7.03 percent to total villages. It is cultivated on 4529.30 hectares. Fodder crops support for milk production. Maize ranks fourth and is limited to nineteen villages it is confined to 14.88 percent to total villages in the northern parts covering 9827.94 hectares having 14.17 percent of net sown area. Vegetables are grown on 6549.40 hectares. The area under cultivation of vegetables is 9.44 percent of net sown area in Waghoshi, Kharadewadi and Ghadgemala located in the western part of the Phaltan Tahsil. Pulses are cultivated in the villages Zadakwadi, Veloshi, Pimparad and Adarki are located in the western and the eastern part of study area. Pulses occupy fourth rank and are confined to five villages having 3.90 percent of total villages in the southern parts. It covers 2433 hectares. It has 3.56 percent of net sown area. Fruits are fourth ranking in nine villages in the study area which grown on 4034.39 hectares having 5.81 percent of net sown area. Sunflower ranks fourth position in single village on 272.52 hectares having 0.78 percent of total villages in Phaltan Tahsil. Fig.-5.4 and Table-5.5 show crops, villages and area in fourth ranking.

Table-5.5
Phaltan Tahsil
Crops, Villages and Area in Fourth Ranking

Sr. No.	Crops	Number of Villages	Percent to total villages	Area in hectares	Percent to total area
1	Jowar	15	11.71	6397.58	9.22
2	Bajara	11	8.59	7872.73	11.35
3	Wheat	28	21.87	15980.09	23.05
4	Sugarcane	18	14.06	11424.92	16.48
5	Maize	19	14.88	9827.94	14.17
6	Fruits	09	7.03	4034.39	5.81
7	Fodder crops	09	7.03	4529.30	6.53
8	Vegetables	13	10.15	6549.40	9.44
9	Sunflower	01	0.78	272.52	0.39
10	Pulses	05	3.90	2433.00	3.56
	Total	128	100	69321.87	100

Source: Computed by Researcher.

Figure-5.4



5.2.5 Fifth Ranking:

There are ten crops are included in this ranking. The spatial distribution of these crops in Phaltan Tahsil is shown in Table-5.6 and Fig.-5.5. These crops are Jowar, Bajara, Wheat, Sugarcane, Maize, Fruits, Fodder crops, Vegetables, Sunflower and Pulses. Among these crops Maize and Vegetables stand first in the study area. Maize covers 18428.66 hectares having 26.58 percent of net sown area. Sugarcane is mostly cultivated on medium black soils with irrigation facilities in the central part covering 7006.69 hectares its 10.10 percent of net sown area. The fruits cultivation has been identified in second position of crop in the study area in eighteen villages Kashidwadi, Upalave, Sawantwadi, Hol, Pimpard, Sathe, Sarade, Andhrud and Shindenagar which are lying along the river Nira. The fruits are cultivated in two patches in the north and the southern parts in the study area. One big patch of fifteen villages is observed in the north-western part. The fruits are cultivated in 8264.04 hectares on deep black soil of the study area. It's percent is 11.92 of net sown area. Bajara is grown on coarse shallow soils covering 3886.60 hectares having 5.60 percent of net sown area. Wheat stands at fourth in ranking in ten villages in Phaltan Tahsil. The distribution of wheat cultivation appears in patchy form. Wheat is cultivated in four villages in the north, six

villages in the north western part and wheat is grown in ten villages in Phaltan Tahsil on 5432.36 hectares having 7.83 percent of net sown area.

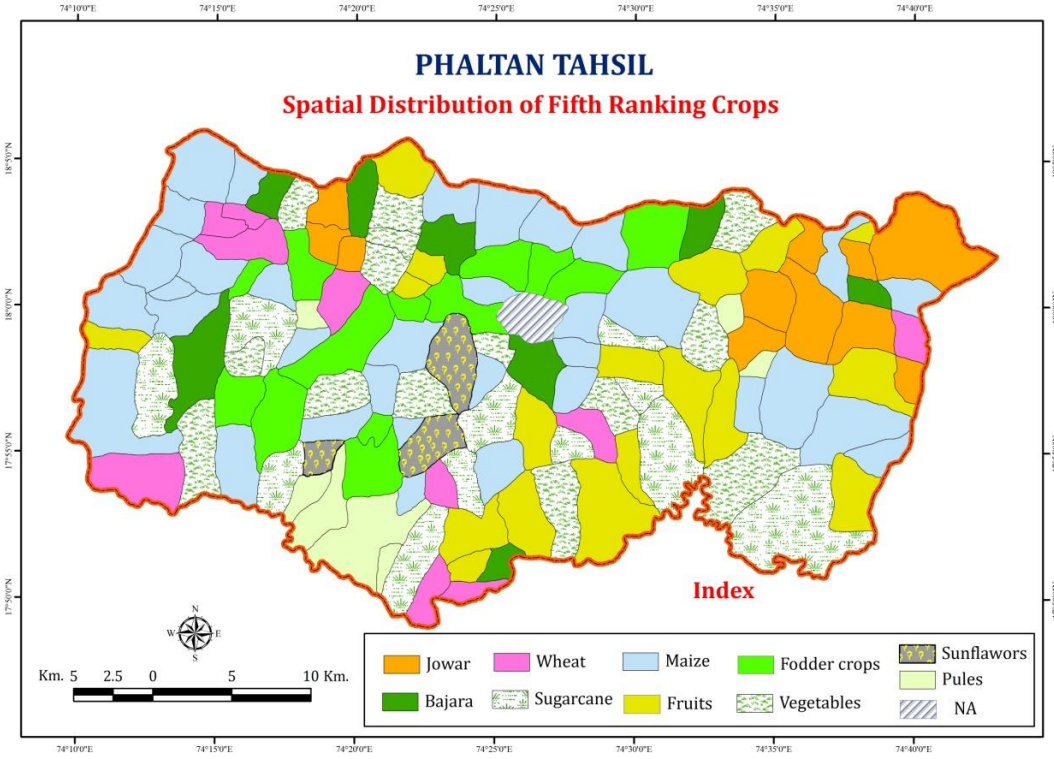
A pulses ranks fifth and is limited to seven villages having 5.46 percent of total villages in the southern parts. Pulses crop covers 1902.74 hectares having 2.74 percent of net sown area. The cultivation of pulses is found in seven villages Waghoshi, Tathwada, Manewadi, Takalwade, Vajegaon, Kalaj and Pirachiwadi in the western parts of the study area. Jowar ranks fifth and is confined to eleven villages. It is cultivated on 8.59 percent of total villages in net sown area covering 7508.92 hectares having10.83 percent of total area. Vegetables cultivation is found in the northern parts in irrigated area in fifteen villages. It is cultivated on 9503.30 hectares having 13.75 percent of net sown area of the Phaltan Tahsil. Fodder crops ranks fifth and is confined to thirteen villages. It is 10.15 percent of total villages in the northern part. It is sown on 5875.56 hectares having 8.47 percent of net sown area.

Table-5.6
Phaltan Tahsil
Crops, Villages and Area in Fifth Ranking

Sr. No.	Crops	Number of Villages	Percent to total villages	Area in hectares	Percent to total area
1	Jowar	11	8.59	7508.92	10.83
2	Bajara	07	5.46	3886.60	5.60
3	Wheat	10	7.81	5432.36	7.83
4	Sugarcane	11	8.59	7006.69	10.10
5	Maize	33	25.78	18428.66	26.58
6	Fruits	18	14.06	8264.04	11.92
7	Fodder crops	13	10.15	5875.56	8.47
8	Vegetables	15	11.76	9503.30	13.75
9	Sunflower	03	2.34	1513.00	2.18
10	Pulses	07	5.46	1902.74	2.74
	Total	128	100	69321.87	100

Source: Computed by Researcher.

Figure-5.5



5.2.6 Sixth Ranking:

The spatial distribution of sixth ranking crop is displayed in Table-5.7 and Fig.-5.6. Ten crops have been identified in this rank crops are Jowar, Bajara, Wheat, Sugarcane, Maize, Fruits, Fodder crops, Vegetables, Sunflower and Pulses. Among the ten crops, crop of fruits is major crop found largest coverage on 18732.70 hectares having 27.02 percent of total area in the northern and the western parts in thirty-two villages. It is 25 percent of total villages. The largest coverage of fruits is found in the villages Tathwada, Dhaval, Sherewadi, Kharadevadi, Nandal, Dalvadi, Malawadi in the west. Maize is cultivated on coarse shallow soil in seventeen villages having 13.28 percent of total villages. It covers 9917.81 hectares, it has 14.30 percent of net sown area in the southern part. A jowar is associated with fertile black soil on 4438.62 hectares having 6.40 percent of net sown area. Jowar is cultivated in ten villages in Phaltan Tahsil having 7.81 percent of total villages in the study area.

Sugarcane occupies sixth rank in the study area covering 2144.73 hectares having 3.09 percent of net sown area. It is mostly grown in the central and the north-western part. It is cultivated in six villages having 4.68 percent of total villages in the study area. Bajara it is grown in three villages having

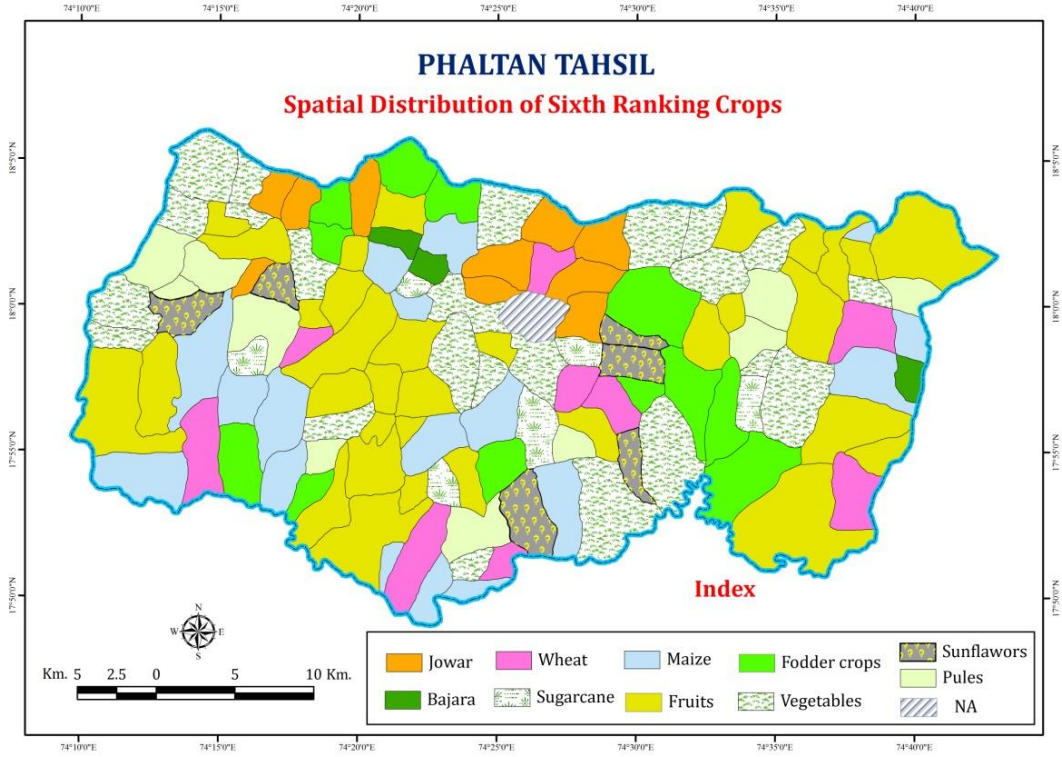
2.34 percent of total villages which are spread throughout study area (Fig.-5.6). The vegetable is cultivated in twenty-two villages covering 11523.70 hectares having 16.62 percent of net sown area. Wheat cultivated in nine villages namely Veloshi, Tardaf, Andhrud, Zirapwadi, Sastewadi, Bhadali, Adarki, Daryachiwadi and Mulikwadi in the western part of the Phaltan Tahsil, it covers 5647.73 hectares having 8.14 percent of net sown area. It is cultivated on coarse shallow soils which result in low yield per hectares. The cultivation of fodder crops covers 6862.49 hectares having 9.89 percent of net sown area. It is sown in twelve villages having 9.37 percent of total villages in the northern parts in the study area. The sixth rank is occupied by sunflower in the study area covering 1826.56 hectares. It has 2.68 percent of total area. A pulse is another crop showing tenth rank in the study area. Its cultivation is in the southern part in eleven villages on 9.70 percent of total area. It is grown on 6728.53 hectares having 9.70 percent of net sown area.

Table-5.7
Phaltan Tahsil
Crops, Villages and Area in Sixth Ranking

Sr. No.	Crops	Number of Villages	Percent to total villages	Area in hectares	Percent to total area
1	Jowar	10	7.81	4438.62	6.40
2	Bajara	03	2.34	1499.00	2.16
3	Wheat	09	7.07	5647.73	8.14
4	Sugarcane	06	4.68	2144.73	3.09
5	Maize	17	13.28	9917.81	14.30
6	Fruits	32	25.00	18732.70	27.02
7	Fodder crops	12	9.37	6862.49	9.89
8	Vegetables	22	17.18	11523.70	16.62
9	Sunflower	06	4.68	1826.56	2.68
10	Pulses	11	8.59	6728.53	9.70
	Total	128	100	69321.87	100

Source: Computed by Researcher.

Figure-5.6



5.2.7 Seventh Ranking:

Ten crops have found place in seventh ranking in Phaltan Tahsil (Fig.-5.7). These crops are Jowar, Bajara, Wheat, Sugarcane, Maize, Fruits, Fodder crops, Vegetables, Sunflower and Pulses. Among these crops, a vegetable is the dominant crop in this rank. Vegetables ranks seventh and is confined to twenty-eight villages having 21.87 percent of total villages in the study area. It covers16369.45 hectares having 23.67 percent of net sown area. Fodder crops include green grass and kadwal ranks as seventh. It is cultivated in 19 village's on11918.87 hectares having 17.19 percent of net sown area. Its areal extent sprawls over the north, the central, the south and the eastern part in dairy dominating area. The seventh rank is held by wheat. It is grown in five villages it is 3.90 percent of total villages in Phaltan Tahsil. The distribution of wheat in the study area is found in two patches. Three villages are found in the western part of the study area. Another patch consisting of two villages lies in the eastern part.

Jowar is another crops showing seventh rank in the study area. Its cultivation is found in the northeast and the north-western part in seven villages having 6.37 percent of total area (Table-5.8 and Fig.-5.7). This crop is grown in 4418.73 hectares. It has 6.37 percent of net sown area. Bajara is

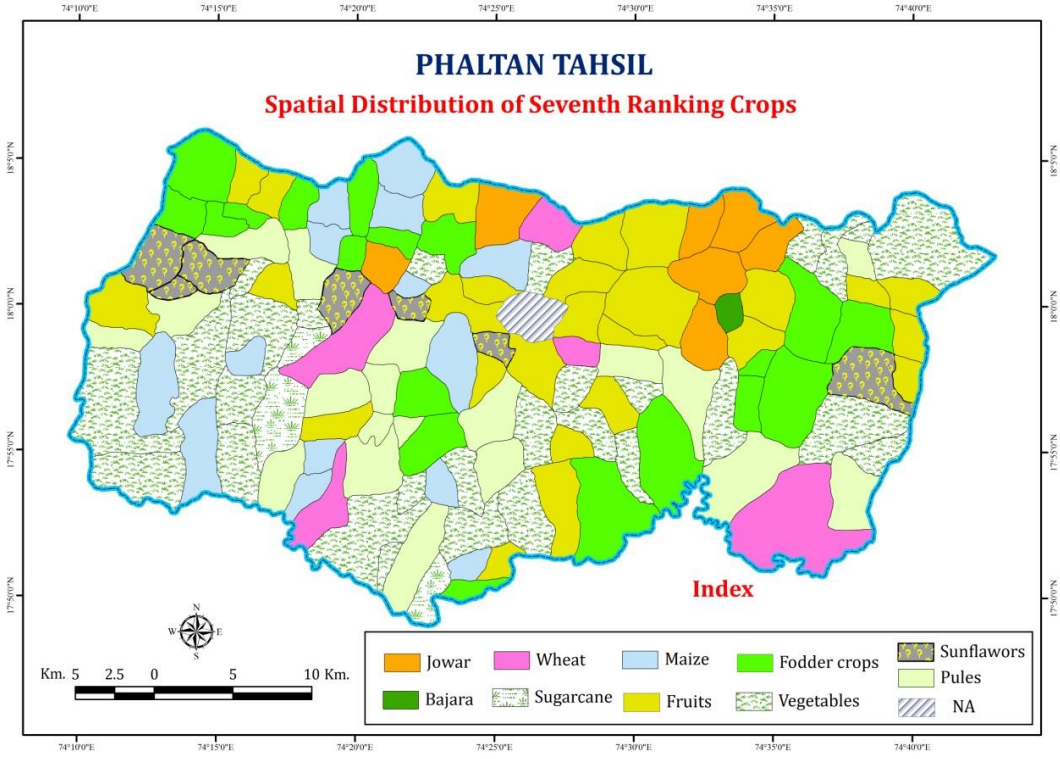
cultivated on 256 hectares having coarse shallow soil and is confined to single village Takalwade. Sugarcane ranks seventh in Phaltan Tahsil. It is cultivated on 1032 hectares having 1.48 percent of net sown area. The crop of fruits is associated with fertile soil and irrigation facilities. The sugarcane is cultivated in surrounding area of sugar factory located at Phaltan and Sakharwadi. The crops of Fruits show seventh ranks in the study area. Its cultivation is found in the northeast and the north-western part in twenty-five villages on 13979 hectare having 20.16 percent of net sown area. Pulses are cultivated on 9708.10 hectares having 14 percent of net sown area. Sunflower stands as seventh ranks in the study area. It covers 3455.28 hectares having 4.98 percent of net sown area. Maize has got seventh rank in fifteen villages. It is sown on cover 5335.98 hectares having 7.69 percent of net sown area.

Table-5.8
Phaltan Tahsil
Crops, Villages and Area in Seventh Ranking

Sr. No.	Crops	Number of Villages	Percent to total villages	Area in hectares	Percent to total area
1	Jowar	07	5.46	4418.73	6.37
2	Bajara	01	0.78	256.00	0.36
3	Wheat	05	3.90	2847.60	4.10
4	Sugarcane	03	2.34	1032.26	1.48
5	Maize	15	11.71	5335.98	7.69
6	Fruits	25	19.58	13979.00	20.16
7	Fodder crops	19	14.84	11918.87	17.19
8	Vegetables	28	21.87	16369.45	23.67
9	Sunflower	07	5.46	3455.28	4.98
10	Pulses	18	14.06	9708.70	14.00
	Total	128	100	69321.87	100

Source: Computed by Researcher.

Figure-5.7



5.2.8 Eighth Ranking:

Ten crops have been entered in eighth ranking in the Phaltan Tahsil (Fig.-5.8). These crops are Jowar, Bajara, Wheat, Sugarcane, Maize, Fruits and Fodder crops, Vegetables, Sunflower and Pulses. Among these crops vegetables is the main crop in rank. The vegetables include Brinjal, Methi, Tomato, Carrot, Cabbage and Ladyfinger they are cultivated in 28 villages on 15919.37 hectares having 22.96 percent of net sown area. Its areal extent sprawls over the north, the central, the south and the eastern part in market dominating area. Fodder crops are cultivated in 22 villages on 10829.63 hectares having 15.68 percent of net sown area. Wheat holds eighth rank in two villages Tathwada and Sawantwadi it has 1.56 percent of total villages. It is cultivated on 574.39 hectares having 0.82 of net sown area. Jowar is another crop showing eighth ranks in the study area. Its cultivation is found in the south-west and the south-eastern part in three villages having 2.34 percent of total villages. This crop is grown on 2349.65 hectares which has 3.38percent of net sown area (Table-5.9 and Fig.-5.8). Bajara is grown on coarse shallow soil in single village located in central part showing isolation it is grown on 550 hectares having 0.79 percent of net sown area. Sugarcane ranks eighth in

Phaltan Tahsil, in seventeen villages. These villages are not uniformly distributed within study area. The sugarcane is also cultivated in surrounding area of sugar factory located at Phaltan and Sakharwadi. It is cultivated on 8248.31 hectares having 11.89 percent of net sown area.

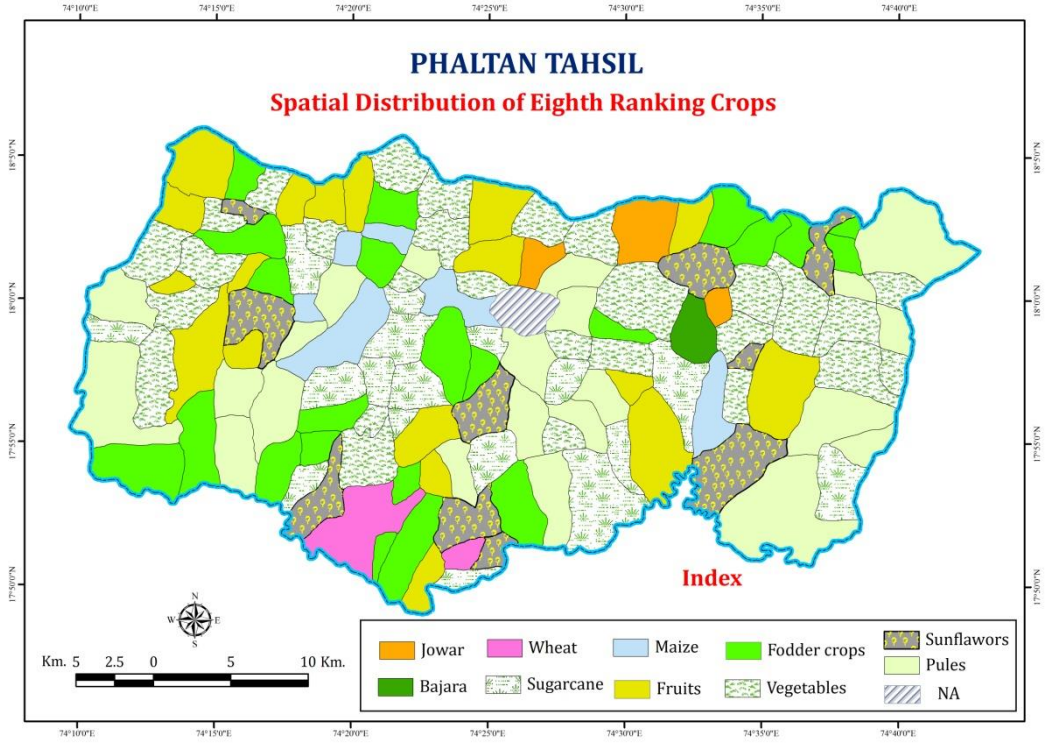
Fruits are grown in eighteen villages located in south and eastern part of the study area. Crop of fruits is associated with fertile soil and irrigation facilities. It is grown 10825.07 hectares, it has 15.61 percent of net sown area. Pulses are grown in twenty-one villages having 17.79 percent of net sown area. These villages are spread throughout study area. It is sown on 12334.60 hectares having 17.79 percent of net sown area. Sunflower ranks eight and is confined to ten villages it has 7.81 percent of total villages in the study area. It is cultivated on 5473.85 hectares having 7.89 percent of net sown area. Maize is cultivated in six villages it is 4.68 percent of total villages. The crop of Maize covers 2217 hectares having3.19 percent of net sown area in the northern part of the study area.

Table-5.9
Phaltan Tahsil
Crops, Villages and Area in Eighth Ranking

Sr. No.	Crops	Number of Villages	Percent to total villages	Area in hectares	Percent to total area
1	Jowar	03	2.34	2349.65	3.38
2	Bajara	01	0.78	550.00	0.79
3	Wheat	02	1.56	574.39	0.82
4	Sugarcane	17	13.28	8248.31	11.89
5	Maize	06	4.68	2217.00	3.19
6	Fruits	18	14.10	10825.07	15.61
7	Fodder crops	22	17.18	10829.63	15.68
8	Vegetables	28	21.87	15919.37	22.96
9	Sunflower	10	7.81	5473.85	7.89
10	Pulses	21	16.40	12334.60	17.79
	Total	128	100	69321.87	100

Source: Computed by Researcher.

Figure-5.8



5.2.9 Ninth Ranking:

The eight crops are included in this ranking. The spatial distribution of these crops in Phaltan Tahsil is shown in Table-5.10 and Fig.-5.9. These crops are Wheat, Sugarcane, Maize, Fruits, Fodder crops, Vegetables, Sunflower and Pulses. Among these crops Fodder crops and Sunflower stands first in the study area. Fodder crops cover 22060.76 hectares having 31.82 percent of net sown area. It is grown forty villages. It has 31.25 percent of total villages in the north, the north-western parts in the study area. Sunflower covers 23178 hectares having 33.47 percent of net sown area. It is found in forty-two villages having 32.81 percent of total villages. Sugarcane is mostly grown in the central part of the study area on 2521.82 hectares having 3.68 percent of net sown area on medium black soil and irrigation facilities. The pulses have been identified in third position in the study area in seventeen villages (Fig.-5.9). The cultivation of pulses is found in two patches in the south-east and the south-western parts in the study area. One big patch of ten villages is observed in the south-western part (Fig.-5.9) and seven villages in the south-eastern part in the study area. Pulses are grown on coarse shallow soils. It is cultivated on 10719.34 hectares having 15.46 percent of net sown area. Vegetables stand at

ninth in ranking in ten villages in Phaltan Tahsil. Vegetable cultivation is done on 3953.76 hectares having 5.70 percent of net sown area. It is grown in ten villages having 7.81 percent of total villages in the north and the southern parts in the study area. Vegetables distribution appears in patchy form.

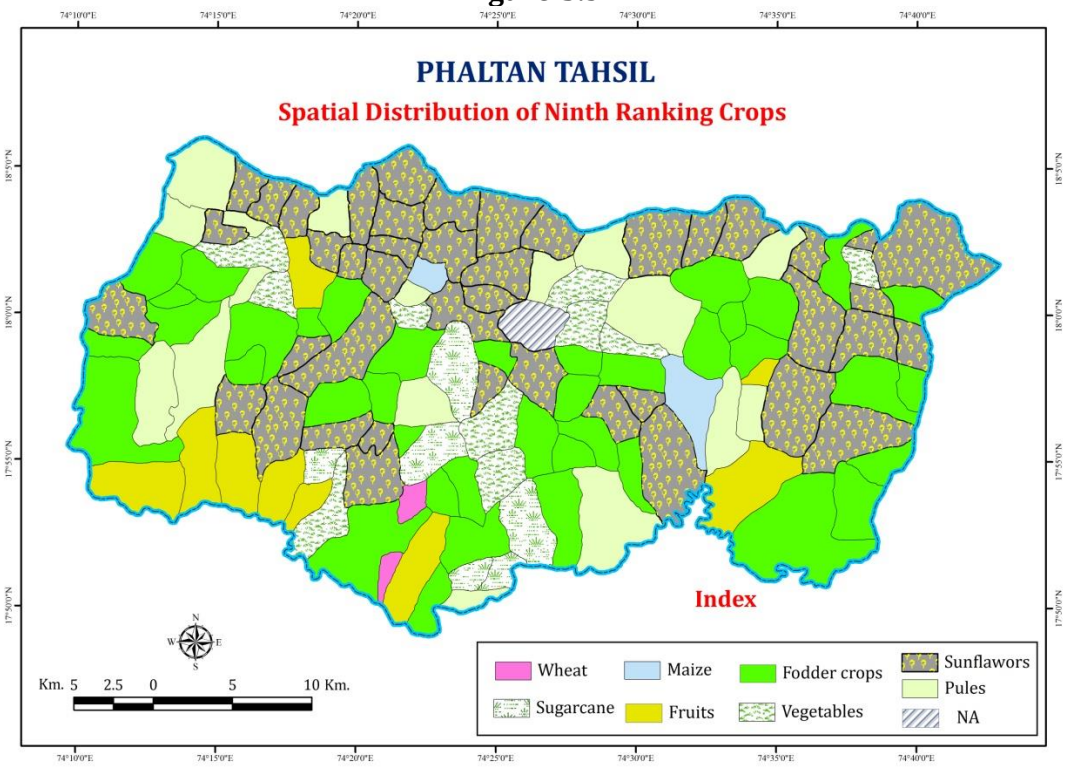
The cultivation of fruits is found in nine villages Wathar-Nim, Wghoshi, Tardaf, Korhale, Tirakwadi, Adarki-bk, Mirade, Vajegaon and Ghadgewadi lying along the western part. Fruits are cultivated 4401.55 hectares on deep black soil of the study area. Maize is cultivated on 1968.64 hectares having 2.83 percent of net sown area.it is 1.56 percent of total villages in two villages namely Nimbhore and Vadale in the central parts of the study area. Wheat is grown in two villages Manewadi and Zadakwadi. It covers 488 hectares having 0.70 percent of net sown area.

Table-5.10
Phaltan Tahsil
Crops, Villages and Area in Ninth Ranking

Sr. No.	Crops	Number of Villages	Percent to total villages	Area in hectares	Percent to total area
1	Wheat	02	1.56	488.00	0.70
2	Sugarcane	06	4.68	2551.82	3.68
3	Maize	02	1.56	1968.64	2.83
4	Fruits	09	7.05	4401.55	6.34
5	Fodder crops	40	31.25	22060.76	31.82
6	Vegetables	10	7.81	3953.76	5.70
7	Sunflower	42	32.81	23178.00	33.47
8	Pulses	17	13.28	10719.34	15.46
	Total	128	100	69321.87	100

Source: Computed by Researcher.

Figure-5.9



5.2.10 Tenth Ranking:

The seven crops are indicated in this ranking. The spatial distribution of these crops in Phaltan Tahsil is shown in Table-5.11 and Fig.-5.10. These crops are Sugarcane, Maize, Fruits, Fodder Crops, Vegetables, Sunflower and Pulses. Among these crops Sunflower and Pulses got the first rank in the study area. Sunflower covers 31319.08 hectares having 45.17 percent of net sown area. It is grown in fifty-seven villages. It is 44.55 percent of total villages in the south and the south-western parts in the study area. Pulses are mostly grown on 22919.66 hectares having 33.09 percent of net sown area in the southern part on medium red soils and irrigation facilities. Sugarcane has been identified in fifth position in the study area in seven villages (Fig.-5.10). The cultivation of sugarcane is found in two patches in the north-east and the north-western parts in the study area. One big patch of five villages is observed in the north-eastern part and two villages in the north-western part in the study area. It is grown on 3712.17 hectares having 5.06 percent of net sown (fig.-5.10). It is fodder crops which ranks tenth and is confined to eight villages having 6.25 percent of total villages in the eastern part. It covers 4221.78 hectares having 6.09 percent of net sown area. Fodder crops distribution appears in patchy form. Four villages are in the north having

medium black soil. Three villages lie in the north-western part having coarse shallow soil and irrigation facilities and one village has isolated location in the north-eastern parts.

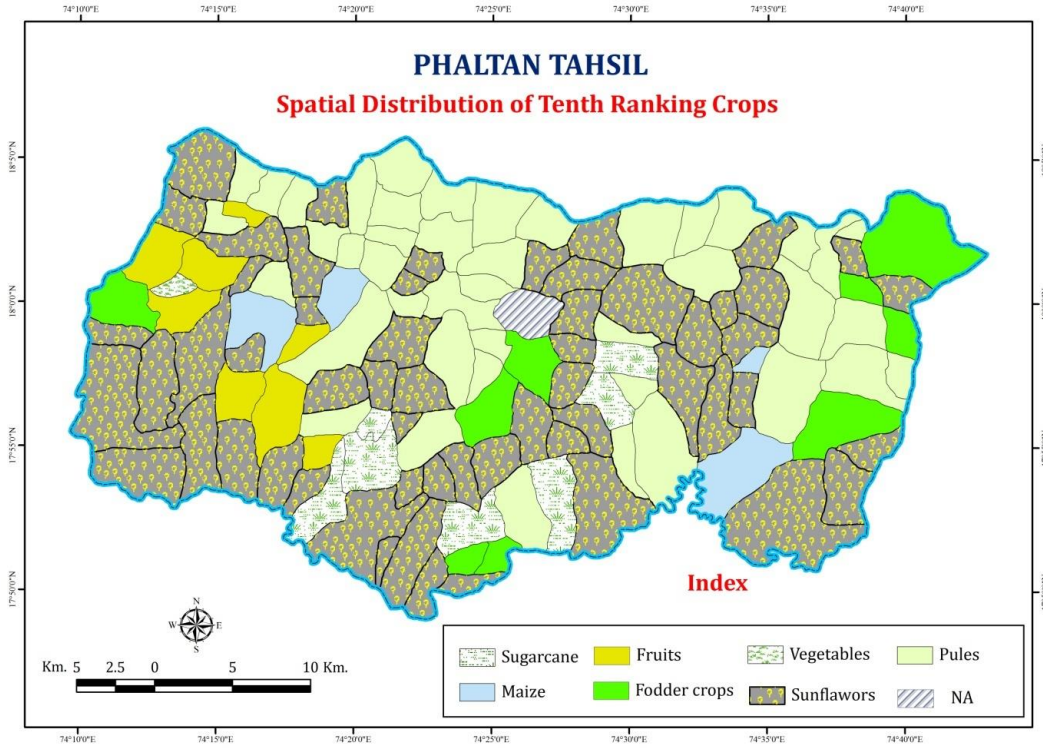
Fruits are cultivated in eight villages covering 3456.25 hectares having 4.98 percent of net sown area. Fruits are grown in eight villages Vadgaon, Aradgaon, Chavanwadi, Kapadgaon, Malewadi, Kapsi, Mulikwadi and Bibi. Fruits are cultivated on 3456.25 hectares on deep black soil of the study area having 4.98 percent of net sown area. Maize is cultivated in four villages namely Nandal, Saswad, Mirde in the west and Vajegaon in the eastern parts of the study area. It is sown on 3730.68 hectares having 5.38 percent of net sown area. Vegetables are cultivated in Koparde village in western part. It is grown on 162.25 hectares having 0.23 percent on net sown area. Maize covers 3730.68 hectares having 5.38 percent of net sown area. It is grown in four villages having 3.12 percent of total villages of Phaltan Tahsil.

Table-5.11
Phaltan Tahsil
Crops, Villages and Area in Tenth Ranking

Sr. No.	Crops	Number of Villages	Percent to total villages	Area in hectares	Percent to total area
1	Sugarcane	07	5.46	3512.17	5.06
2	Maize	04	3.12	3730.68	5.38
3	Fruits	08	6.25	3456.25	4.98
4	Fodder crops	08	6.25	4221.78	6.09
5	Vegetables	01	0.78	162.25	0.23
6	Sunflower	57	44.55	31319.08	45.17
7	Pulses	43	33.59	22919.66	33.09
	Total	128	100	69321.87	100

Source: Computed by Researcher.

Figure-5.10



5.3 Crop Combination Region:

The studies of crop combination regions comprise an important aspect of agricultural geography as it supplies good basis for agricultural regionalization. Crops are generally cultivated in combinations (Weaver, 1954). The study of crop combination of any region has got immense importance in geographical study as it gives us the relative position of crops on regional scale. Farmers cultivate crops in different physical and cultural conditions. The pattern of crop combination gives rise to spatial predominance of specific crops or combination resulting the emergence of regions. Such analysis would finally minimize the change of over simplified generalization (Ali, M.1978). Crop combination study in Geography is useful in many ways: Firstly it gives an adequate understanding of an individual crop. Secondly, combination is in itself an integrative reality that demands definition and distribution analysis and lastly crop combination regions are necessary for the construction of more complex structure of different agricultural region (Weaver, 1954).

The study of crop combination is part and parcel of Agricultural Geography and such study is greatly helpful for regional agricultural planning.

A number of quantitative and qualitative methods have been developed for decision of crop combination regions. In qualitative methods, crops are arranged or ranked in hierarchical order and then crop combinations are decided. The case of these methods is the simplicity in calculation. Quantitative techniques are more precise, accurate and scientific than qualitative methods. In 1954 first attempt for depiction of agricultural region was made by Weaver who has studied crop combination for Middle East countries. Later on many more methods were introduced. It was Thomas who modified the methods in 1963. Weaver's formula by incorporating 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 give varied results than obtained by Weaver's method. Cop pock (1964) also changed version of Weaver's method wherein he considered the rank in recognizing the leading crops.

The Weaver's technique was afterward changed by Doi (1959) where he provided 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. Due to these weaknesses, Rafiullah (1965) changed Weaver's method and introduced a new method known as "Maximum Positive Deviation Method" by using same statistical procedure with altogether different format. The changed formula of Rafiullah is as below:

$$d = \sqrt{\frac{(\sum D^2p - D^2n)}{N^2}}$$

Where,

D= is the deviation between actual crop and the appropriate crop percentage in theoretical distribution.

p= is the positive difference.

n= is the negative difference.

N= is the No. of crops in the crop combination.

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

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

The statistical technique used by Rafiulla is more accurate and rational than other and therefore it is quite popular for depiction of crop combination regions. According to this method percentage area of all crops was arranged in descending order for 128 villages. The crops having area less than 5 percent were excluded from the calculation and maximum positive deviation of variance was calculated. For monoculture medial value was considered at 50 percent, for two crop combinations it is 25 percent, three crop combinations the value is 16.7 percent, for four it is 12.5 percent and five crop combinations it is 10 percent and so on. In present study area, ten crops were used for computation of crop combination region. The obtained results of crop combination are shown in Figure-5.11 (Appendix-L).

5.3.1 Monoculture:

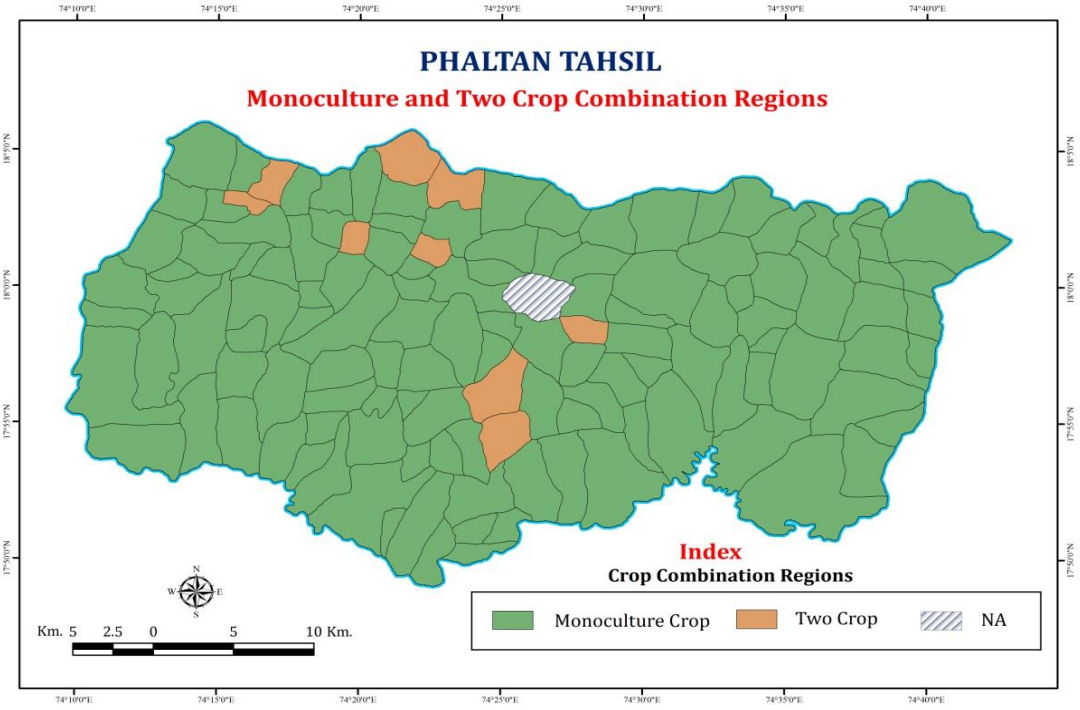
Jowar, Bajara and Sugarcane crops have monoculture in Phaltan Tahsil (Fig.-5.11). These three crops are identified in 119 villages having 92.96 percent of total villages in Phaltan Tahsil. Jowar is leading crop in study region showing highest coverage in fifty villages (Fig.-5.11). It is grown on 33696.87 hectares. Sugarcane is identified as monoculture in forty-two villages in the north and the central parts in the study area on deep soil and irrigation facilities (Table-5.13). Irrigation and fertile soil are major factors growing sugarcane along the bank of the Nira River and these villages are lying in the east, the central and the northern parts of the study area on deep soil and the Nira right canal irrigation in Phaltan Tahsil. Bajara is identified as monoculture occupying only 21.09 percent net sown area in the study area. It is occurred in the south-west and the south-eastern part of coarse shallow soils. Jowar is grown in fifty villages having 39.06 of total villages. It is cultivated on 33696.87 hectares. It is 45.84 percent of net sown area. Sugarcane is cultivated in forty two villages. It is 32.81 percent of total villages. It is sown on 12041.70 hectares having 16.38 percent of net sown area. Bajara is grown in twenty seven villages. It is 21.09 percent of total villages. It is cultivated on 24410.23 hectares having 33.21 percent of net sown area (Table-5.13).

Table-5.12
Phaltan Tahsil
Crop Combination Regions

Sr. No.	Types of crop combination	Number of villages	Percent to total villages	Area in hectares	Percent of Area
1	Monoculture	119	92.96	65772.80	94.88
2	Two crop combination	09	7.04	3549.07	5.12
	Total	128	100	69321.87	100

Source: Computed by Researcher.

Figure-5.11



5.3.2 Two Crop Combination Region:

Four crops namely Sugarcane, Wheat, Jowar and Bajara enter into two crop combination in different villages. Figure-5.11 reveals two crop combinations in nine village's area in the southern part of the study area. Sugarcane has largest area entering in this combination with Bajara, Wheat, Jowar and Sugarcane. Four villages in the study area have combination of Sugarcane with Bajara and wheat located in the south and the western parts in Phaltan Tahsil on deep black fertile soil. Two crop combinations of Jowar and Bajara are found in four villages which are lying in the southern and the western parts on coarse shallow and medium black soil. Jowar and Bajara crop

combination appeared in Kurawali-kh, Mandavkhadak, Kolki and Malewadi located in the southern part entered in combination of Sugarcane with Bajara and Wheat. These villages are situated on the bank of the Nira River. Jowar entered with Wheat as two crop combination in Jinti village on coarse shallow soil. Sugarcane and Bajara are sown only in single village. It is 0.78 percent of total villages. They are grown on 305 hectares having 0.44 percent of net sown area. The combination of crops Wheat and Jowar are cultivated in a single village having 0.78 percent of total villages. They are grown on 735 hectares. It is 1.00 percent of net sown area. Sugarcane and Wheat are cultivated in three villages having 2.36 percent of total villages. They are grown on 1170.33 hectares. It is 1.59 percent of net sown area. The cultivation of Jowar and Bajara is found in four villages having 3.12 percent of total villages. They are cultivated 1136.05 hectares. They have 1.54 percent of net sown area.

Table 5.13
Phaltan Tahsil
Crop Combination Types and Crops

Sr. No.	Types of crop combination	Crops in combination	Number of villages	Percent to total villages	Area in hectares	Percent of Area
1	Monoculture	Jowar	50	39.06	33696.87	45.84
		Sugarcane	42	32.81	12041.70	16.38
		Bajara	27	21.09	24410.23	33.21
2	Two crop combination	Sugarcane+ Bajara	01	0.78	305.00	0.44
		Wheat+ Jowar	01	0.78	735.00	1.00
		Sugarcane+ Wheat	03	2.36	1170.33	1.59
		Jowar+ Bajara	04	3.12	1136.05	1.54
	Total		128	100	73495.18	100

Source: Computed by Researcher.

5.4 Crop Diversification Region:

Crop diversification is a concept which is opposite to crop specialization. The cultivation of crop relies on physical, socio-economic conditions and technological development in the study area. This cultivation of crop reveals contemporary competition. Crops are diversified in the field due to erratic nature of rainfall and inadequate irrigation in order to sustain farmers grow many crops. The greater number of crops led to greater competition, the higher is the magnitude of diversification. Many geographers and economist have utilized diversification concept in various sense. At the beginning concept was used in manufacturing field to obtain the degree of diversification by Cleann (1930, Tree (1938), Florence (1942) and Rain Wald (1949). Gibbs Martin has employed diversification concept for computing measurement of diversification of employment in industry. Bhatia (1965) has computed crop diversification in India to know crop combination in the area. The formula, later on has been changed 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 necessary to know the competition of crops in region. In order to discover understands the crop diversification, in present study, Gibb's-Martin's Index has been utilised and computed for 128 villages in Phaltan Tahsil. The formula is as below:

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

Where:

X = Percentage of total cropped area occupied by each crop or hectare age under individual crop.

If the total cultivated area in the region is dedicated completely to one crop showing specialization, the index value will be zero (Singh, 1984).

The obtained results have been shown in Fig.-5.12 and Table-5.14 shows crops in number, villages and area in crop diversification in Phaltan Tahsil. The optimum crop diversification is seen in Nimbhore and Bhilkati villages (0.87) located in the western part and lowest at Pawarwadi (0.48) situated in the eastern part of the study area. It is seen that whole study area is divided into four crop diversification regions which is discovered as follow

i) Area of high crop diversification

ii) Area of moderate crop diversification

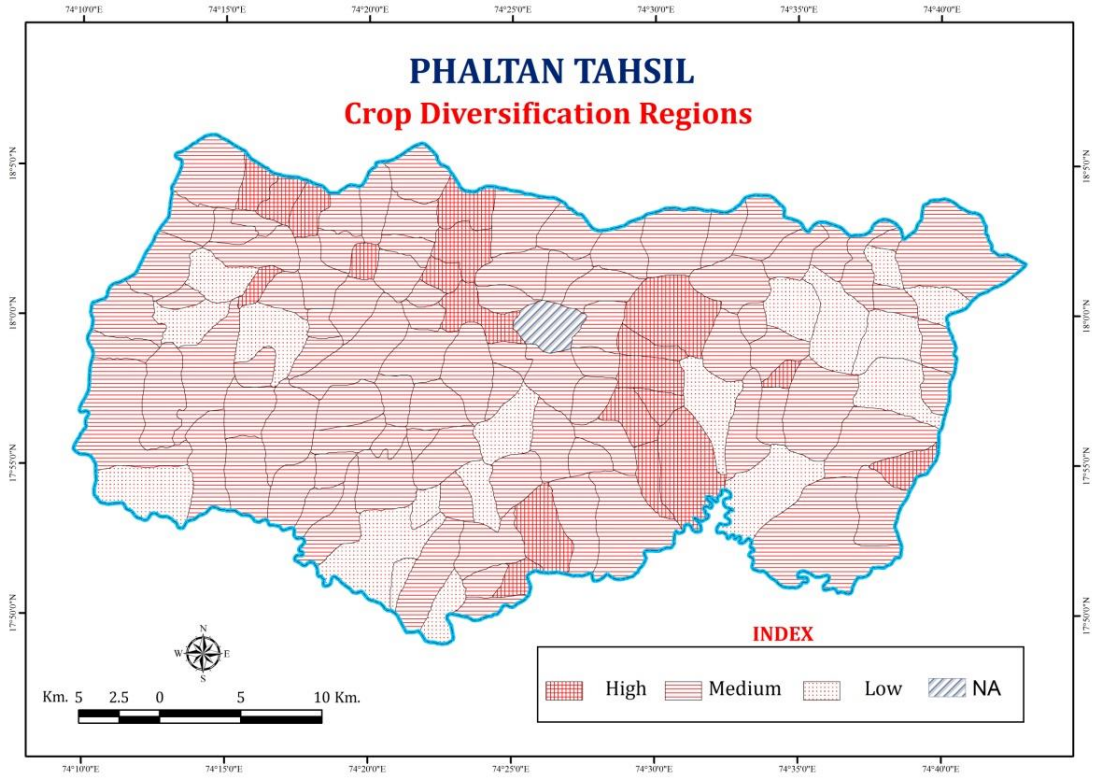
iii) Area of low crop diversification

Table 5.14
Phaltan Tahsil
Crop Diversification Pattern

Sr. No.	Type of Crop Diversification	Value	Number of Villages	Percent to total Villages	Gross cropped Area	Area in Percent
1	High Diversification	>0.80	20	15.62	8839.62	12.75
2	Moderate Diversification	0.60-0.80	90	70.32	49078.28	70.80
3	Low Diversification	0.40-0.60	18	14.06	11403.97	16.45

Source: Computed by Researcher.

Figure-5.12



It is observed that the largest area of 8839.62 hectares appears in the high crop diversification having 12.75 percent of net sown area in Phaltan Tahsil. The area of high crop diversification is found in twenty villages having

15.62 percent of total villages in Phaltan Tahsil. Maximum area appears disintegrated in numerous patches throughout the study area. The largest patch under Moderate diversification crops is found in the east and the northern part of Phaltan Tahsil. It is found on 49078.28 hectares having 70.80 percent of net sown area in Phaltan Tahsil. Ninety villages come under this region and the largest numbers of crops are found in moderate degree of diversification. Ten crops Jowar, Bajara, Wheat, Sugarcane, Maize, Fruits and Fodder crops, Vegetables, Sunflower and Pulses enter in this diversification. The index value ranges between 0.60 to 0.80. Area of low crop diversification covers 11403.97 hectares having 16.45 percent of net sown area of the study area. This area appears in the southern and the eastern part covering eighteen villages having 14.06 percent of total villages. Crops in this diversification are less in number than the previous categories. The index value of low crop diversification is between 0.40 to 0.60.

5.5 References:

1. Ali, Mohammad, (1979), "Dynamics of Agricultural Development in India", (Ed.), Concept Publication, Private Company, New Delhi.

2. Ali, Mohammad, (1978), "Studies in Agricultural Geography", Rajesh Publication, New Delhi.

3. Ayyar, N.P. (1969), "Crop Regions of Madhya Pradesh-A Study in Methodology", Geographical Review of India, March, Pp. 1-19.

4. Bhatia, S.S., (1965), "Pattern of Crop-combination and Diversification in India". Economic Geography, Vol. 41, No. 1, pp. 38-50.

5. Cop pock, J. T. (1964), "Crop Livestock and Enterprise Combinations in England and Wales", Economic Geography, Vol. 40, PP. 65-77.

6.Doi, Kikukazu, (1959), "The Industrial Structure of Japanese Prefectures Tokyo", proceeding of International Geographical Union, Section of Human Geography, Regional Conference in Japan 1957, pp. 310-316.

7. Gibbs, J.and W. Martin, (1962), "Urbanization, Technology and the Division of Labour: International Patterns", American Sociological Review, pp.13.

8. Ogale, S.B., (2012),"Spatio-temporal Analysis of Agricultural Land use and Productivity of Baramati Tahsil, Pune District (Maharashtra)", Unpublished Ph.D Thesis Submitted to T.M.V., Pune.

9. Singh, J. and Dhillon, S.S., (1984), "An Agricultural Geography", Tata-McGraw-Hill, Publishing Company Limited, New Delhi.

10. Singh, J., (1976), "Agricultural Atlas of India", Vishal Publication, Kurukshetra, Haryana.

11. Thomas D., (1963), "Agriculture in the wales during the Napoleonic Wars Cardiff", University of Wales Press, 1963.

12. Vaidya, B.C., (1997), "Agricultural land use in India",Manak Publication Pvt.ltd., New Delhi.

13. Weaver, J.C., (1954), "Crop Combination Regions in the Middle West". The Geographical Review, Vol. 44 No. 2 Pp. 176-181.

CHAPTER-VI
AGRICULTURAL PRODUCTIVITY AND LEVELS OF AGRICULTURAL DEVELOPMENT OF THE STUDY AREA

CHAPTER-VI
AGRICULTURAL PRODUCTIVITY AND LEVELS OF AGRICULTURAL DEVELOPMENT OF THE STUDY AREA

6.1 Introduction to Agricultural Productivity:

The previous Chapter-V "Crop Combination and Diversification" explained crop regions by taking into account the area under crops in Phaltan Tahsil. The present chapter is fully dedicated to focus on the production aspect in the study area. The knowledge of existing levels of productivity is necessary for better planning and management for development of backward areas. The population has been rapidly growing and as result it needs to be managed properly. Hence, it is crucial to make a detailed study of each crop and its production. Here an effort has been made to discover the crop productivity regions of Phaltan Tahsil and the factors involved in it.

It is the term 'Productivity' which is regarded as the mensuration of production. Rao and Jasbir Singh (1981) considered "Productivity as the degree at which the economic, cultural, technical and organizational variables can exploit the biotic resources of the area for agricultural production".

Agricultural Productivity is a relationship of a large number of factors such as environmental, socio-economic and technological factors. Agricultural efficiency is a ratio between the achievements in terms of agricultural production and the actual potential of the productivity. Agricultural efficiency is a physical concept rather than a value concept and it describes the changing relation between output and one of the major inputs like land, labour and capital. Bhatia (1967) defined Agricultural efficiency as "the aggregate performance of different crops in regard to their output per acre". Singh (1979) defined Agricultural Productivity as "The quality of returns from arable land". He argued that quantity of produce shows its intensity and the spatial expansion. Agricultural Productivity is a multi-dimensional concept which includes technological advancement, effective management of available resources and organizational set up for the agricultural production. Therefore, the study of Agricultural Productivity is necessary for differentiating and confining the areas whose performance and attainments are deviated and also it is helpful for formulating a future oriented plan of action for agricultural planning.

Singh and Dhillion (2000) suggested that the "Yield per Unit" should be considered to reveals Agricultural productivity. This may be defined as "Ratio of index of local agricultural output to the index of total input utilized in farm production" (Shafi, 1984). It is, therefore, a measure of efficiency with which the inputs are used in production, if other things are 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 involved in agriculture. In general, it may be expressed by the man hours or days of work needed to produce a unit of production.

Agricultural Productivity is generally regarded from two directions:

(a) Productivity of land.

(b) Productivity of infrastructure engaged in Agriculture.

Productivity of land is closely linked with the productivity of infrastructure. So in this study area, efforts have been made to assess the spatial differences.

The seven parameters are given below:

i) Computation of Agricultural Productivity based on Kendall's Ranking Co-efficient

It is referred only to the ranking of the yields in weight per unit of land but is not in any way weighted as per 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 region.

iii) Computation of Agricultural Productivity based on Standard Nutrition Unit's

This method of productivity measurements 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 area.

v) Shafi's Modified Productivity Co-efficient Index

Here the type of computation calorie values relating to each crop has been included 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 indicates the existing capability of agricultural production to support the population. This parameter becomes important especially in densely populated country 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 area unit by the percentage of crop land share and divided the percentage share of the total cropped area. The present study aims at computing of crop productivity for Phaltan Tahsil having diversity in soil, local relief, transportation and irrigation. The region displays rolling plain with local undulations sloping at the south-west to the south-east. The physiography has direct effect on the soil types and its spatial distribution. The productivity data at village level is unavailable. To overcome this difficulty, the yield data of each crop was gathered during field work both on yield and land for the selected villages. This data has been used to get crop productivity for these four villages. These four villages are representative to entire Phaltan Tahsil. These villages are Barad, Sasakal, Dhaval and Padegaon. Enyedi's method was selected to compute crop productivity of Phaltan Tahsil due to its accuracy.

6.2 Enyedi's Productivity Index:

Enyedi, G.Y. (1964) while describing geographical types of agriculture in Hungary refers to his formula of productivity index for deciding Agricultural Productivity. Shafi (1972 and 1974) also adopted this approach to decide the productivity indices in respect of twelve food crops in India. His formula for evaluating productivity co-efficient involved the spatial distribution of productivity for major crops and later mapping and interpreting it by utilising Enyedi's Index.

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

Where,

Y = Production of the selected crop in unit area i.e. villages.

Yn = Total Production of the selected crop at regional level

(Entire study region).

T = Area under Selected Crop in unit area (Village level).

Tn = Total cropped area in entire study region.

With the help of this formula, the productivity index values for four sample villages are calculated for the year 2011. Based on these values, the productivity regions are categorized into high, medium and low productivity regions.

6.3 Productivity of Jowar:

The spatial distribution of Productivity of Jowar is shown in Table-6.1 and Figure-6.1. It is observed that local topography, soil and rainfall distribution influence the Productivity of Jowar. Least index Productivity of 73.12 is recorded in Sasakal village which is situated in the south-western part of Phaltan Tahsil. Because of maximum area is under sugarcane and fodder crops cultivation. Soil of Dhaval village is coarse shallow to medium black. Jowar is Rabi crop which requires less amount of water. It is a drought resistant crop. This village situated in the western part of study area and shows high Productivity of Jowar having 112.56. The highest index productivity of jowar in Padegaon village has 140.73. Barad village has 84.41 productivity of Jowar. It is index Productivity of Jowar is less because soil in Barad village is coarse, less amount of rainfall and no irrigation facility.

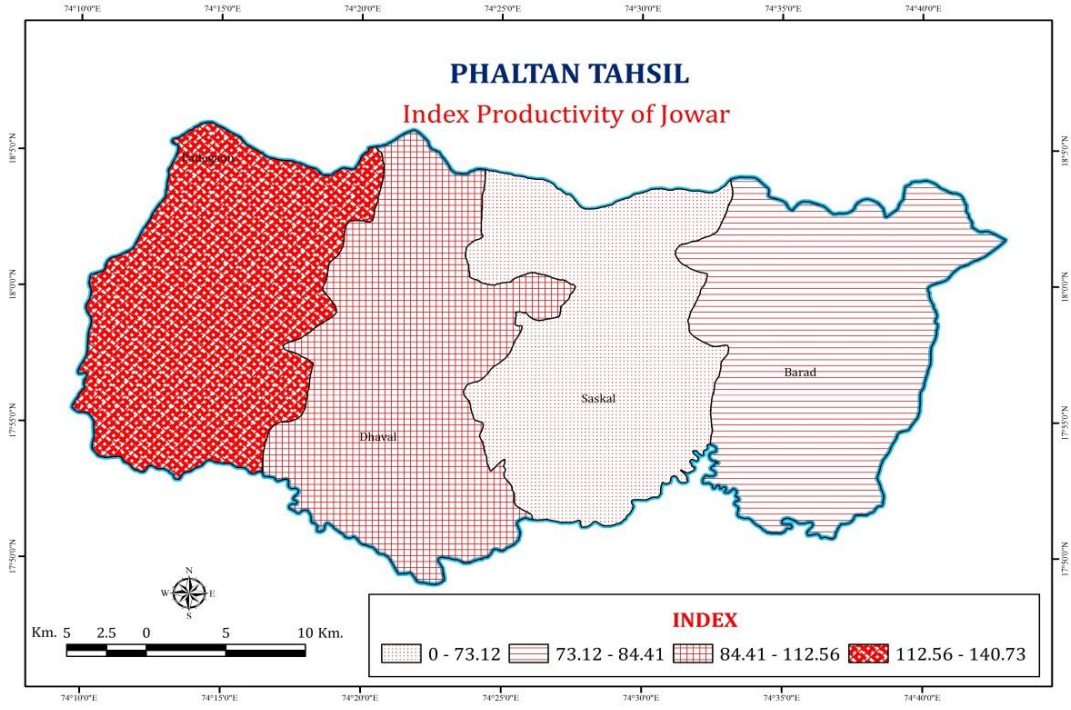
The Productivity pattern of Jowar in Phaltan Tahsil shows an increasing trend towards the western part due to plane topography, medium to deep black soil and irrigation. Variation in soil type, local relief and rainfall differentiate the productivity pattern in the western and the eastern part of Phaltan Tahsil. The index of Productivity of Jowar in Dhaval village which is situated in the western part of Phaltan Tahsil is 112.56 because soil of Dhaval village is shallow to medium black and there is scarcity of water but jowar requires fewer amounts of water and drought resistant crop.

Table- 6.1
Phaltan Tahsil
Index Productivity of Jowar

Sr. No.	Name of the Villages	Area in Hectares	Total Production Quintal	Production Quintal/Hect.	Index of Productivity
1	Barad	275	4125	15	84.41
2	Sasakal	70	910	13	73.12
3	Dhaval	257	5140	20	112.56
4	Padegaon	72	1800	25	140.73
	Total	674	11975	Average 17.77	-

Source: Computed by Researcher.

Figure- 6.1



6.4 Productivity of Bajara:

Bajara, a drought resistant crop of Kharif season, is grown on inferior quality soil having less commercial value. The spatial distribution of Bajara is depicted in figure-6.2. The lowest index of productivity of 83.57 is observed in Dhaval village, which is located in the western part of Phaltan Tahsil. The highest index productivity of Bajara of 122.90 is recorded in Padegaon village which lies in the western part of Phaltan Tahsil. It is because of good and suitable quality of soil and facilities of irrigation. Barad village has 103.29

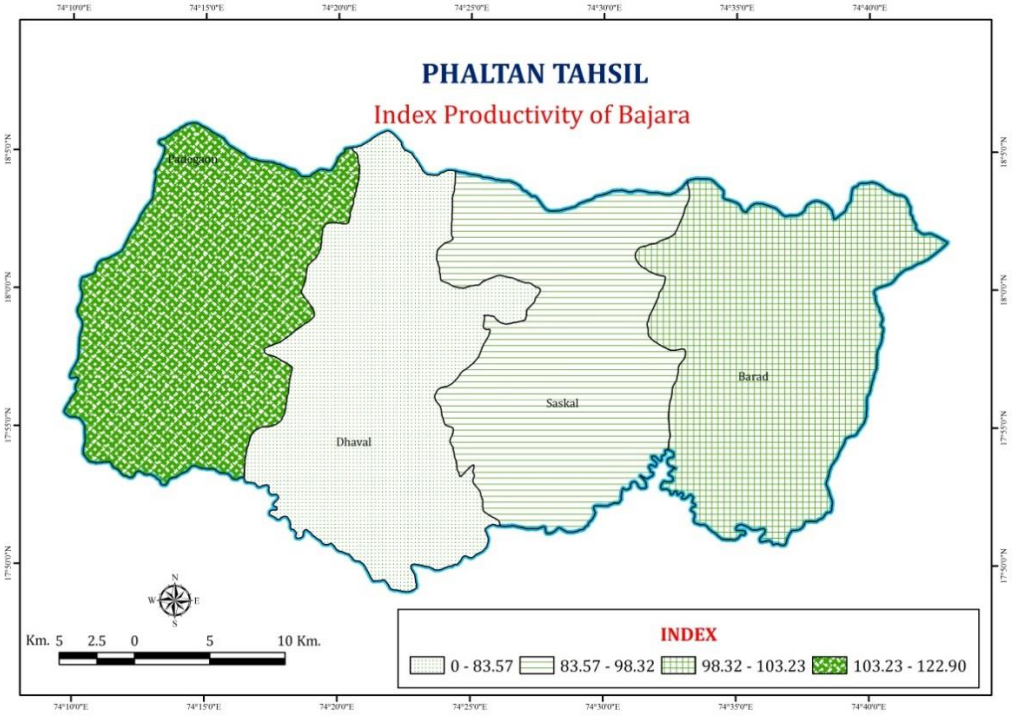
index productivity of Bajara. Barad village is situated in the eastern part of the study area. The productivity index of bajara of Sasakal village which is in the south-eastern of Phaltan Tahsil is 98.32. The general productivity pattern of Bajara shows increasing trend towards the south-west and the eastern part of the study area. The Productivity trend of Bajara does not have any significant co-relation with soil, water and physiography since poorer soils are available at each and every village levels which are generally brought under Bajara cultivation. Productivity Index of Bajara for four selected villages is shown in Table-6.2.

Table- 6.2
Phaltan Tahsil
Index Productivity of Bajara

Sr. No.	Name of the Villages	Area in hectares	Total Production Quintal	Production Quintal/Hect.	Index of Productivity
1	Barad	269	5657	21	103.23
2	Sasakal	140	2800	20	98.32
3	Dhaval	243	4131	17	83.57
4	Padegaon	145	3625	25	122.90
	Total	797	16213	Average 20.34	-

Source: Computed by Researcher.

Figure- 6.2



6.5 Productivity of Wheat:

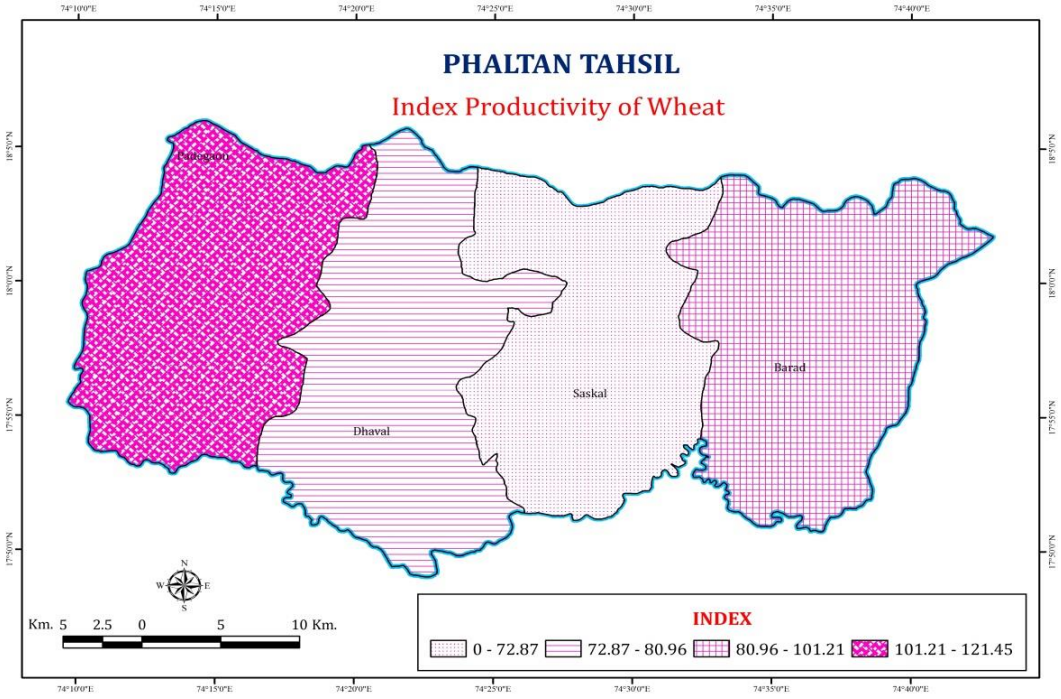
Wheat as a Rabi crop is cultivated over medium to deep black soil with subsoil moisture and hence it hardly requires irrigation facility. The spatial distribution pattern of Wheat productivity is displayed in Figure-6.3.The highest index productivity of Wheat 121.45 is observed in Padegaon village which lies in the western part of Phaltan Tahsil. The lowest index of productivity 72.87 is recorded in Sasakal village which is situated south eastern part of Phaltan Tahsil. Dhaval village which is located in the western part of Phaltan Tahsil has 80.96 index productivity of wheat. It is found that index of wheat in Barad village which is in the eastern part of the study area is 101.21. The index productivity pattern of wheat is increasing towards the north-west and the north-eastern part due to plane topography, medium to deep black soil and irrigation. The central and the northern parts have low index productivity of wheat due to high relief, coarse shallow soil with low moisture retention capacity and lack of irrigation facility. It is observed that there is potential to large hectares of land under wheat cultivation to increase production and quality by sowing improved varieties of seeds.

Table- 6.3
Phaltan Tahsil
Index Productivity of Wheat

Sr. No.	Name of the Villages	Area in hectares	Total Production Quintal	Production Quintal/Hect.	Index of Productivity
1	Barad	113	2800	25	101.21
2	Sasakal	47	846	18	72.87
3	Dhaval	34	680	20	80.96
4	Padegaon	88	2640	30	121.45
	Total	282	6966	Average 24.70	-

Source: Computed by Researcher.

Figure- 6.3



6.6 Productivity of Sugarcane:

Sugarcane is a long duration crop grown medium black and deep black soil with assure supply of irrigation. The spatial distribution of Sugarcane productivity is shown in Figure-6.4. The highest index productivity of sugarcane is 107.64 which are found in Padegaon village situated in the western part along the bank of the Nira River. It is followed by Dhaval village which is situated in the western part of the study area. The index productivity of sugarcane in Dhaval village is 92.28. Apart from the favourable soil type, the main reason behind this increased productivity is the improvisation of irrigation facilities in these villages. The lowest index productivity of Sugarcane 78.93 is observed in Sasakal village is situated in the south-eastern part of Phaltan Tahsil. The index productivity of sugarcane in Barad village which lies the eastern part of Phaltan Tahsil is 89.70. The southern and the south-western parts in this village have extensive coverage of high relief, rugged and stony surface which are considered to be inferior and hence the reason for less productivity. The rugged topography, coarse shallow soil and unavailability of irrigation in the northern part make less productivity of Sugarcane.

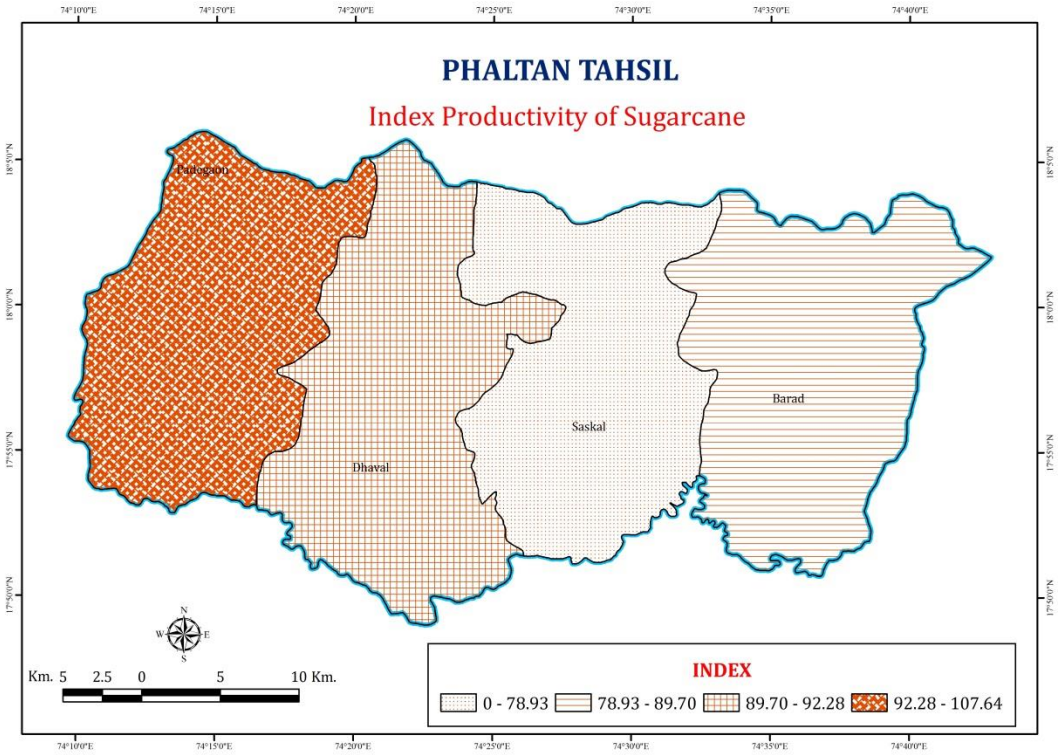
The productivity of sugarcane is increasing in the northwest to the north-east direction. This area physiographical lies in the Nira right canal and the bank of river Nira and the Banganga. Moreover, it is observed that the north and the north-eastern part of the villages yield very high index productivity of sugarcane than the northern part due to high fertility of soils. The area included in Barad, Sasakal, Dhaval and Padegaon villages of the study area (Fig.-6.4).

Table- 6.4
Phaltan Tahsil
Index Productivity of Sugarcane

Sr. No.	Name of the Villages	Area in hectares	Total Production Quintal	Production Quintal/Hect.	Index of Productivity
1	Barad	93	11675	125	89.70
2	Sasakal	48	5280	110	78.93
3	Dhaval	02	260	130	92.28
4	Padegaon	255	38250	150	107.64
	Total	398	55465	Average 139.36	-

Source: Computed by Researcher.

Figure- 6.4



6.7 Levels of Agricultural Development:

6.7.1 Introduction:

In the present study, the variation in Phaltan Tahsil is determined with the help of six variables viz. Net sown area, Irrigated area, Agricultural implements, Number of Agricultural Workers, Number of Satara District Central Co-operative Bank and Productivity of Yield Index of Jowar, Bajara, Wheat and Sugarcane. Besides this, the development of Phaltan Tahsil is taken in with their respective categories i.e. high, medium, and low on the basis of scores of standard deviation. The present analysis has been carried out from the data related to four variables using Z-score to get the composite scores. On the basis of this composite score, the tahsil has been classified into three development categories i.e. high, medium, and low. As a result, this analysis showed that the modern technological inputs through agro service centres have a reciprocal relationship with Agricultural development in the study area.

The growth rate of total food grain production was less in the last two decades thereby making traditional farming a non-variables agricultural activity. Inconsistency in productivity across the tahsil and even within crops continues with significant increase in small and marginal land holdings. Agricultural development indicates the equality of agricultural system of the region. It is a multi-dimensional concept which mainly includes real strength development of cropped area, farming system, irrigation, high yielding improved varieties of seeds, chemical fertilizers, insecticides, pesticides, specialization and commercialization of agriculture (Mohammed, 1986). The changing scenario of agro-economy drew attention of researcher on distribution of technological development in agricultural. Majority of the Indian population depends on agricultural produce and for them it is the only source of livelihood. Due to rapid increase in population, the existing traditional methods of agriculture cannot meet the growing demand. As a result, new techniques have to be adopted to develop agro-economy.

6.7.2 Database and Methodology:

For the assessment of Agricultural development, secondary data is used for the period 2011 which was collected from District Statistical Handbook, Socio-Economic abstract of district profile of Phaltan Tahsil.

To determine the level of Agricultural development, different indicator variables have been used such as Net sown area, Irrigated area, Agriculture Implements, Number of Agricultural Workers, Number of Satara District Central Co-operative bank and Crop Productivity Yield Index of the different crops such as Jowar, Bajara, Wheat and Sugarcane.

For calculation of overall levels of Agricultural development and its even distribution, the data of all variables have been transformed using Z-score technique. The formula is:

Z-Score=

$$Z_i = \frac{X_i - \bar{X}}{SD}$$

Where,

Zi=standard score for the i th observation.

Xi= original value of the ith observation.

$\bar{X}$ =mean of the value of X variable.

SD = standard deviation of X variable.

The result of the standard score obtained for different indicators were aggregated by Composite Standard Score (CSS), so that the regional inconsistencies in the levels of development of the study area may be evaluated and studied on a common scale.

The Composite Standard Score may be algebraically expressed as:

$$\mathbf{CCS} = \frac{\Sigma Zij}{N}$$

Whereas,

CSS- Composite Standard Score

Zij – Scored of an Indicator J in the Tahsil.

N- Number of indicators.

In order to classify the circles according to the magnitude of development, the composite score were divided into three classes that are high medium and low.

6.7.3 List of the selected indicators/ variables:

X1- Percentage of Net sown area to total cropped area.

X2- Percentage of Irrigated area to total cropped area.

X3- Number of Agricultural Implements.

X4- Number of Agricultural Workers.

X5- Number of Satara District Central Co-operative Bank.

X6- Crop Productivity Yield index of the different crops.

X6a- Jowar

X6b- Bajara

X6c- Wheat

X6d- Sugarcane

Agricultural development is a multi-dimensional activity and key to which is crop productivity. It is one of the vital aspects of rural development. The objective of Agricultural development is to increase the growth of Agricultural output so as to provide livelihood to the growing population.

Table-6.5
Phaltan Tahsil
Standard Score for Agricultural Development

Sr. No.	Revenue Circles	X1	X2	X3	X4	X5	X6				Composite Index
							X6a	X6b	X6c	X6d	
1	Phaltan	-1.20	-1.12	-1.40	-1.03	-0.23	0.16	-1.31	-0.87	-0.03	0.78
2	Barad	1.55	1.54	0.57	1.62	1.62	-0.63	0.08	0.42	-0.91	0.65
3	Vidani	-0.37	0.14	-0.41	-0.03	-1.15	-1.07	-0.26	-0.13	-5.14	0.93
4	Taradgaon	0.03	-0.57	1.24	-0.54	-0.23	1.54	1.48	1.74	6.09	1.19

Source: Computed by Researcher.

6.7.4 Distribution of variables/ indicators:

(1) Net sown area (X1):

The Net sown area can be defined as the total area sown in a year. Higher will be the crop production and this will be reflect in Agricultural development. Amongst the four circles, the top position is occupied by Barad circle. Barad circle is in the high group which ranges from 1.00 to above with a score of 1.55 of net sown area. Taradgaon circle falls in the medium group which ranges from 1.00 to 0.00 with a score of 0.03 net sown areas. The low

group ranges below 0.00. There are two circles under this category Vidani circle and Phaltan circle which have score of -0.37 and -1.20 respectively. Table-6.5 displays Standard Score for Agricultural Development.

(2) Irrigated area (X2):

Irrigation is very vital for any kind of Agricultural development and is a prerequisite for the success of modern technology in agriculture. Irrigation plays a significant role in the entire agriculture sector. The changing trends in intensity of irrigation depicts dynamic attempt to overcome environmental limitations to transform the potential of the area into agricultural resource (Singh, 1974). The total irrigated area has been calculated as the percent of the total sown area and further the Z-score of total irrigated is calculated.

In the present study, high level of irrigation has been observed in Barad circle which has score of 1.54 and medium level of irrigation has been observed in Vidani circle having score of 0.14. There are two circles which indicate low levels of irrigation Taradgaon and Phaltan circles they have score of -0.57 and -1.12 respectively.

(3) Agricultural Implements (X3):

Advanced agricultural technology doesn't only mean the usage of hybrid seeds and other modern inputs, but it also incorporates new agricultural practices. Mechanization of certain agricultural operations has successfully addressed to the problem of shortage of labours during the peak season and also to some extent has decreased the labour cost by engaging less number of workers in the agricultural activities. Therefore, such agricultural implements are the key to the modern agricultural development. The backwardness of the Indian agricultural implements has been recorded in Vidani circle with -0.41 score. Medium level of agricultural implements is shown in Barad circle which has score 0.57, while the lowest agricultural implements are observed in Phaltan circle and Vidani circle having -1.40 and -0.41score respectively.

(4) Agricultural Workers (X4):

Agricultural workers are also important factors for agricultural development like chemical fertilizers, HYV seeds and machineries etc. There are many activities in the field in which agricultural workers perform. The highest number of agricultural labour has been found in Barad circle. It has the score of 1.62. Apart from Barad circle, the rest all circles show lowest number

of agricultural workers i.e. level of development in the number of agricultural labours. The score of Vidani circle is -0.03 while score of Taradgaon circle is -0.54 and score of Phaltan circle is -1.03.

(5) Satara District Central Co-Operative Bank (X5):

Satara District Central Co-Operative Bank plays a very important role in the agricultural development. The phenomenal growth in the consumption of chemical fertilizers and other modern inputs can be made possible largely because of liberal provision of credit or loan facilities of by the co-operative bank of government to the cultivators. These banks provide loan and subsidies to the farmers in terms of cash or machineries and tools like tractors and pump sets etc. With the help of these facilities, farmers in Phaltan Tahsil accelerated the productivity of different crops. It is found that the number of branches of Satara District Central Co-operative banks is not equally distributed in the study area. The level of Z-score of Satara District Central Co-operative bankhas been high in Barad circle which is 1.62 score. 0.00 score is low levels score which is recorded in Phaltan circle, Vidani circle and Taradgaon circle having score -0.23, -1.15 and -0.23 respectively.

(6) Crop Productivity Yield Index (X6):

Agricultural productivity determines the level of agricultural development in any region. It refers to per acre or hectare of yield in a unit (Kgm/ quintals) of any crops of field. In order to increase the productivity of crop, farmers try to adopt various types of techniques which are required for overall development including social and economic development. The agricultural productivity yield index and Z-score is calculated for selected crops.

(6 a) Jowar (X6-a):

Jowar is a major crop of Phaltan Tahsil and it is produced in almost every part of the Tahsil. The circle under high category of above 1.00, which is found in Taradgaon circle with score of 1.54. The circle under medium category 1.00 to 0.00 is recorded in Phaltan circle which is 0.16. Low level category below 0.00 of Jowar production is seen in Barad circle and Vidani circle having score -0.63 and -1.07 respectively.

(6 b) Bajara (X6-b):

Bajara is another major crop of the Phaltan Tahsil which is produced almost all circles. The circle under high category above 1.00 is identified in Taradgaon circle its score is 1.48. The circle under medium category 1.00 to 0.00 is recorded in Barad circle 0.08 score. The lowest level of productivity below 00.00 is observed in Vidani circle and Phaltan circle having score of -0.26 and -1.31 respectively.

(6 c) Wheat (X6c):

Wheat is major crop of the Tahsil which is produced everywhere. Wheat is produced on large scale in Taradgaon circle with the score of 1.74 and it falls under the high category which is always above 1.00. The circle under medium category 100 to 0.00 is recorded in Barad circle with score of 0.42. The lowest level below 0.00 is observed in Vidani circle and Phaltan circle having score of -0.13 and -0.87 respectively.

(6 d) Sugarcane (X6-d):

Sugarcane is the most significant crop cultivated in the study area where irrigation facilities are available. Taradgaon circle leads in the production of sugarcane due to fertile soil, river basin and availability of irrigation facilities like lift irrigation. A very high level of productivity has been observed in Taradgaon circle which has 6.09 score. Whereas the rest of all circles of Phaltan Tahsil are under the category of lowest level. The score of Barad circle is -0.91, Phaltan circle is -0.03 and Vidani circle is -5.14.

6.7.5 Z-Score value of all variables combined:

To assess the level of agricultural development in Phaltan Tahsil, all the four variables have been aggregated. The Z-score value of all variables are transformed and combined with the help of Z-score and Composite Standard Score (CSS) was prepared (Table-6.5). The composite index of Taradgaon circle is 1.19 while composite index of Barad circle is 0.65. the composite index indicate that Taradgaon circle is the most developed in Phaltan Tahsil and Barad circle is at the bottom. On the basis of composite Z-score, the circles have been categorized into two classes i.e. high and low, which clearly show the spatial variation in level of agricultural development in Phaltan Tahsil. Composite standard score of. Phaltan circle is 0.78 whereas Composite standard score of Vidani circle is 0.93.

6.8 The Spatial Pattern and Levels of Agricultural Development:

The Spatial distribution of variables and Agricultural development is not uniform in Phaltan Tahsil. It provides very significant information about level of agricultural development. The study highlights that the majority of Tahsil comes under high development of agriculture which is located in middle, the northern and the north-western part of Phaltan Tahsil.

Table-6.6
Phaltan Tahsil
The Spatial Pattern and Level of Agricultural Development

Sr. No.	Z-Score	Levels of Development	Number of Circles	Circles
1	Above 1.00	High	01	Taradgaon circle.
2	Below 1.00	Low	03	Phaltan circle, Vidani circle, Barad circle.

Source: Computed by Researcher.

Agriculture is not developed in Phaltan circle, Vidani circle and Barad circle due to non-industrialization, rugged topography and poor irrigation facilities. For the development of these areas, there is a need of urgent implementation of irrigation facilities which is hampering the agricultural development. The study highlights the impact of location and agricultural productivity on agricultural development planning of the study area. Taradgaon circle is only circle which is included the levels of agricultural development. On other hand three circle- Phaltan circle, Vidani circle and Barad circle are placed in low levels of agricultural development.

6.9 References:

1. Agalave, P, (2000), "Research Methodology and Techniques", First edition, Vidya Publishing, Nagpur, PP. 423-425.

2. Aslam Mohmood, "Statistical Methods in Geography."

3. Bhatia, S.S., (1967), "A New Measurement of Agricultural efficiency in Utter Pradesh (India), "Economic Geography", Vol. 43, No. 3, P.P. 244-266.

4. Cole,J.P,and King ,A. M, (1968), " Quantitative Geography", John Hilley and Sons, London PP. 176-178.

5. Deshmukh Ram,(2005), "Fundamental Statistics",Vidya Prakashan, Nagpur, pp.213,214.

6. Eniyedi, G. Y., (1964), “Geographical Types of Agriculture”, Applied Geography in Hungary, Budapest.

7. Gupta,C.B,(1978), “An introduction to Statistical Methods”, Vikas Publication house,New Delhi.

8. Karlekar Shrikant, and Kale Mohan,(2006),“Statistical Analysis of Geographical Data”, Diamond publication, Pune.

9. National Council of Educational Research and Council Statistics for Economics, First Edition (2006) PP.74-91.

10. Rao and Jasbir Singh (1981), “Transformation of Agriculture”, Vishal Publication, Kurushetra, Hariyana.

11. Sapre and Deshpande, V. D., (1964), “Inter District Variations in Agricultural Efficiency in Maharashtra State”, Indian Journal of Agricultural Economics, Vol. 19.

12. Savanur S.K., (2008), “Research Methodology for Information Sciences”, Universal Prakashan, Pune, pp.145, 146.

13. Shafi, M. (1972): “A New Approach to the Delimitation of Food Productivity Regions in India”, International Geography Congress Abstract No. 2, Canada, Pp. 756-757.

14. Shafi, M. (1974): "Perspective on the Measurement of Agricultural Productivity", The Geographer, Aligarh, Vol. 21, No. 1, Pp. 1-10

15. Shafi M., (1960), “Measurements of Agricultural Efficiency in Uttar Pradesh”, Economic Geography, 36 (4), pp. 296-305.

16. Singh R.L.,(1968), “Element of Practical Geography”, Students friends, Allahabad.

17. SinghJasbir, and Dhillon,S.S, (1984), “Agricultural Geography”, Tata-McGraw-Hill, Publishing Company Limited, New Delhi pp-14,15,62.

18. Singh,J.,(1974), “An Agricultural Geography of India: A Geographical Analysis”, Visual Publication Kurukshetra, Harayana.

19. Singh R.L., (1979),“Element of Practical Geography”, Kalyani Publishers, New Delhi.

CHAPTER-VII
CASE STUDIES OF SAMPLE VILLAGES

7.1 General Introduction

7.2 Basis of Sampling

7.3 Land Use Pattern of Sample villages

- **A. Barad Village**
- **B. Sasakal Village**
- **C. Dhaval Village**
- **D. Padegaon Village**

7.4 Resume

7.5 References

CHAPTER-VII
CASE STUDIES OF SAMPLE VILLAGES

7.1 General Introduction:

Sampling is defined as a technique by which "A part is collected to represent the whole". In this context, sampling was used to determine the adequate information from the total number of farmers in the study area to abridge the finding of the target population. The sample size represents the features of the entire population. The method of sampling is practical, faster and also economically viable. It yields more comprehensive information and accuracy, thereby saving a lot of time and money. In this way, survey of more diversified and larger population can be covered. In the preceding chapters-V and VI, regional pattern of agriculture land use is extensively described to study the spatial and temporal variations in Phaltan Tahsil. An attempt has been made to study and identify the agricultural regions in Phaltan Tahsil by using analytical and quantitative techniques. The cropping pattern in the study area is influenced by factors such as physiographic, soil, climate, irrigation facilities and socio-economic factors. Village wise study of land use and cropping pattern at micro level helps for better understanding of intensive land use. Phaltan Tahsil consists of 128 villages and single town covers 1190.29 square kilometres area. For this purpose, an extensive sampling study of four villages of Phaltan Tahsil has been done. These sample villages are namely Barad, Sasakal, Dhaval and Padegaon. The data of these four villages related to general land use and crop have been collected from the questionnaires interviews of the farmers in the concerned village and agriculture office and Revenue Department of the concerned Tahsil for year 2011. The questionnaires have been circulated among farmers, Sarpanch, Talathi and Gram-Sevak. Besides this, frequent personal visits were made to four sample villages to collect primary data and other relevant information.

7.2 Basis of Sampling:

The sample villages were selected for comprehensive study of agricultural pattern and problem of villages by applying systematic sampling technique i.e. Factor Analysis Technique. In this method, the researcher has identified the agricultural regions in Phaltan Tahsil such as the back ward

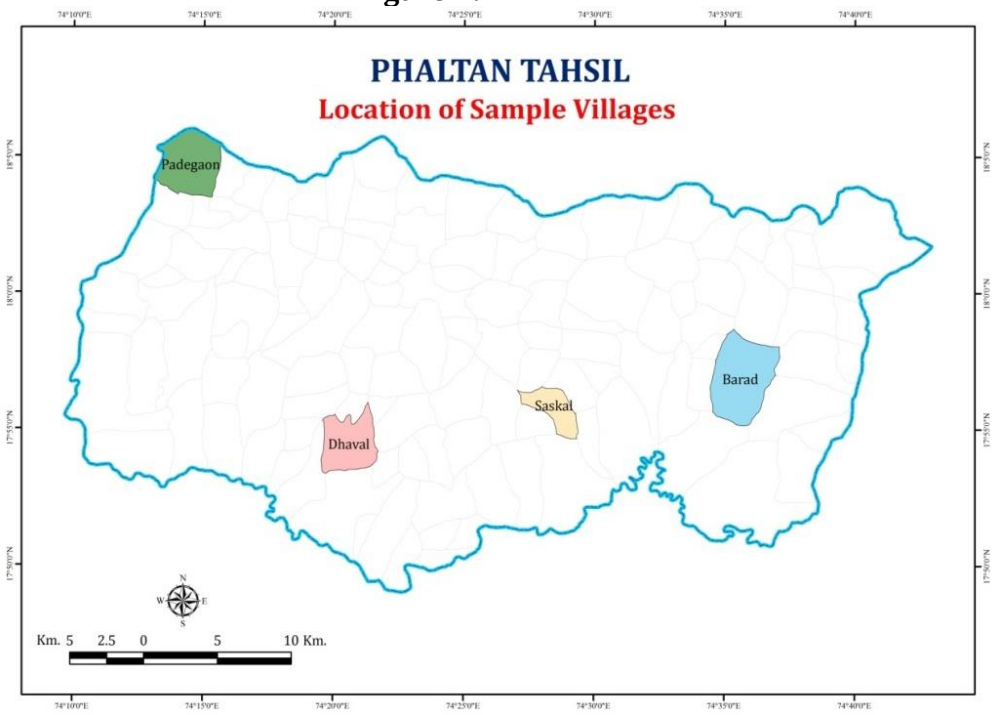
region, the developing region and the developed region. Further, one village from each region was selected by considering certain aspects like accessibility, population and convenience from weekly market centre. The location of selected sample village is shown in Table-7.1 and Figure-7.1. Both topographical and cadastral maps have been used in order to identify the village and their boundaries. The crop land use of every plot is shown in the map. Questionnaires were used to seek primary data from farmers. These questionnaires contained questions related to family background, income, expenditure, crop land use pattern, inputs, production, irrigation, occupation and problems faced by farmers etc. The questionnaires were circulated to the concerned village authorities like Talathi, Sarpanch and Gram-Sevak for getting administrative related data.

Table-7.1
Phaltan Tahsil
Agricultural Regions and Sample Villages

Sr. No.	Agriculture Regions	Villages	Population 2011	Area (hectares)
1	Developing	Barad	4387	2281.45
2	Backward	Sasakal	1632	787.18
3	Developing	Dhaval	3146	1032.07
4	Developed	Padegaon	5034	1435.17

Source: District Census Handbook, Satara District, 2011.

Figure-7.1



7.3 Land use Pattern of Sample villages:

A. Barad village:

Introduction:

Barad village is situated in the eastern part of Phaltan Tahsil in Satara district. Barad village lies in the eastern part of Phaltan Tahsil. This is located 18 kilometres from Phaltan and is well connected by Pandharpur-Pune road. This village extends 74^{O}43’6” East longitudes and 17^{O}9’8” North latitudes (Fig.-7.2) and covers 2281.45 hectares of land and having a population of 4387 in 2011 of which 2229 are males and 2158 are females. The density of the population is 192 persons per square kilometres in 2011 census. There were 900 households in Barad village. Gunaware village shares its boundary with Vajegaon village in northwest, Rajuri village in the east, Mirade village in the south, Tirakwadi village in the west and Shereshindewadi village in the south western part, Kurawali-bk village in the southeast. Phaltan is a weekly market centre located 18 kilometres from this village.

Physiography, Climate and Soil:

Barad village lies 580 meters above Mean Sea Level (MSL). The general slope is from the south to the north. The village experiences wet climate during rainy season and warm climate in summer. This region receives 450 millimetres rainfall from southwest monsoon which begins in June and

lasts till October. The Nira right bank canal lies on the north boundary of this village. This canal flows the west to the east along the north boundary. Physiographic and soils show positive impact on cropping pattern. The soils of this village are classified into three categories Deep black, Medium deep black and Shallow black (Fig.-7.3). Medium deep black occupies 35 percent area in the northern part towards the boundary of Kurawali-bk. Here the farm size is large because of less fertility and loamy structure of soil. Shallow black appears lying on high relief and has less fertility. Deep black soil can be identified on 33 percent area in a continuous patch starting from the north to the south and follows towards the west and the eastern part of the village. Jowar, Bajara, Wheat and Pulses are cultivated in this type of soil. Shallow black is spread over the south, the northeast and the north-western parts occupying 32 percent area. Apart from Jowar, Bajara, Wheat and Maize, other crops such as Sugarcane, Fodder crops, Pulses and Vegetables are cultivated in this type of soil.

Figure-7.2

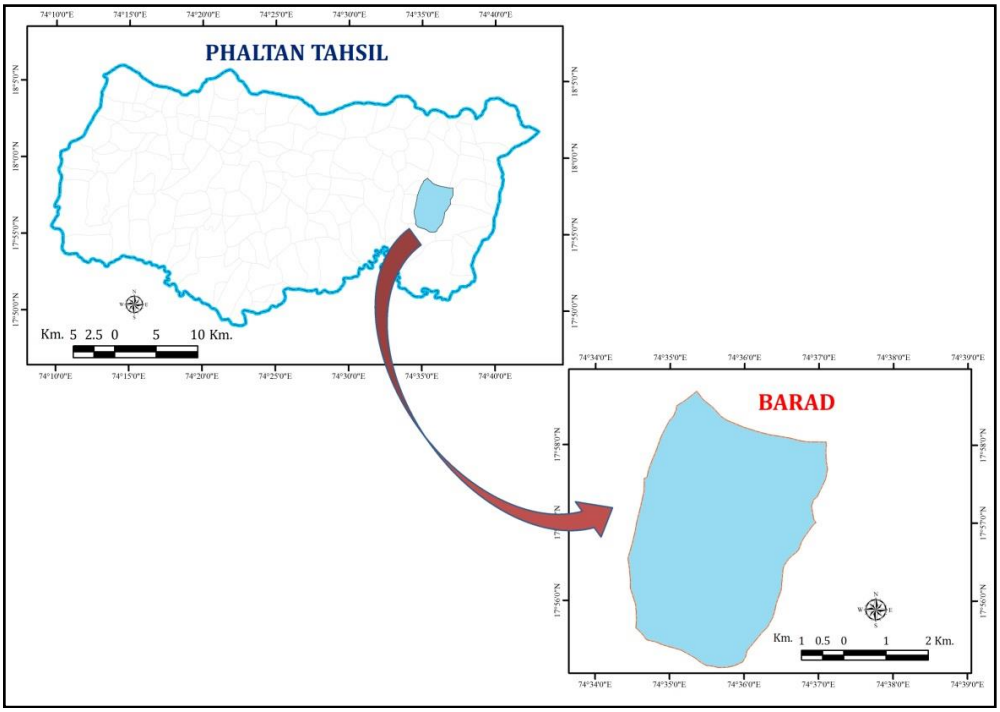
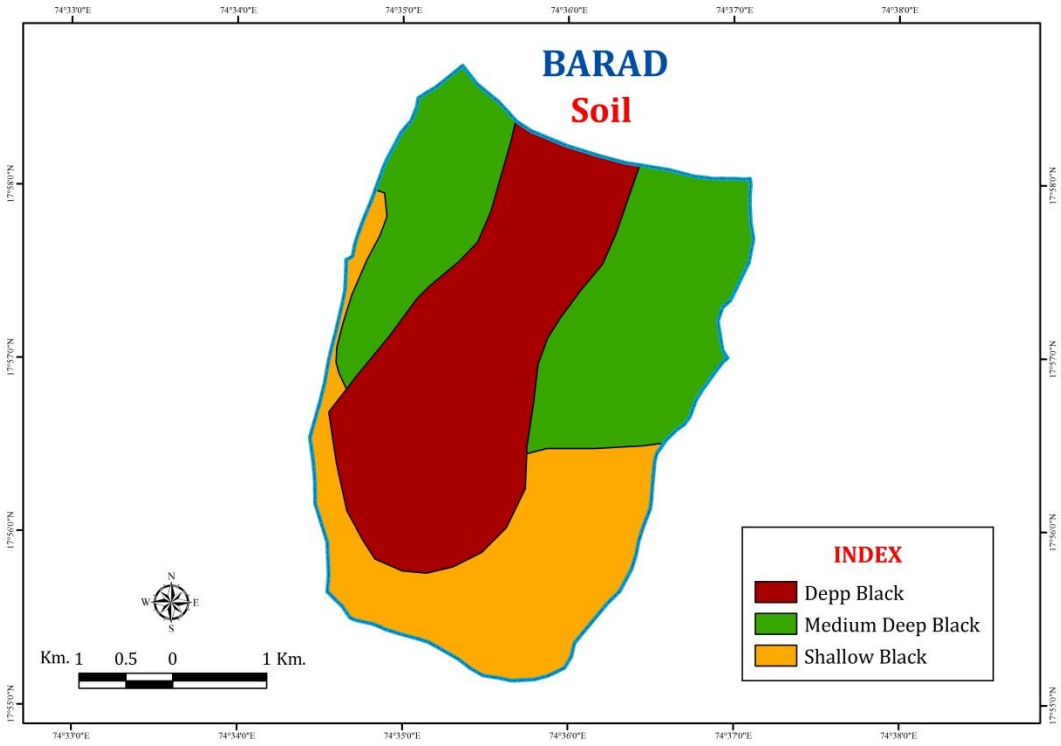


Figure-7.3



Temporal Analysis of Land use:

Physiography has a prime role in land use pattern in Barad village. Since village is surrounding by hills from southern side, 75 percent area of this village is under cultivation. When compared to other sample villages, Barad has relatively more forest area having 2.47 percent which lies in the south, the east and the south-eastern parts. Tables-7.2 presents the temporal variation in crop land use in Barad village. The net sown area accounts to 75.43 percent. During the study period, an increasing trend in net sown area has been found it has 42.56 percent in 1991. It increased to 75.43 percent, it is increased by 32.87 percent. The area under cultivable waste is negligible and it has increased by 1.62 percent whereas fallow land has decreased by 9.94 percent from 1991 to 2011 (Fig.-7.4). The land not available for cultivation has decreased to 24.65 percent during the study period. Only forest cover has seemed to be stable over this period. Among the crops, Jowar has got the highest coverage in Barad village which is 15.97percent and has topped the list during 1991 to 2011.

Bajara as a kharif crop has ranked second with 15.65 percent. Bajara cultivation has increased its area by 4.5 percent similarly maize cultivation has increased by 4.35 percent. Sugarcane is a major cash crop covering 5.42

percent to net sown area. The area under sugarcane was 4.50 percent in 1991. Due to well irrigation facilities in this village, the share of sugarcane in net sown area has increased by 0.92 percent in 2011. Other crops like sunflower, vegetables, pulses, fruits and fodder crops have seen decreasing trend during the study period (Fig.-7.5)

Table-7.2
Barad village
Land Use Pattern (in hectares)

Sr. No.	Land use Categories	1991	2001	2011
1	Total village area	2281.45	2281.45	2281.45
2	Net sown area	971 (42.56%)	1471 (64.47%)	1721 (75.43%)
3	Land not available for cultivation	621.54 (27.24%)	309.19 (13.55%)	59.19 (2.59%)
4	Cultivable waste	48 (2.10%)	85 (3.72%)	85 (3.72%)
5	Fallow land	585 (25.63%)	360.35 (15.79%)	360.35 (15.79%)
6	Forest	55.91 (2.47%)	55.91 (2.47%)	55.91 (2.47%)

Source: Computed by Researcher.

Spatial Land Use Pattern:

The partial rugged topography, availability of irrigation and typical soil has contributed to the present land use pattern in Barad village, the net sown area is 1721 hectares which accounts for 75.43 percent. Out of which 837.12 hectares land is irrigated (*Bagayat*) and 883.88 hectares land is un-irrigated(*Jirayat*). The net sown area is concentrated in the southwest, the southeast and the southern parts of this village (Fig.-7.4). Fallow land occupies 360.35 hectares of area. It appears in three patches, one patch of fallow land appears in south occupying large area. Second patch is found in the southwest part and the third patch is in the southeast.

The land not available for cultivation is 59.19 hectares having 2.59 percent which is utilized for houses, roads, school and temples. The area under forest is only 55.91 hectares having 2.47 percent and it lies towards the southern part of this village. The major Kharif crops are fruits, Bajara, Maize, Pulses and Fodder crops (Fig.-7.5). Bajara leads amongst the Kharif crops and occupies 15.65 percent of net sown area. This crop is mainly grown on silt

clay loam soil in the southern and the western parts. Wheat is grown on 6.54 percent area in the eastern and the northern parts. Sugarcane is cultivated on 5.42 percent areas of northern part in this village. Vegetables are found along the Nira right canal and occupy only 1.33 percent area. These vegetables include Tomato, Onion, Cucumber, Coriander etc. Bananas are grown along the eastern part on suitable soil and depending on the availability of water. Jowar is grown on 15.97 percent area in the southern and the eastern parts.

Jowar is cultivated mostly for domestic purpose and as a fodder crop. This crop is grown in both Kharif and Rabi seasons. Wheat, Fodder crop, fruits and Maize are grown in Rabi season (Fig.-7.6). Maize is grown on 4.35 percent area in the north and the western parts. Pulses are cultivated in 0.14 percent area and are distributed evenly throughout the village area. It has been observed that in some patches Maize and Fodder crops are grown in summer season also.

Figure-7.4

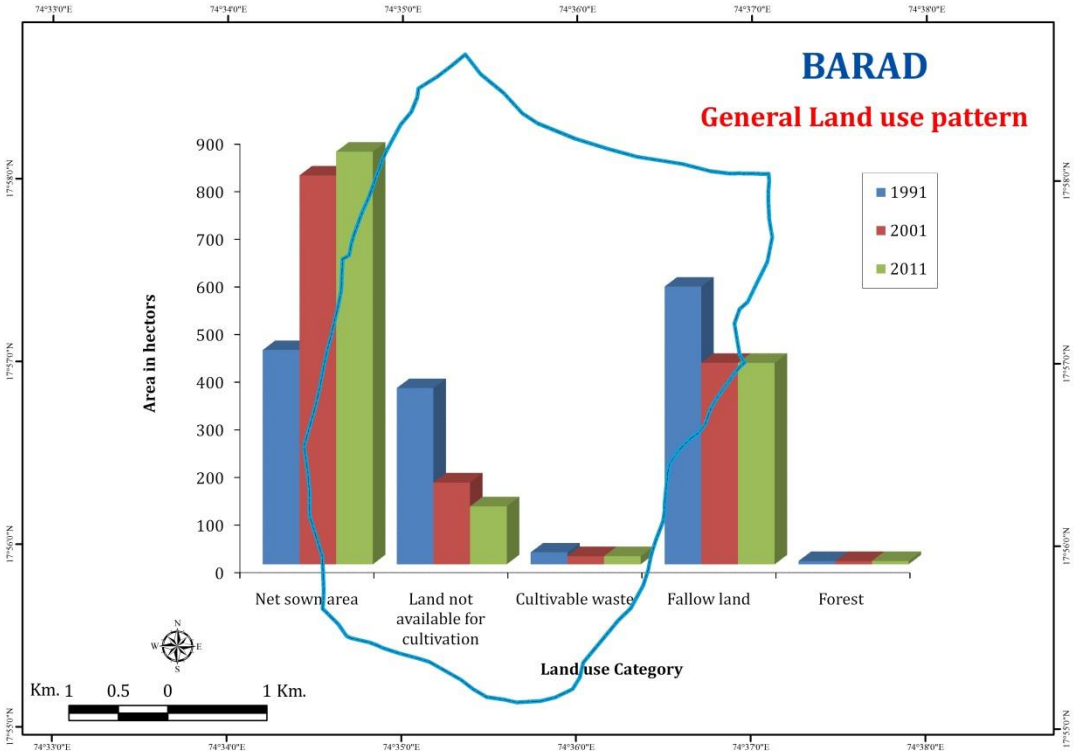


Figure-7.5

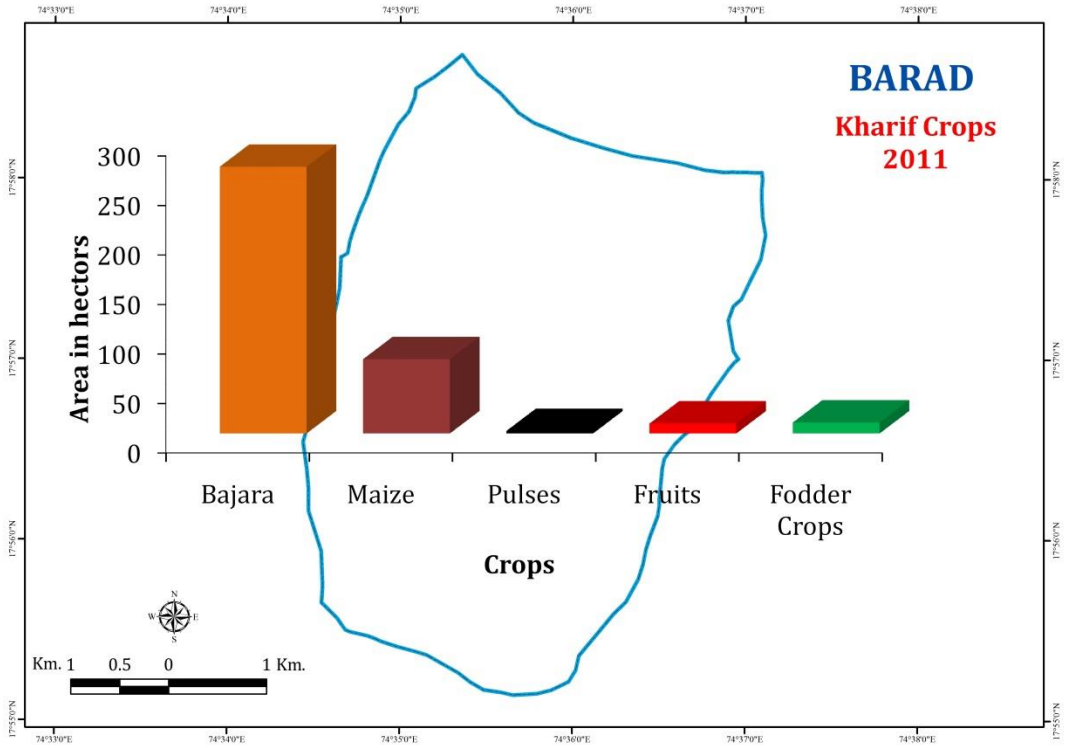
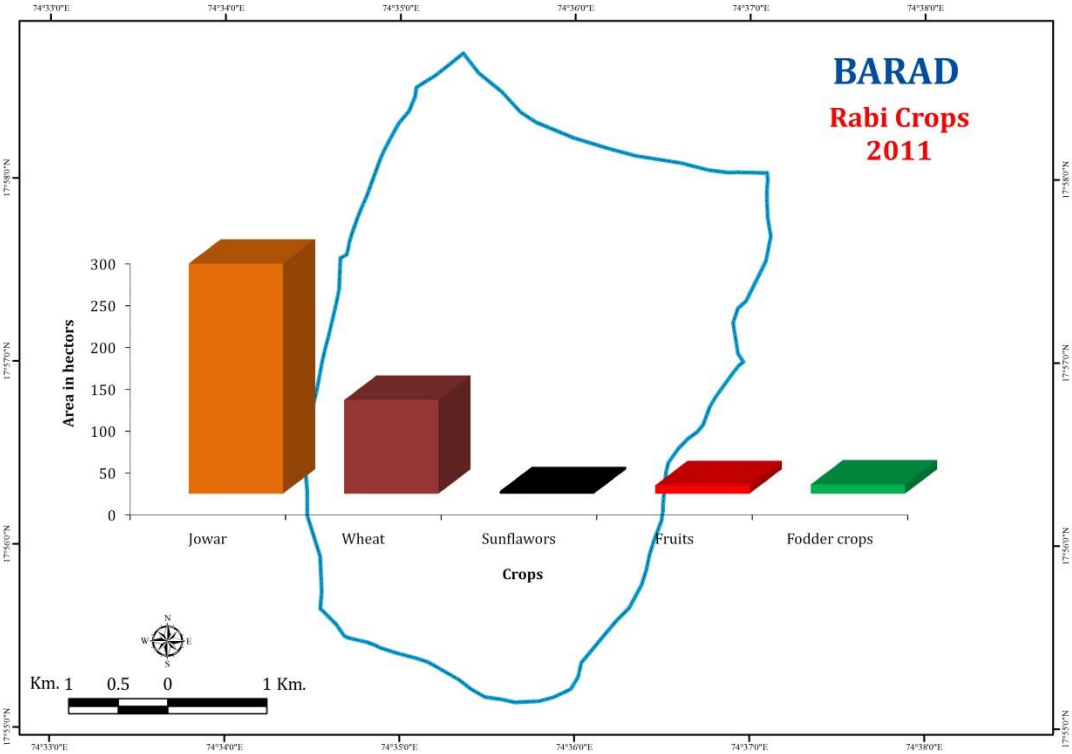


Figure-7.6



Land Use and Population:

Tables-7.3 exhibits per capita share for different land use categories in Barad village. The net sown area in this village accounts for 75.43 percent to total geographical area which in turn accounts for 0.52 hectares per head of the village. The irrigated area has 0.19 hectares per head while double cropped area is 0.06 hectares per head. There are 2447 land holders in this village. Out of these 64.22 percent are small farmers having less than two acre land. The medium farmers having 2 to 5 acres land are about 6.57 percent while 29.21 percent farmers are big land holders possessing more than five acres of land.

The nearest market centre is Phaltan which is just 18 kilometres from Barad village. This village is connected by roadways to Phaltan, Vidani and Natepute for commodity transportation. Four Krishi Seva Kendra are located at Barad village. There are 65 tractors available for agricultural practices. There are 312 wells, 95 boring pumps and 85 lift irrigation found in this village. Electrified water pumps are 312 in numbers. The sugarcane production is supplied to the Sriram Sahkari Sakhar Karkhana located at Phaltan which is 18 kilometres from Barad village. This sugar factory has turned the traditional agriculture to irrigation based cash crops.

Table-7.3
Barad village
Land Use and Population

Sr. No.	Land use Categories	Area in hectares	Land Per Head of Population (hectares)
1	Total village area	2281.45	0.52
2	Net sown area	1721.00	0.39
3	Land not available for cultivation	59.19	0.01
4	Cultivable waste	85.00	0.01
5	Fallow land	360.35	0.08
6	Forest	55.91	0.01
7	Double cropped area	269.40	0.06
8	Gross cropped area	1921.10	0.43
9	Irrigated area	837.12	0.19

Source: Village Revenue Record, Phaltan (2011).

Occupational Structure:

From 1991 to 2011, it is found that there has been an increase of population of 4.55 percent. The main workers have decreased by 4.62 percent. Among the main workers, cultivators have increased by 5.90 percent from

1991 to 2011 whereas agricultural labours and other workers have decreased by 6.23 percent and 0.31 percent respectively. On the other hand, the other workers have increased by 0.31 percent. The marginal workers have decreased to 6.81 percent while non-workers have increased to 11.43 percent. In 1991, there were 50.62 percent of cultivators in village and 35.24 percent of actual agricultural labours. In 1991, Marginal workers were only 8.26 percent of total population. In 2011, cultivators in the village have been increased by 5.90 percent but agricultural labour and marginal labour have been decreased by 6.23 percent and 6.81 respectively.

Table-7.4
Barad village
Occupational Structure

Sr. No.	Category	Population						Percent Change
		1991	Percent	2001	Percent	2011	Percent	
1	Total population	4196	100	4560	100	4387	100	4.55
2	Total Main Workers	2165	51.59	2162	47.41	2061	46.97	-4.62
	i) Cultivators	1096	50.62	1145	52.96	1165	56.52	5.90
	ii) Agricultural Labour	763	35.24	580	26.82	598	29.01	-6.23
	iii) Other Workers	306	14.14	437	20.21	298	14.45	0.31
3	Marginal Workers	347	8.26	246	5.3	64	1.45	-6.81
4	Non Workers	1684	40.13	2152	47.19	2262	51.56	11.43

Source: District Census Handbook, Satara District, 1991, 2001and 2011.

Problems of the village:

In Barad village 46.97 percent main workers are engaged in agricultural activity. In this study, it was found that three main areas hampered the agricultural development of this village viz. partial uneven topography, medium soil quality and moderate irrigation facilities. During the field visit it was noted that the land under irrigation have increased from 70 hectares to 215 hectares. But this was not a significant progress in irrigation. There is 8.38 percent of dry land or rain fed land in this village. Farmers face acute water shortage problem right from January till the end of May. Bore wells and tube wells are the only source of water for crop cultivation during the summer

season. In order to tackle this issue of water shortage, rainwater conservation, harvesting measures should be introduced by constructing continuous contour trends and nalla bandings on hill slopes in south side of village on Mirade Talav. The Nira right bank canal appears just north side of this village which is beneficial for small patch of land.

In Barad village, 64.22 percent farmers are small farmers who cannot afford to buy modern farm equipment's, fertilizer, costly hybrid seeds and pesticides. Over 85 percent farmers expressed the view that the government should provide capital funds to farmers for farm operations. Proper guidance and knowledge should be provided regarding modern agriculture techniques. Apart from the water shortage problem, agriculture in this village is suffering from shortage of electricity supply. There is a daily load shedding 10 to 14 hours which is affecting the productivity of crops. Farmers are facing labour problems in their fields as they have to pay more labour charges resulting in fewer profit margins for their commodities. The Youths of this village are facing problems of unemployment. The farmers insisted that the government should provide financial support to the youths to start agriculture allied business in this village.

B. Sasakal Village:

Introduction:

Sasakal village is located in the central part of Phaltan Tahsil. It is 12 kilometres away from Phaltan and having an area extent of 787.18 hectares. Sasakal village extends from $17^{O}55'49"$ North latitudes and $74^{O}27'56"$ East longitudes (Fig.-7.7). This village shares its boundaries with six neighbouring villages. Zirapwadi village and Bhadali-bk village to the north, Vinchurni village to the west, Nirgudi village and Dhumalwadi village to the south and Bhadali-kh village and Dudhebavi village to the east. According to 2011 Census, the population of Sasakal village is 1632 including 830 males and 802 females. The density of population is 207 persons per square kilometres in 2011 when compared to 178 persons per square kilometres in 1991. There are 346 households in Sasakal village. Phaltan is a weekly market centre located 12 kilometres from this village.

Physiography, Climate and Soil:

Sasakal village lies in the south eastern part of Shambhu Mahadeo off-shoots having an elevation of 600metres from Mean Sea Level (MSL). The slope is towards south. This village has a gentle topography with an exceptional fold. Sasakal stream (*Odha*) is flowing at the western part of this village and flows the south to the north. This is a perennial stream in this area. This village experiences seasonal wet climate because of aerographic rainfall and receives rainfall from the south west monsoon during the period of June to September. The village has sandy loam, sandy clay loam and clay loam soil types. Silt clay soil occurs on 41.50 percent of area where Sugarcane, Wheat, Pulses, Maize and Vegetables are cultivated. Sandy clay loam spreads over 40.90 percent of area in which Jowar, Bajara, Wheat and Maize are grown clay loam soils covers only 8.45 percent area while village settlement and streams area cover 9.15 percent. The Fig.-7.8 displays all these data.

Figure-7.7

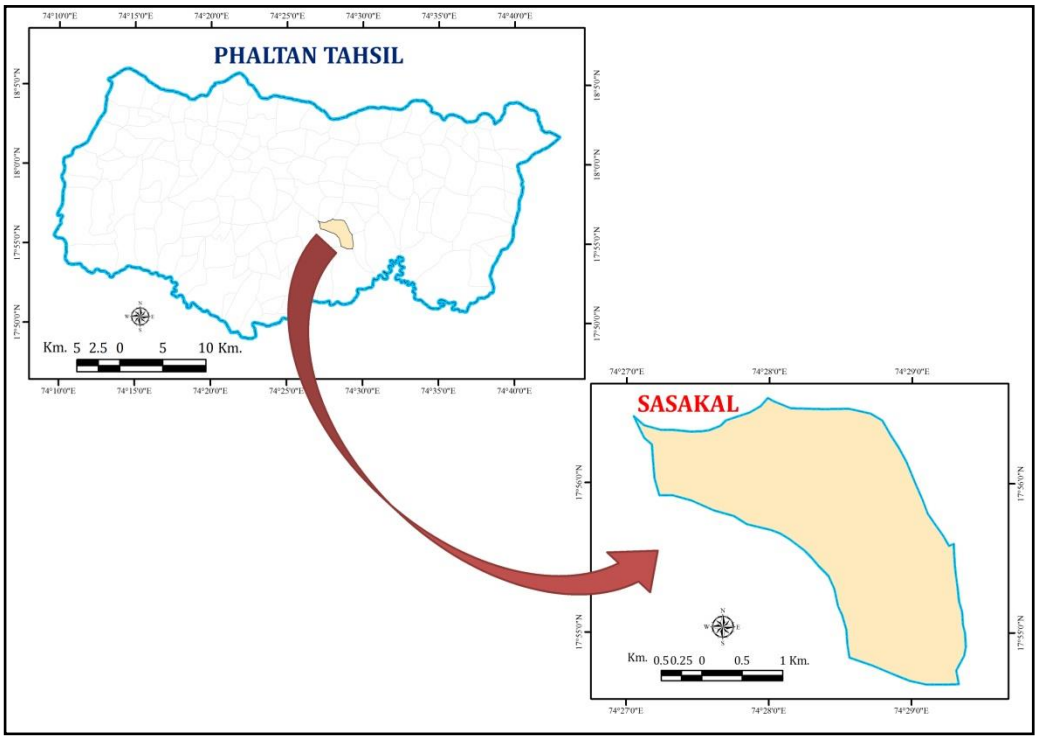
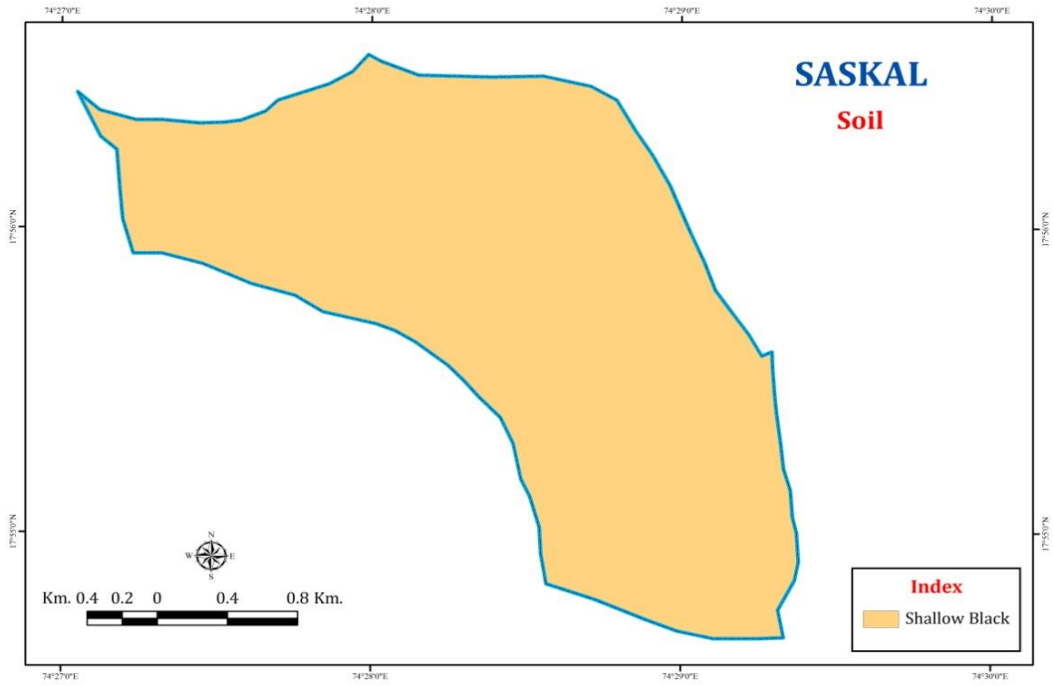


Figure-7.8



Temporal Analysis Land Use:

Physiography has a predominant role in land use pattern in Sasakal village. This village is surrounded by hill range from three sides (i.e. east, south and south-western parts). 30.08 percent area in this village was under cultivation in 1991. Table-7.5 presents the temporal variation in crop land use in Sasakal. In 2011 the net sown area accounts for 42.78 percent. It is found that the net sown area has been increased by 12.70 percent during the study period. In 1991, the area under cultivable waste was negligible and in 2011 it increased by 7.87 percent whereas fallow land 19.22 percent has seemed to be stable from 1991 to 2011(Fig.-7.9). The land not available for cultivation cover has decreased during study period.

Table-7.5
Sasakal village
Land Use Pattern (in hectares)

Sr. No.	Land use Categories	1991	2001	2011
1	Total village area	787.18	787.18	787.18
2	Net sown area	236.79 (30.08%)	336.79 (42.78%)	336.79 (42.78%)
3	Land not available for cultivation	387.21 (49.18%)	237.21 (30.13%)	237.21 (30.13%)
4	Cultivable waste	12.00 (1.52%)	62.00 (7.87%)	62.00 (7.87%)
5	Fallow land	151.18 (19.22%)	151.18 (19.22%)	151.18 (19.22%)

Source: Computed by Researcher.

Spatial Land Use Pattern:

The present land use pattern of Sasakal village has been influenced by soil types, climate and irrigation. The net sown area covers 42.68 percent of total geographical area. The total area of this village under irrigation is 38.31 percent. Area not available for cultivation extends over 30.13 percent which includes stream, houses, roads, temple and school (Fig.-7.9). Sasakal village fallow land occupies 19.20 hectares area and is found in the southern part and the south eastern part.

Jowar has second ranking coverage of 28.83 percent net sown area in Sasakal village during 2011 while it was 21.75 percent of net sown area during 1991.Bajara is a main Kharif crop grown on 140 hectares because this area is very suitable for Bajara cultivation due to medium rainfall during kharif season. Bajara has ranked first having 41.66 percent of net sown area in 2011. Bajara has increased in its area by 4.45 percent during study period. Maize has increased by 17.85 percent area during this study period.

Sugarcane is a cash crop covering 48 hectares area having 14.28 percent of net sown area. The area under Sugarcane was 9.35 percent in 1991 whereas in 2011it is increased to 14.28 percent. This increase was seen due to medium rainfall in autumn and increased irrigation facilities. Jowar, Fodder crops, Vegetables and Sunflower are grown on subsistence level on a much smaller scale. Jowar and maize are used mostly as wheat (Fig.-7.11). Crops like

Vegetables, Pulses, Fruits and Fodder crops have shown a decreasing trend during study period (Fig.-7.10).

Most of the farmers have drawn pipelines for irrigation from nearby stream (*Odha*) which is 100 meter from this village. Water is lifted throughout the year which is very useful in Rabi season for cultivation of Wheat, Sugarcane, Maize, Coriander, *Methi*, *Mula*, Spinach, Onions, Potatoes and Cucumber. Some farmers also sow onions during summer season due to availability of water. The nearest market centre is Phaltan. The vegetables are generally sent to Phaltan market and sometimes vegetables are sending to Baramati market. Wheat is grown on 47 hectares land in northern part in this village. Fruits are cultivated on 17 hectares land in eastern and northern parts. Jowar covers 70 hectares land. Sunflower and pulses are grown on small scale. Sugarcane is grown throughout the year along the stream in the northern part (Fig.-7.11).

Figure-7.9

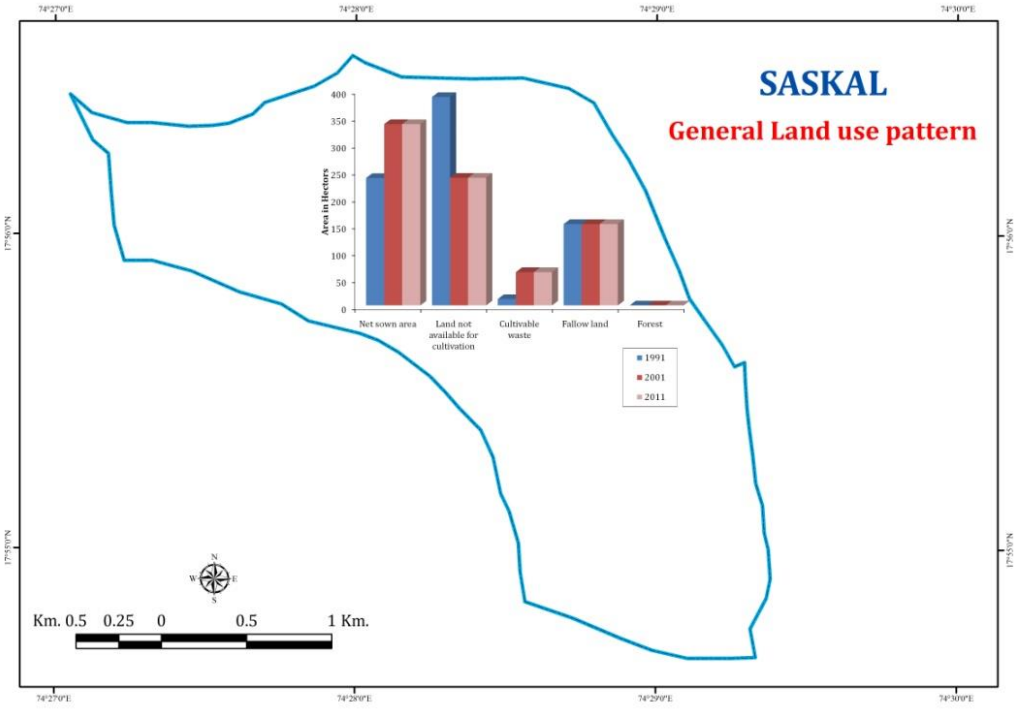


Figure-7.10

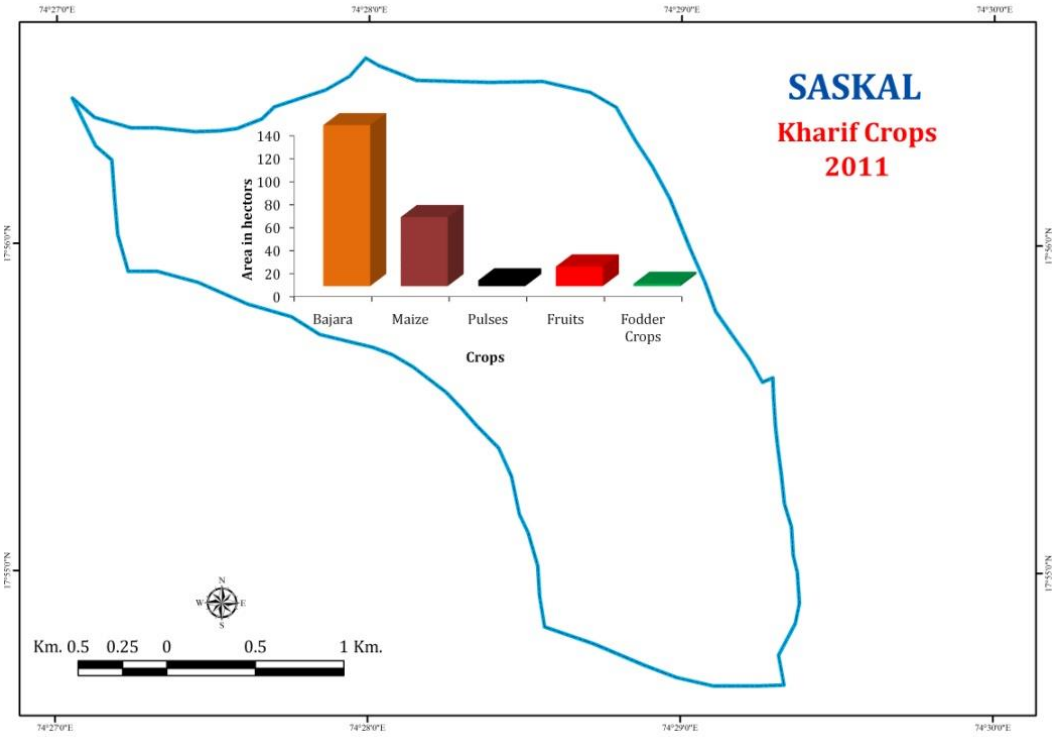
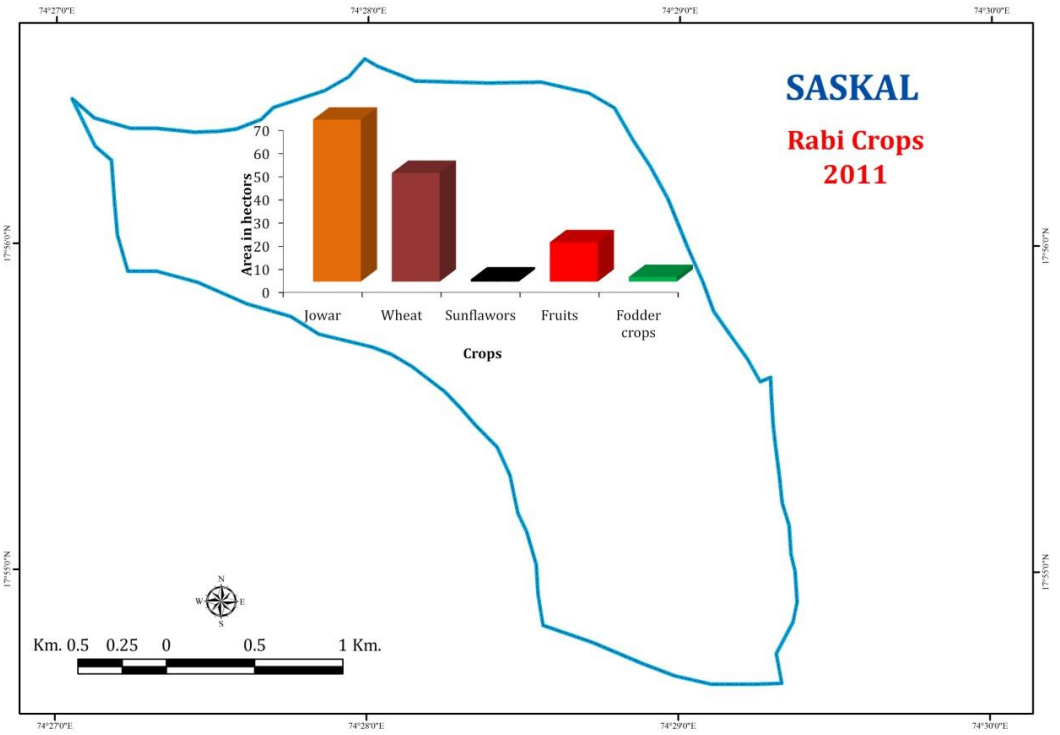


Figure-7.11



Land Use and Population:

Table-7.6 summarizes land use and population in Sasakal village. As per 2011 Census, population of Sasakal village was 1632 of which 830 males and 802 females. The density of population is 207 persons per square kilometres.

In 2011, there are 343 farmers in the Sasakal village, 15.93 percent are small farmers having less than one acre land holding. There are 33.94 percent small farmers having 1 to 2 acres of land holding and 43.23 percent are medium farmers possessing 2 to 5 acres land and 6.90 percent large farmers having more than 5 acres land. Per capita land availability is 0.48 hectares. Per capita net sown area is 0.20 hectares whereas double cropped area is 0.12 hectares. Irrigation area observed is 0.18 hectares per person.

This village is well connected to Phaltan and Girvi for commodity transportation. No Krishi Seva Kendra is located at Sasakal village. There are 17 tractors available for agricultural practices in Sasakal village. There are 167 wells, 23 boring pumps and no lift irrigation found in this village.190 Electrified water pumps are in Sasakal village. The sugarcane production is supplied to the Sriram Sahkari Sakhar Karkhana located at Phaltan which is 12 kilometres from Sasakal village. This sugar factory has turned the traditional agriculture to irrigation based cash crop.

Table-7.6
Sasakal village
Land Use and Population

Sr. No.	Land Use Categories	Area in hectares	Land Per Head of Population(hectares)
1	Total village area	787.18	0.48
2	Net sown area	336.00	0.20
3	Land not available for cultivation	237.21	0.14
4	Cultivable waste	62.00	0.03
5	Fallow land	151.18	0.09
6	Double cropped area	210.00	0.12
7	Gross cropped area	636.00	0.38
8	Irrigated area	301.60	0.18

Source: Computed by Researcher.

Occupational Structure:

Occupation structure in Sasakal village is depicted in Table-7.7 showing spatial changes in population structure related to agriculture. During the study period, this village has witnessed population growth from 1408 to 1632. The percentage of main workers has increased by 6.77 percent. Among main workers, cultivators have shown considerable increase of 6.77 percent from

1991 to 2011 whereas agricultural labourers have also shown decrease of 1.18 percent and other workers have decreased to 2.66 percent. Percentage of marginal workers has decreased by 8.73 percent in 10 years span while non-workers have increased by 1.95 percent. The increase in the non-working population indicates the increasing dependency ratio in this village.

Table-7.7
Sasakal village
Occupational Structure

Sr. No.	Category	Population						Percent Change
		1991	Percent	2001	Percent	2011	Percent	
1	Total population	1408	100	1484	100	1632	100	15.90
2	Total Main Workers	550	39.06	644	43.86	748	45.83	6.77
	i) Cultivators	231	42.00	309	47.98	343	45.85	3.85
	ii) Agricultural Labours	186	33.81	192	29.81	244	32.63	-1.18
	iii) Other Workers	133	24.18	143	22.20	161	21.52	-2.66
3	Marginal Workers	197	13.99	67	4.51	86	5.26	-8.73
4	Non Workers	661	46.94	773	52.08	798	48.89	1.95

Source: District Census Handbook, Satara, District, 1991, 2001and 2011.

Problems of Sasakal Village:

The personal visits, observation and interviews with farmers, Talathi and Gram-Sevak of Sasakal village have exposed the problems of this village. Soil types and availability of irrigation influence crop cultivation. Sasakal village has 38.31 percent of land under irrigation. Agriculture in this village depends on rain water, Lift from streams, 21 tube wells and 167 wells are the main sources of water for irrigation. A small barrage is constructed across the nearest flowing local stream. The farmers lift water from this irrigation project but there is no guarantee of continuous electric supply to electric pump fitted for lift irrigation along streams and wells. Load shedding of 10 to 14 hours a day in Sasakal village curbs the supply of water to crops. Over 95 percent farmers expressed their concern about unpredictable and poor electricity supply that directly affects the productivity of crops in this village.

Education facility for the children of this village is up to 10th class only and beyond this stage they have to go to Phaltan for higher studies. Phaltan is 12 kilometres away from Sasakal. Also, there is shortage of drinking water in Sasakal village. Every house has a water tapping but there is irregular supply of drinking water. The water is supplied three times a week. The villagers face sewage problems as it has open drainage system which has adverse effect on health of villagers. Farmers practice conventional methods of agriculture. Land fragmentation is identified in this village which is hampering the growth of agriculture. The numbers of small farmers in this village are high. The villagers are nowadays moving to Phaltan and Satara in search of livelihood. This in turn, has seen a considerable reduction in availability of labourers in this village.

C. Dhaval Village:

Introduction:

Dhaval village is situated in south-western part in Phaltan Tahsil. It is located on 17°9'8" North latitudes and 74°43'6" East longitudes. Rainfall scarcity and occurrence of frequent drought conditions are common in this village. Phaltan is the weekly market centre which is located 18 kilometres away from Dhaval village. The village spread over an area of 1032.07 hectares. As per 2011 Census, the population of this village was 3146 of which 1656 males and 1490 females. The density of population has increased by 52 in 2011. In 2011, the density is 304 persons per square kilometres which it was 252 persons per square kilometre in 1991. In 2011, there are 615 households in this village. Dhaval village shares its boundary with Sherechiwadi village to the north, Miryachiwadi village and Dalwadi village to the east, Wadgaon village to the west and Tathwada village to the south. The village settlement lies in the central part of village area (Fig.-7.12).

Physiography, Climate and Soil:

Dhaval village is surrounded by hill ranges from two sides i.e. the south and the east. The location of this village is in the foothills. The general slope of this village is towards the west and the northwest. There are two seasonal streams flows in the south-north direction. The elevation of the village is 645 meters above Mean Sea Level (MSL). It falls in scarcity zone in Phaltan Tahsil having an average annual rainfall of 500mm. the rainfall is received from the

south west monsoon which begins in the first week of June and ends in October. Maximum rainfall is recorded in the month of July. Both soil and irrigation play key roles for crop growth in Dhaval village. Soil of village is grouped into four types- Silt clay, Sandy loam, Sandy clay loam and Clay soil. Sandy soil accounts for 65 percent area and is observed along the hill range and its offshoots in central, east, south and south-western parts of the village. The sandy soil experiences heavy erosion. Jowar and Bajara are generally grown in this soil type. Sandy loam soil covers 15 percent area and it is concentrated in north-central part which is suitable for Sugarcane. Clay soil is spread in two small patches on 5 percent area along the stream. Sugarcane and vegetables are commonly grown in this type of soil.

Figure-7.12

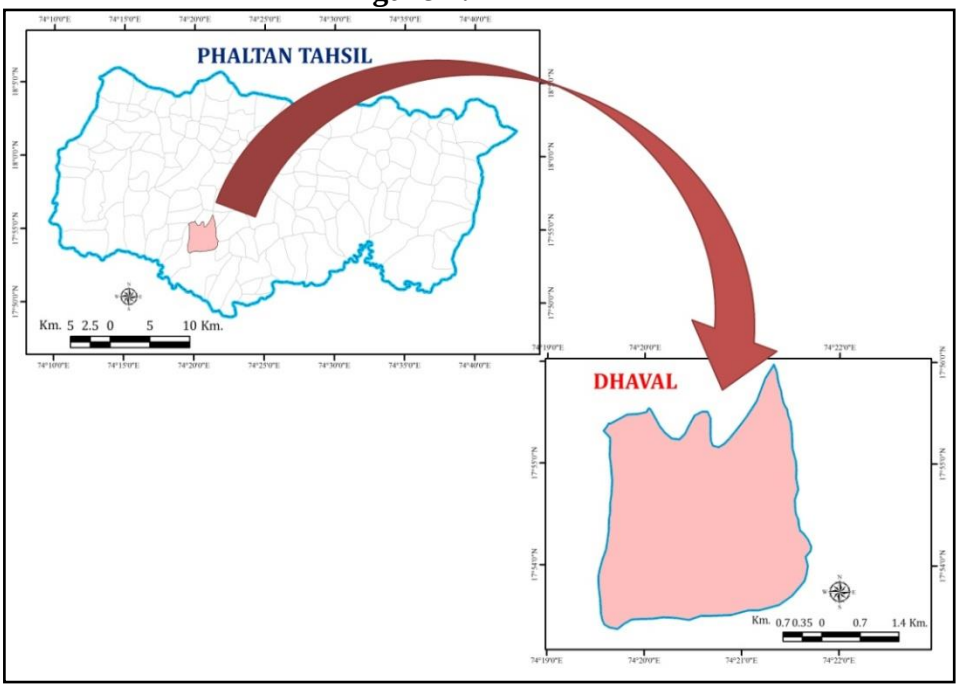
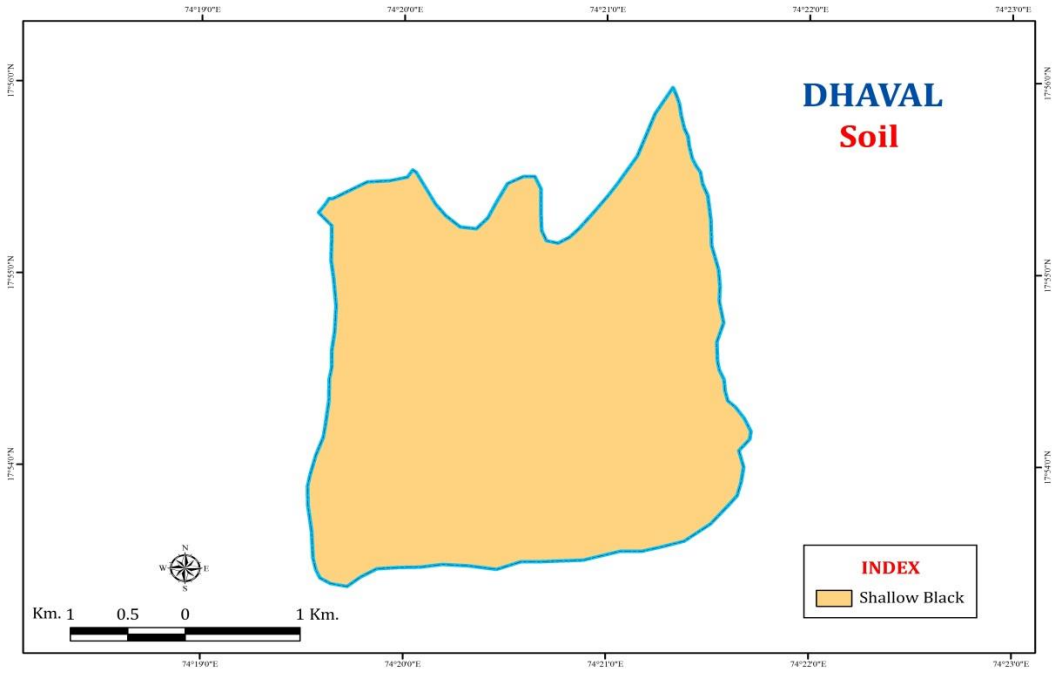


Figure-7.13



Temporal Analysis of Land Use:

Physiography has chief role in land use pattern in Dhaval village. Since the village is surrounded by hill range from two sides (i.e. south and south-eastern parts), 51.54 percent areas in this village are under cultivation. Dhaval village has relatively more forest area which is 8.38 percent of total area. it is larger than other sample villages covering the south and the south-eastern parts. Table-7.8 presents the temporal variation in crop land use in Dhaval village. The net sown area accounts for 51.54 percent. It shows trend during the study period it is increased by 17.63 percent. From 1991 to 2011, the area under cultivable waste has decreased by 6.30 percent whereas fallow land has increased by 21.50 percent. The land not available for cultivation has decreased by 32.83 percent and forest cover has remained stable during the study period. This is shown in Fig.-7.14.

Jowar has the highest coverage of 48.30 percent in Dhaval village and is listed first rank during 2011. It was 49.90 percent during 1991. Bajara which is kharif crop is listed second rank with 45.67 percent in 2011. Bajara has increased in its area by 5.50 percent during study period. Maize has increased by 0.15 percent. Sugarcane is a cash crop casing 7.91 percent of net sown area. The area under sugarcane was 4.65 percent in 1991 and it showed an increase of 0.89 percent in 2011. The reason cited for this increase is due to well

irrigation facility. Crops like Vegetables, Pulses, Fruits and Fodder crops have shown declining trend during study period (Fig.-7.15).

Table-7.8
Dhaval village, Land Use (in hectares)

Sr. No.	Land use Categories	1991	2001	2011
1	Total village area	1032.07	1032.07	1032.07
2	Net sown area	350.00 (33.91%)	502.00 (48.64%)	532.00 (51.54%)
3	Land not available for cultivation	470.00 (45.53%)	131.13 (12.70%)	131.13 (12.70%)
4	Cultivable waste	70.00 (6.78%)	35.00 (3.39%)	5.00 (0.48%)
5	Fallow land	55.78 (5.40%)	277.65 (26.90%)	277.65 (26.90%)
6	Forest	86.29 (8.38%)	86.29 (8.38%)	86.29 (8.38%)

Source: Computed by Researcher.

Spatial Land Use Pattern:

The local relief of this village plays vital role in land use pattern in Dhaval village. The net sown area 532 hectares in this village accounts for 51.54 percent concentrated in the western and the eastern parts along the stream. 35.65 percent is irrigation area in this village which is less than other sample villages. Upper part of the hill range is covered by forest whereas foothill and offshoots of hill range running the west-east direction is occupied by fallow land (Fig.-7.14). Forest area is spread on 8.38 percent of total geographical area which is confined to the south, the east and the south-eastern parts on hilly ranges. The fallow land in Dhaval village occupies 26.90 percent and it has been identified along the foothill spurs in the central, the west and the southern parts where the soil is sandy. Dhaval village represents the area of Jowar and Bajara crop combination. Jowar is a leading crop of Rabi season which is cultivated over 47.09 percent of net sown area in the south, the central, the north and the north-western parts.

During the study period, it was found that Bajara has been replaced by Jowar on 6.30 percent area. Wheat is a winter season crop covering 6.39 percent area and it is cultivated along the stream in Sandy clay loam and Clay

soil in the north-western parts. Sugarcane occupies 0.37 percent area in the central part in irrigated tracks. Fodder crops concentrate in the north-eastern part over Sandy clay loam and Clay soil covering 3.19 percent of net sown area. Vegetables are grown along the stream in the western and the eastern part occupying 0.75 percent area. Pulses, Sunflower and Fruits crops are grown on 3.75 percent area in the southern part. This is shown in Fig.-7.16.

Figure-7.14

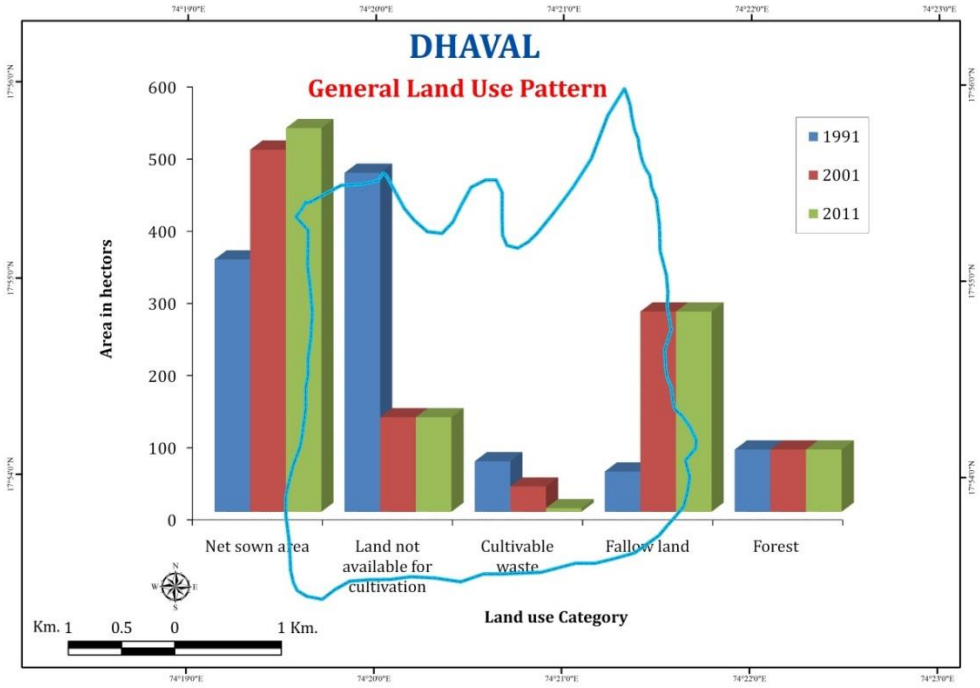


Figure-7.15

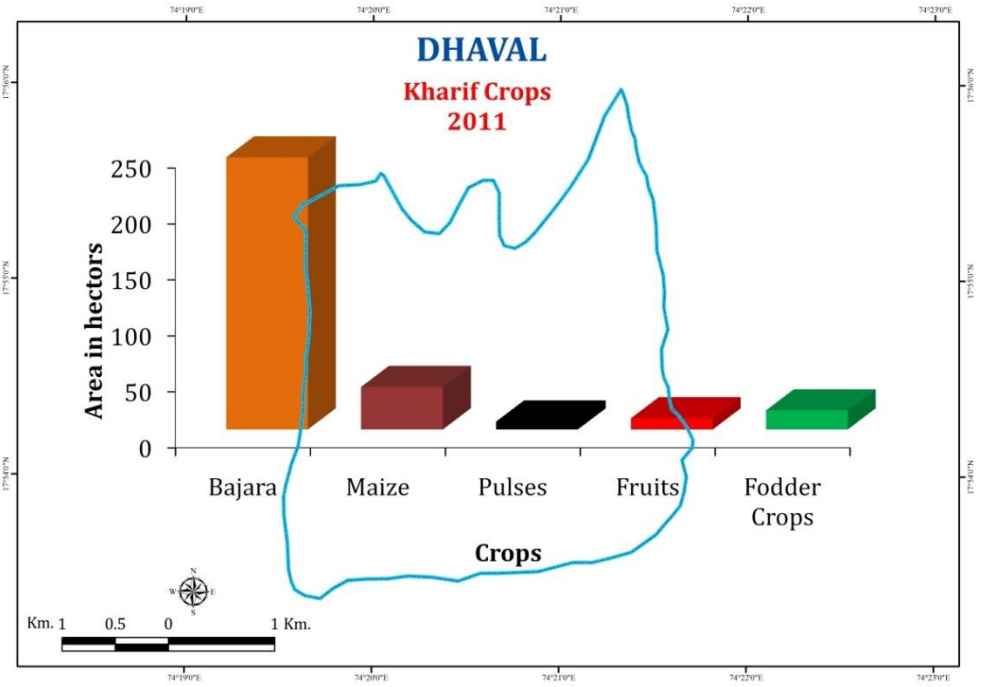
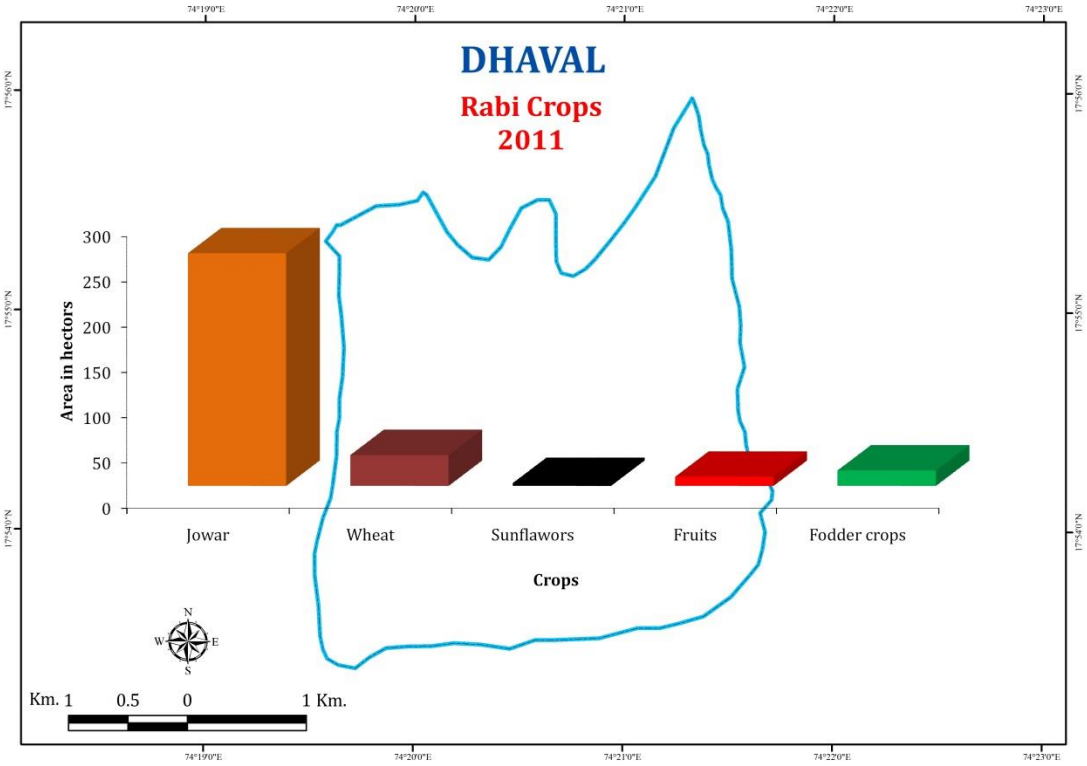


Figure-7.16



Land Use and Population:

Dhaval village is a medium village in term of population having 3146 persons in 2011. This village has 40.62 percent small farmers, 48.29 percent medium farmers and only 11.06 percent big farmers. Per capita land available for cultivation is 0.16 hectares in this village (Table-7.9). The population density in Dhaval village is 304 persons per square kilometre in 2011. It was 252 persons per square kilometre in 1991.The density of population has increased by 20.58 percent when compared to the density population in 1991. The nearest market centre is Phaltan which is just 18 kilometres from Dhaval village.

This village is connected to Phaltan, Tathawada and Pusegaon for commodity transportation. No KrishiSeva Kendra is located at Dhaval village. There are 48 tractors available for agricultural practices and 184 wells, 38 boring pumps in this village. There are 222 Electrified water pumps in Dhaval village. The sugarcane production is supplied to Sriram Sahkari Sakhar Karkhana located at Phaltan which is 18 kilometres from Dhaval village.

Table-7.9
Dhaval village
Land Use and Population

Sr. No.	Land Use Categories	Area in hectares	Land Per Head of Population(hectares)
1	Total village area	1032.07	0.32
2	Net sown area	532.00	0.16
3	Land not available For cultivation	131.13	0.04
4	Cultivable waste	5.00	0.001
5	Fallow land	277.65	0.08
6	Forest	86.29	0.02
7	Double cropped area	257	0.08
8	Gross cropped area	754.42	0.23
9	Irrigated area	368.00	0.11

Source: Computed by Researcher.

Occupational Structure:

Dhaval village has witnessed 20.58 percent population growth from 1991 to 2011. The percentage of main workers has increased by 10.30 percent. Among the main workers cultivators have increased by 25.86 percent from 1991 to 2011, whereas agricultural labourers and other workers have decreased by 1.36 percent and 24.56 percent respectively. The percentage of marginal workers has decreased by 1.55 percent while non-workers have decreased by 8.75 percent. According to 2011 census, there are 44.37 percent of main workers and 8.50 percent of marginal workers in this village. Actual cultivators are 72.20 percent, 20.34 percent are agricultural labours in this village.

Table-7.10
Dhaval village
Occupational Structure

Sr. No	Category	Population						Percent Change
		1991	Percent	2001	Percent	2011	Percent	
1	Total population	2609	100	2695	100	3146	100	20.58
2	Total Main Workers	889	34.07	1262	46.82	1396	44.37	10.30
	i) Cultivators	412	46.34	873	69.17	1008	72.20	25.86
	ii) Agricultural Labours	193	21.70	248	19.65	284	20.34	-1.36
	iii) Other Workers	284	31.96	141	11.17	104	7.4	-24.56
3	Marginal Workers	262	10.05	136	5.05	267	8.50	-1.55
4	Non Workers	1458	55.88	1297	48.12	1483	47.13	-8.75

Source: District Census Handbook, Satara District, 1991, 2001and 2011.

Problems of Dhaval Village:

Dhaval village shows 55.81 percent of its work force engaged in agriculture sector. Frequent occurrence of drought has disturbed the economy of this village. Water scarcity has been the basic problem over a couple of years. The farmers are badly suffering by irregular supply of electricity and the problem of load shedding. 40 percent small farmers have reported the need of capital investment in agriculture. These farmers are unable to afford the high input cost involved in agriculture against the infertile soil and also to avail irrigation facilities. Absence of local market creates difficulties in travelling to a distance of 18 kilometres so as to reach Phaltan. Dairy has been the secondary activity of the villagers. It has been suffering by lack of fodder lands, water scarcity, road accessibility etc. The village lacks the infrastructures like good road, communication facilities, public toilets, primary health centres, street light and safe drinking water supply etc.

D. Padegaon Village:

Introduction:

The village Padegaon is in Phaltan Tahsil of Satara district. It extends from 17^{O}28’6” North latitudes and 74^{O}28’25” East longitudes. It is 30 kilometres away from Phaltan towards the west and 7 kilometres away from Lonand towards the south-west. It is confined by Nira village in the north-

west, Mirewadi village in the east, Koregaon village in the south and Yedewadi village in the north (Fig.-7.17). This village extends over 1435.17 hectares of area. According to 2011 Census, it has a population of 5034 which includes 2561 males and 2473 females. The density of population is 350 persons per square kilometres in 2011;it was 293 persons per square kilometre in 1991. There are 1012 households in Padegaon village in 2011.

Physiography, Climate and Soil:

Padegaon village lies at 560 metres above Mean Sea Level (MSL). General slope of village is towards the north. This village is situated along the banks of the Nira River which flows from the west to the east direction in the southern part of this village. This village receives rainfall from the south-west monsoon which begins in June and lasts up to October. The winter season experiences from November to February. Summer season is from March to May. The soils of village are classified into four categories namely Sandy loam, Sandy Clay loam, Clay loam and silt clay (Fig.-7.18).

Sandy clay loam and Clay soil is ranging from 10 cm to more than100cm in depth and Sandy clay loam soil is having slope from 1 to 15 percent towards south with moderate erosion-prone. Sandy loam soil occupies on 15.30 percent of land in the north and the central part of the village. Sandy clay loam occupies in the north, the west and the eastern parts in this village on 25.75 percent of area. Clay loam appears in the central part of this village covering 12 percent of area. Silt clay has found in the largest area having 52.70 percent in the south and the eastern part in this village and has 1 to 3 percent slope towards the Nira River. Clay soil is found along the Nira canal. It is moderate and is slowly turning into saline due to excessive irrigation.

Figure-7.17

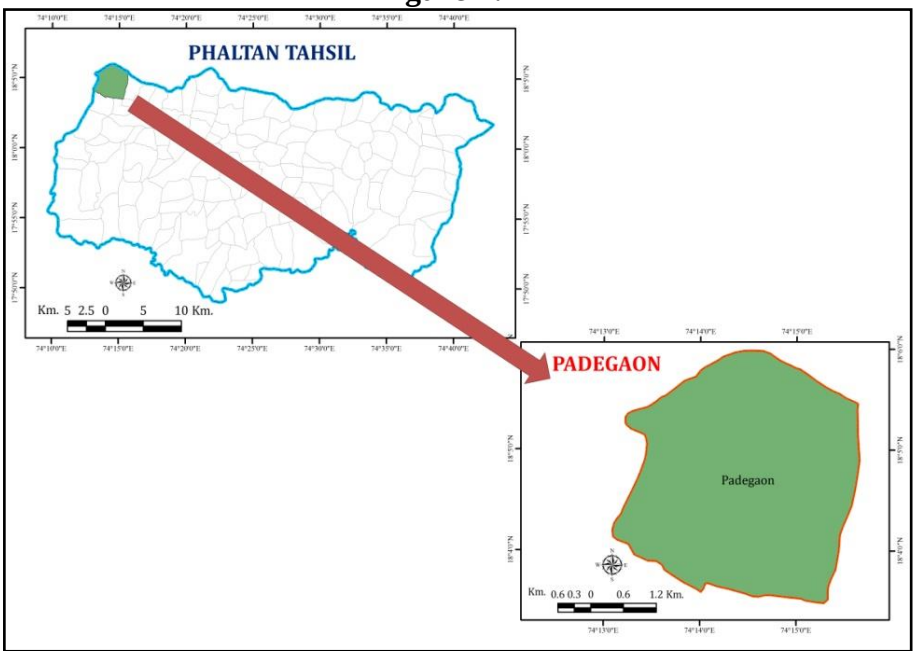
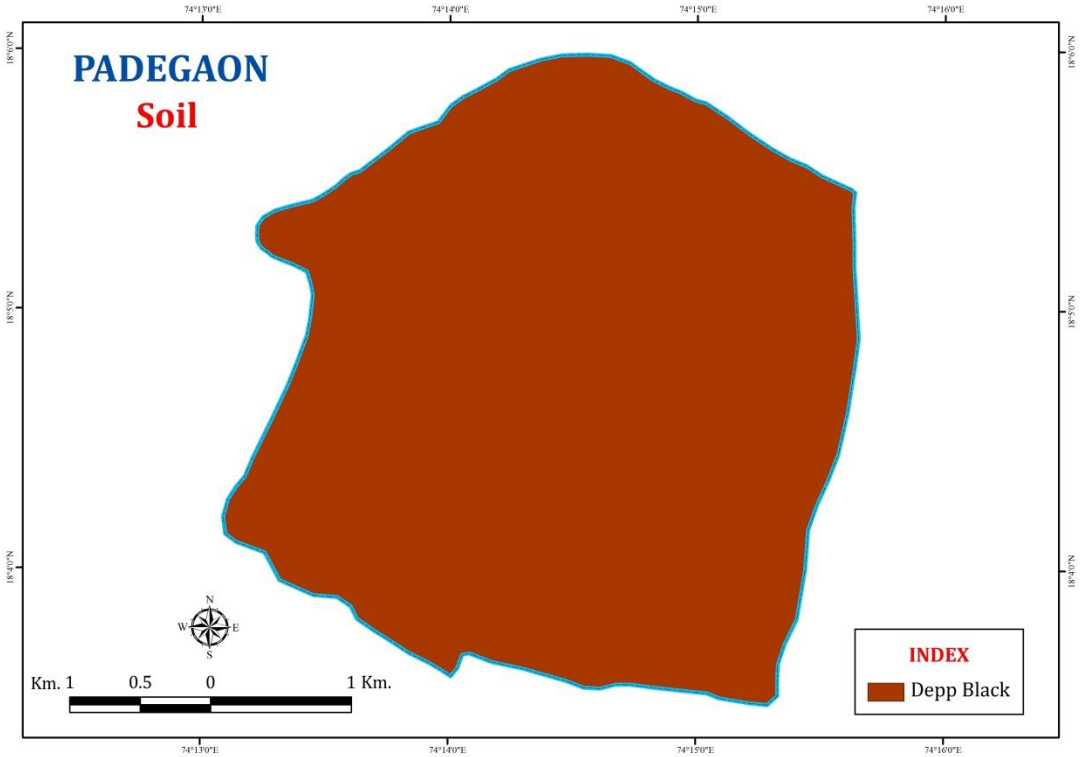


Figure-7.18



Temporal Analysis of Land Use:

Physiography has played a predominant role in land use pattern in Padegaon village. Since the village is surrounded by plain area from both sides and 60 percent of area in this village is under cultivation. Padegaon village has smaller forest it occupies 0.50 percent of area under forest which is found in the southern parts. Table- 7.11 represents the temporal variation in crop land

use in Padegaon village. The net sown area accounts for 60.37 percent. It shows increasing trend during the study period. It is increased by 29.02 percent. The area under cultivable waste is negligible and it has decreased by 0.56 percent similarly fallow land has decreased by 11.16 percent from 1991 to 2011 (Fig.-7.19). In 2011, the land not available for cultivation is 8.48 percent and forest land is 0.50 percent.

Sugarcane has the highest coverage in Padegaon which is 29.42 percent and is ranked first in 2011. It was 25.27 percent during 1991. In 2011, it is increased by 4.15 percent due to irrigation facilities and as cash crop. Bajara, as a kharif crop comes second with 16.73 percent in 2011. It was 11.03 percent in 1991. It is increased by 5.70 percent in 2011. Wheat has increased by 10.15 percent during the study period in 2011. Jowar is ranked fourth and it covers 8.30 percent of the net sown area. The area under Jowar was 5.50 percent in 1991. Due to better irrigation facilities, area under cultivation of has been an increase over the period of time. Crops like maize, vegetables, pulses, fruits and fodder crops have shown decreasing trend during study period (Fig.-7.21).

Table-7.11
Padegaon Village
Land Use Pattern (in hectares)

Sr. No.	Land Use Categories	1991	2001	2011
1	Total village area	1435.17	1435.17	1435.17
2	Net sown area	450.00 (31.35%)	816.52 (56.89%)	866.52 (60.37%)
3	Land not available for cultivation	370.00 (25.78%)	171.74 (11.96%)	121.74 (8.48%)
4	Cultivable waste	25.00 (1.74%)	17.00 (1.18%)	17.00 (1.18%)
5	Fallow land	583.26 (40.63%)	423.00 (29.47%)	423.00 (29.47%)
6	Forest	6.91 (0.50%)	6.91 (0.50%)	6.91 (0.50%)

Source: Computed by Researcher.

Spatial Land Use Pattern:

The present land use pattern in Padegaon village is determined by soil types and availability of irrigation. The Nira right canal passes through this village area from the south to the south-west corner. This canal provides water for eight months during the year. In 2011, the net sown area accounted for

60.37 percent spreading over the central, the east and the southern parts. Fallow land covers 29.47 percent area appearing in the north where it is called *Malran*. This part is slightly elevated than the southern part of this village. Forest area coverage is only 0.50 percent in the southern part of the village. The land not available for cultivation accounts for 4.48 percent. It consists of houses, school building, temples, roads etc. Generally, village has two seasons-Kharif and Rabi. The major crops cultivated during kharip season are Sugarcane, Bajara, Fodder crops, Maize and Vegetables (Fig.-7.20) and the major Rabi crops are Wheat and Jowar. Maize is also sown in summer season. Among crops cultivated in the village sugarcane ranks first with 29.42 percent and is grown on clay and clay loam soil types. This is the main crop in the village because of irrigation facilities from the Nira right canal and the Nira lift irrigation. It is mainly cultivated in the northern parts of this village.

Vegetables are chiefly grown in the west and the northern parts of the village. Vegetables include *Methi, Tomato, Brinjal, Dudhibhopala,* and Lady's finger*, Gawar*, Cabbage and Coriander. These vegetables are sown as an intercrop in sugarcane and wheat cultivation. Fodder crops are cultivated on 27 hectares area in both the seasons. The vegetables are sold in Lonand and Nira markets. In addition to this vegetables are also directly sent to Pune market as Pune is accessible by road and rail. Jowar is found in the southern parts of this village on *Malran* elevated area on rain fed. This area is under rain shadow and has less irrigation due to elevated topography.

Kharif Bajara is cultivated in around 145 hectares of land. Bajara and Jowar are cultivated at subsistence level by farmer. This area is 67.47 percent under irrigation due to Nira right canal and lift irrigation. Wheat ranks third occupying 10.15 percent area. Climate and soil are suitable for wheat cultivation. Wheat appears in different patches spreading in the north, the west and the eastern parts of this village. Maize is cultivated mostly as fodder crops on 2.19 percent area. Fodder crops include *Kadwal* and Grass. Intercrop vegetables have less than 1.73 percent area during Rabi season. There is a maximum use of land in Rabi season because of irrigation facility. The farmers also grow fruits such as local variety of *chikoo* (Saputo), *Dalimb* (Pomegranate), *Sitaphal* (custard apple) and Lemon because climate and soil

are suitable for *chikoo*, *Dalimb* and *Sitaphal* cultivation fruits. In Padegaon, 423 hectares of land is fallow land.

Figure 7.19

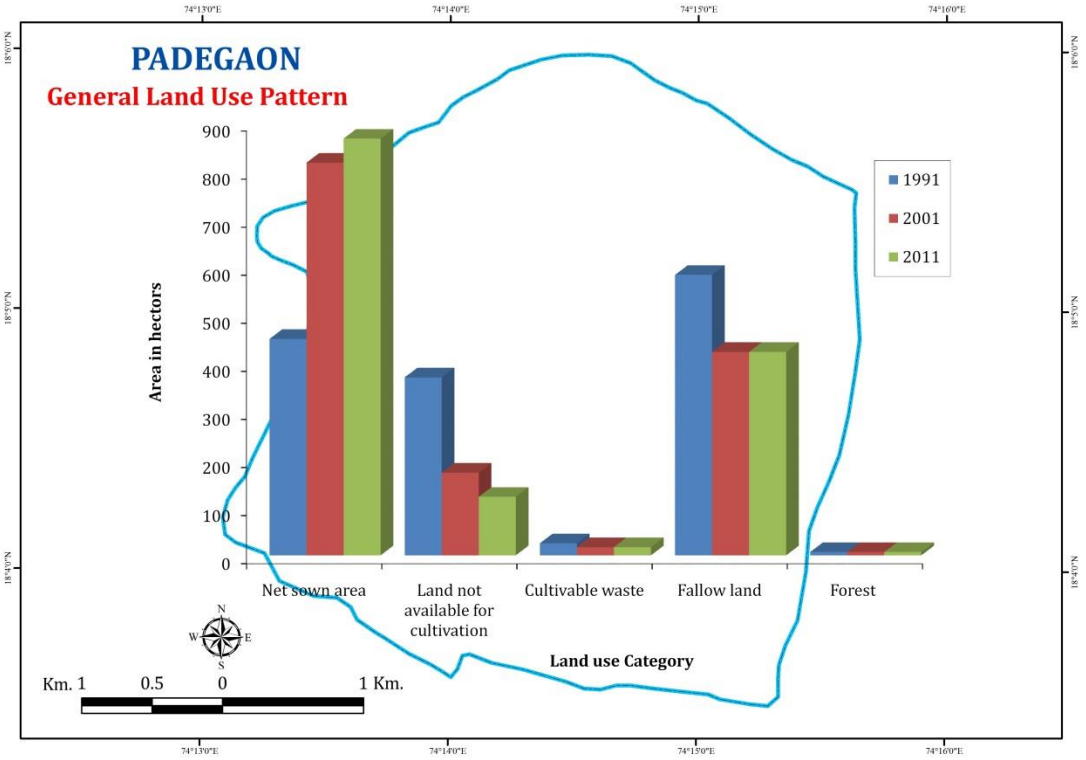


Figure 7.20

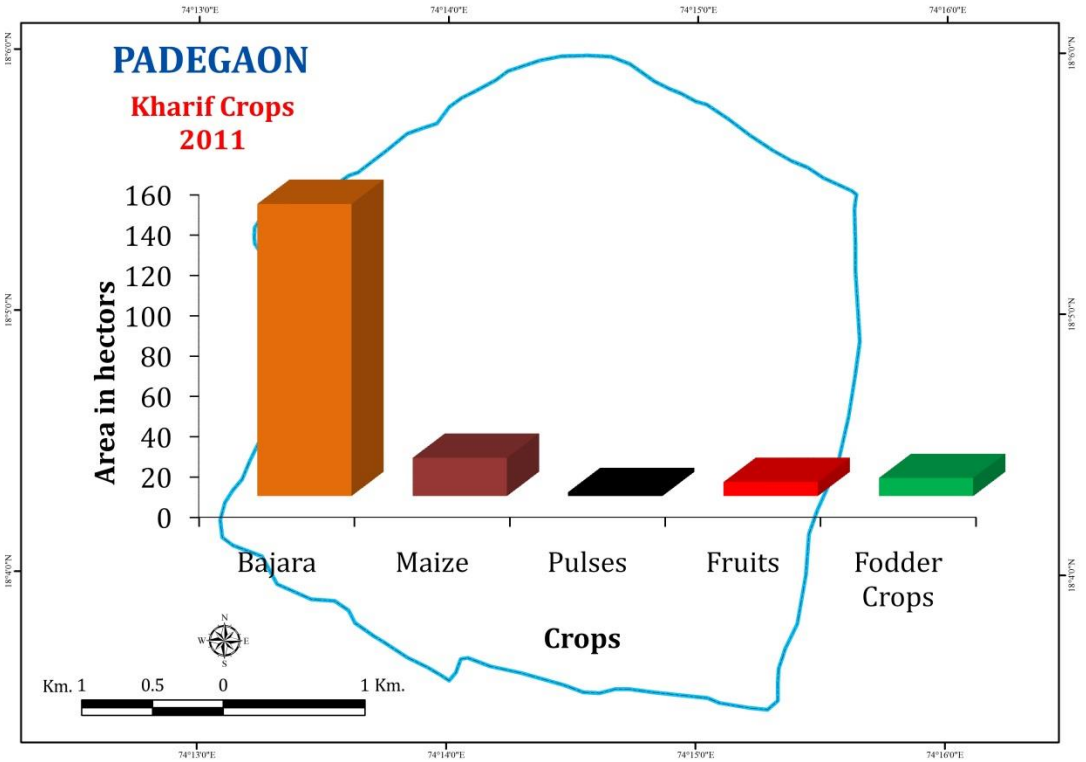
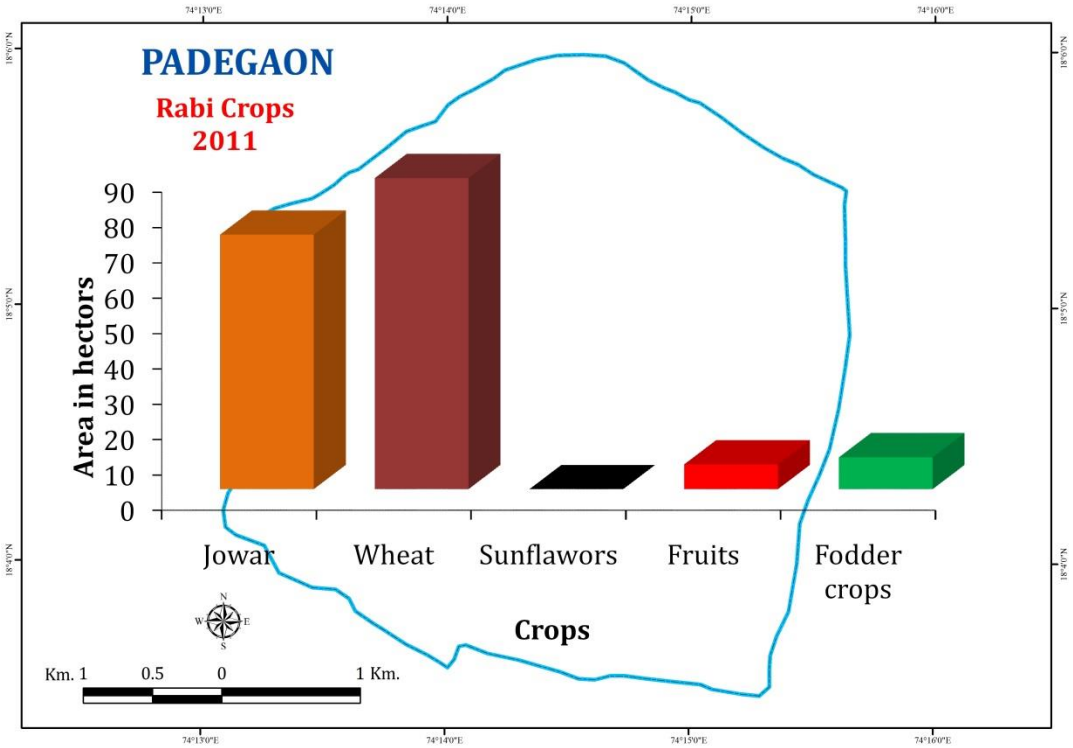


Figure 7.21



Land use and population:

Table-7.12 represents per capita share for different land use categories in Padegaon village. It is observed that per capita land availability is 0.28 hectares. Average net sown area contributes 0.17 hectares per head while double cropped area is 0.02 hectares per head. In Padegaon village, irrigated area is observed to be 0.19 hectares per head. The village is 67 percent irrigated by the Nira right bank canal which flows from the west to the east through the village area. In between the Nira River, which is the north of the Padegaon Gavthan, and the Nira right canal, which is the south of the village, the farm size is very less but very fertile. The Nira right bank canal originates from Veer dam which is constructed across the Nira River in Purandar Tahsil which is 30 kilometres in distance from the village.

The big farmers who have more than 5 acres of land are 1.67 percent of the total farmers in the village whereas 29.95 percent farmers belong to this category of medium farmers who have 2 to 5 acres land. 68.36 percent farmers are small farmers having 1 to 2 acres of agricultural land. The nearest market centre of the village is Nira which is just 5 kilometres from Padegaon village. This village is connected to Nira, Lonand and Pune for commodity transportation. Krishi Seva Kendra is located at Padegaon village. There are 65

tractors available for agricultural practices. There are 123 wells, 28 boring pumps and 6 lift irrigation found in this village. Electrified water pumps are 310 in numbers. The sugarcane production is supplied to the New Phaltan Sugar Works located at Sakharwadi village which is only 8 kilometres from Padegaon village. This sugar factory has turned the traditional agriculture to irrigation based cash crops.

Table-7.12
Padegaon Village
Land Use and Population

Sr. No.	Land Use Categories	Area in hectares	Land Per Head of Population(hectares)
1	Total Village area	1435.17	0.28
2	Net sown area	866.52	0.17
3	Land not available for cultivation	121.74	0.02
4	Cultivable waste	17	0.003
5	Fallow land	423	0.08
6	Forest	6.91	0.001
7	Double cropped area	145	0.02
8	Gross cropped area	1168.96	0.23
9	Irrigated area	968.40	0.19

Source: Village Revenue Record, Phaltan (2010-11).

Occupational Structure:

Padegaon village has witnessed 19.48 percent population growth from 1991 to 2011. In 1991 main workers were 45.01 percent while they are 46.50 percent in 2011. During this period, the percentage of main workers has increased by 1.5 percent. Among the main workers, cultivators have increased by 2.048 percent from 1991 to 2011, similarly agricultural labours have been increased by 16.32 percent but marginal workers have decreased by 0.11 percent. The percentage of other workers has increased by 8.01 percent while non-workers have decreased by 1.38 percent during the study period.

Table-7.13
Padegaon Village
Occupational Structure

Sr. No.	Category	Population						Percent Change
		1991	Percent	2001	Percent	2011	Percent	
1	Total population	4213	100	5070	100	5034	100	19.48
2	Total Main Workers	1896	45.01	2301	45.38	2341	46.50	1.5
	i) Cultivators	663	15.74	911	39.59	912	18.12	3.99
	ii)Agricultural Labours	824	19.56	835	36.28	847	36.18	-7.27
	iii) Other Workers	710	16.85	555	24.11	582	24.86	3.27
3	Marginal Workers	45	1.07	236	4.66	48	0.96	-0.1
4	Non Workers	2272	53.92	2533	49.96	2645	52.54	-1.38

Source: District Census Handbook, Satara District, 1991, 2001 and 2011.

Problems of the Village:

During the field visits and personal interviews with Farmers, Talathi, Gram-Sevak, it has been revealed that similar problems are being faced by the Padegaon farmers in comparison to other sample villages. It was noted that 68 percent farmers have pointed out the water shortage problem during summer season. The Nira right bank canal passes through this area but it does not provide water during summer season as per requirement. This occurs whenever there is less rainfall received in the Nira catchment area. Salinity problems are identified along the Nira river bed because of excessive irrigation by farmers. This land is called *Chopan* locally. Veer dam is constructed across the Nira river. The discharge of water from canal is not regular during summer season. Lack of political support and mismanagement of water distribution are basic reasons. Irregular electricity supply and load shedding are adversely affecting agricultural land use. Here also 10 to 14 hours of electricity load shedding is found which in many ways is affecting irrigation schedule of this village.

Small farmers face the problems of expansion of land cultivation due to high population pressure. It is revealed from the field survey that the northern part in this village has found soil erosion problem. This village belongs to

water scarcity zone of rain-shadow. In order to prevent this, continuous contour trenches and *nalla* banding work are essential for to present soil erosion. During the field visit more than 65 percent house-holders articulated the view that government should provide job opportunity to rural youth and unskilled labours. There is a need to implement employment guarantee scheme for job seekers in this village. The big farmers are facing the problem of non-availability of agricultural labours. Such farmers have to pay more wages to the labour which reduces their profit margin.

7.4 Resume:

Sampling is defined as a technique by which "a part is collected to represent the whole". It yields more comprehensive information and accuracy, thereby saving a lot of time and money. This technique has been used to study and identify agricultural regions in Phaltan Tahsil. The sample size represents the features of the entire population. The cropping pattern in the study area is influenced by factors such as physiographic, soil, climate, irrigation facilities and socio-economic factors. For this purpose, an extensive sampling study has been carried out of four villages of Phaltan Tahsil. These sample villages are namely Barad, Sasakal, Dhaval and Padegaon.

Agricultural area wise Padegaon village is well developed. Barad village and Dhaval village are developing, whereas Sasakal village is placed in the backward category. The percentage of main workers of all the sample villages engaged in agricultural activity is more or less the same i.e. around 45 percent of population. Common soil types found in all the sample villages are Sandy loam, Sandy clay loam, Silt clay and Clay soil. The main source of water for these villages is the Nira River and the Nira right canal. During the study period, it has been found that Barad village has shown a great amount of increase in the net sown area having 32.87 percent when compared to other sample villages.

Padegaon village has the least total land per head of population i.e.0.28 hectares. Bajara and Jowar are the major crops of Barad village, Dhaval village and Sasakal village, whereas Sugarcane is the major crop of Padegaon village. Phaltan is the nearest accessible weekly market centre for these villages. Apart from Phaltan, Lonand is also a nearby weekly market centre for Padegaon village. Vegetables and fruits are sent to Pune by road. Some of the

common problems of these villages are shortage of water, heavy load shedding and soil erosion to some extent, unemployment and lack of financial support from government.

7.5 References:

1. Bureau of Economics and Statistics, Government of Maharashtra Socio-Economic Review and District Statistical Abstracts of Satara District, (1991, 2001 and 2011).

2. Department of Agriculture office, Phaltan Taluka.

3. Department of Agriculture, Phaltan Taluka office, Phaltan, Namuna No. 20.

4. District Census Handbook, (1991), Published by the Director, Government Printing Press and Stationary, Maharashtra State, Bombay.

5. Ghodake, Balasaheb, (2006), "The Planning and Development of Agrcultural in Daundtahsil", Unpublished Ph.D. Thesis, University of Pune.

6. Government of Maharashtra (2011), "Maharashtra State Gazetteers Satara District".

7. Government of Maharashtra, (2011), Maharashtra State Gazetteers Satara District.

8. Husain, M, (1979), "Agricultural Geography", Inter India Delhi, pp.114-155.

9. Kasid, D.L., (2010),"Study of Agricultural Productivity in Sindhudurg District", (1981-82 to2005-06), Unpublished Ph.D. thesis, submitted to the Shivaji University, Kolhapur.

10. Patil,S., (2012), "Spatio Temporal analysis of Agricultural Land use pattern in Pune District", unpublished Ph.D Thesis Submitted to T.M.V. Pune.

11.Shafi, M., (2006), "Agricultural Geography", Pearson Education, PP.99-100.

12. Singh, J. and Dhillon, S.S., (1984), "An Agricultural Geography", Tata-McGraw-Hill, Publishing Company Limited, New Delhi.

13. Socio-Economic Abstract of Satara District, (2011).

14. Vaidya, B.C., (1997), "Agricultural land use in India",Manak publication pvt.ltd, New Delhi.

CHAPTER-VIII
SUMMARY AND CONCLUSION

8.1 Summary

8.2 Problems and Strategy

8.2.1 The Eastern part of the Phaltan Tahsil

8.2.2 The Western part of the Phaltan Tahsil

8.3 Suggestions

8.4 Conclusion

CHAPTER-VIII
SUMMARY AND CONCLUSION

8.1 Summary:

Agriculture, with its allied sectors, is unquestionably the largest livelihood provider in India, more so in the vast rural areas. It also contributes a significant figure to the Gross Domestic Product (GDP). Sustainable agriculture, in terms of food security, rural employment and environmentally sustainable technologies such as soil conservation, sustainable natural resource management and biodiversity protection, are essential for holistic rural development. At 157.35 million hectares, India holds the second largest agricultural land globally. Agricultural exports constitute the fifth of the total export of the country. The country is also the largest producer, consumer and exporter of spices and spice products in the world and overall in farm and agricultural outputs, it is ranked the second. India is the largest producer of Pulses, Milk, Tea, Cashew and Jute and the second largest producer of Wheat, Rice, Fruits, Vegetables, Sugarcane, Cotton and Oil seeds.

Agriculture is the primary source of livelihood for 58 percent of the country's population. In spite of the rapid growth of industries and service sectors in India, agriculture still remains an important economic activity. As per the survey of 2011, the agriculture labour account for 62 percent of the total workers and Maharashtra alone occupies 66.10 percent of the total agricultural labours. Maharashtra occupies 9.36 percent of land area in India 9.30 percent of population, 12.30 percent of net sown area, 11.50 percent gross cultivated area and 4.50 percent of the gross irrigated area. Jowar is the major crop grown in Maharashtra and it occupies 54 percent of the total harvested land, while cotton occupies 33.80 percent and Bajara 12.90 percent. Nearly 13 percent of the total harvested area under sugarcane is occupied by Maharashtra. In the past, vast research has been carried out at both national and at state level to study various aspects like crop, land use, general land use, crop productivity, problems and prospects of agriculture. Presently there are many such activities being carried out by using modern tools and techniques.

Phaltan Tahsil is selected for the present research work. On the basis of this study, following observations have been made for agriculture development

in Phaltan Tahsil of Satara district. Climatologically, Phaltan lies in the rain shadow zone of the Western Ghats. Physically, it is located in the Nira and the Banganga basin which are a part of middle the Bhima river basin. There are four types of soils structures found in Phaltan tahsil, deep black, medium black, coarse shallow and laterite. 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 to 500 mm. The study area receives average annual rainfall of 437.66 mm. The mean annual maximum temperature is recorded in the month of May (41℃) while the mean annual minimum temperature is observed in the month of January (10℃). The road transport system is the main support for collecting and distribution various agricultural products. The major district roads and village roads links are Phaltan-Pune, Phaltan-Satara and Phaltan-Baramati State Highways. The total length of Phaltan-Satara State Highway No.61 in the study area is 65 kilometres. Phaltan-Baramati State highway No.60 runs in the northern direction in the study area having a length of 22 kilometres. The total length of Phaltan-Pune State Highway No.70 in the study area is 65 kilometres. The study area is also served by a broad gauge railway line connecting Lonand. However, the railway track stretches only about 20 kilometres. Out of 128 villages in this tahsil, only 40 villages get the benefit of the Nira right canal and the remaining 88 villages depend on uneven rainfall. All these villages fall under the drought prone area and for them the Nira and the Banganga rivers are the main sources of water.

Phaltan Tahsil like other regions has also witnessed a steady growth of population. The growth rate of population from 1991 to 2011 is 25.31 percent and the main reason behind this is the agro-industrial development. In 1991, the population of Phaltan Tahsil was 273451 and as per 2011 census it is 342667. The average density of population is 287 persons per sq.km. as per 2011census. There are thirteen weekly market centres in Phaltan Tahsil, which provide an opportunity to the farmers, consumers, sellers, traders and mediators for exchanging goods. The market centres of Adarki-bk and Wathar-Nim are situated on State highway No. 61 and are easily accessible throughout the year. Sakharwadi market centre has a lean connection with other market centres in the study area owing to its isolated location. Vidani, Pimparad and

Barad market centres are linked with state highways and major district roads and Phaltan town is the largest market centre among these and is well known for cattle and vegetables marketing in the study area. It is found that 91.04 percent of the total working force in Phaltan Tahsil is engaged in agricultural activities among which cultivators account for 41.38 percent and agricultural labours for 29.08 percent. However, the percentage of other workers has increased by 10.10 percent from 1991 to 2011 due to the establishment of small scale industries and the introduction of new industries in Phaltan M.I.D.C. similarly the newly established service sector has also contributed in the increase of other workers.

The temporal variation in land use pattern of the study area has been studied for the period of thirty years from 1991 to 2011 to find out the trend in general land use. It is found that net sown area is steadily increasing from 1991 to 2011. In 1991 the total net sown area was registered as 39199 hectares which account for 32.93 percent of the total available land. After ten years i.e. 2001 it is recorded as 54425 hectares which is 45.72 percent of the available land in Phaltan Tahsil. As per statistics of 2011the total net sown area has been recorded as 69325 hectares which is 58.24percent. In other words the increasing trend in net sown area is found during the study period. This increase is attributed to increasing awareness of improved agricultural techniques and introduction of the use of new improved seeds by farmers. This significant increase in net sown area can also be attributed to the efforts of cultivation in which more land under trees and shrubs etc. was brought subsequently under cultivation. Moreover, increasing awareness and mounting pressure of population on land use pattern has brought this type of land under cultivation. The highest net sown area is recorded at Vajegaon which is 95.95 percent in the eastern part in the study area due to deep black soil and irrigation facility, whereas the lowest has been identified at Dhumalwadi village which is 9.96 percent.

The land which is not available for cultivation has steadily declined from 1991 to 2011 in the study area. The total decline during the study period is 23.19 percent. Non-agricultural land has been substantially decreased by 0.10 percent from the period of 1991 to 2011. 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. The study of data collected indicates that there is a tendency of farmers in Phaltan Tahsil to bring more and more land under cultivation. The famers have brought the waste land under cultivation. This cultivation waste land 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. Similarly it is noticed that cultivable waste land in Phaltan Tahsil is increased slowly in study period it is increased from 3697 hectares in 1991 to 3810 hectares in 2011. Fallow land in Phaltan Tahsil in 2011 covered 23009 hectares which is 19.33 percent of total area. In 1991, this land was 25493 hectares having21.41 percent. This indicates the changes in the area under this category as farmers want to use every piece of land for growing crops in the study area. Phaltan Tahsil has 10770 hectares land under forest accounting for 9.04 percent to total geographical area in 2011. Forest coverage has shown decreasing trend of 0.11 percent from 2001 to 2011.

The temporal variation in cropping pattern of Phaltan Tahsil is studied from 1991 to 2011. It is found from study of data crop of jowar shows a steady decline during the study period from 1991 to 2011 by 4.20 percent of total aerial extent. It is also towards the west and the eastern parts of Phaltan Tahsil. it is also revealed that the percent of sugarcane cultivation has been increased by 0.32 percent towards the west and the eastern part of Phaltan Tahsil. Percentage of sugarcane cultivation has been revealed that Wheat, Fruits and Vegetable crops have also shown increasing trend during the study period. Increasing irrigation facility is the main cause of this change in the study area. On other hand decreasing trend is seen in cultivation of crops like Bajara, Fodder crops, Maize and Pulses. The total increase in cultivation of Bajara crop is 3.80 percent from 1991 to 2011. The variation in land use relates to the extent of these ten crops with soil characteristics, irrigation, relief, proximity to the market places and accessibility. The relationship among these factors is well established through agricultural land use analysis of the study area.

Jowar is identified as the first ranking crop in Phaltan Tahsil occupying 40.95 percent of the total area. This crop is mainly concentrated in the north and the eastern part due to inadequacy of irrigation, undulating topography and

soil retentively. Sugarcane occupies the second position after Jowar which is cultivated on 10.97 percent of net sown area. Wheat also has concentration in the north on fertile, black and deep soil which favours its cultivation. Its percentage is 7.98 of net sown area. Bajara is sown on 11457 hectares accounting for 20.79 percent to net sown area. The distribution of this crop is influenced by the amount of rainfall, terrain characteristics and soil types. Fodder crop occupies 0.46 percent of the net sown land and its cultivation is found in the areas where dairy farming and livestock raising activity is developed. It is found in the northwest, the northeast and the central parts of the study area. Sunflower cultivation covers 0.21percent of net sown area while Pulses were cultivated on 5.96 percent of net sown area. Fruits and Vegetables contribute 1.65 percent and 5.25 percent respectively of net sown area. Among all the factors, it has been noted that soil, irrigation facilities and proximity to the market centres control the spatial-temporal distribution of crops in the study area.

Ranking of crop reveals the relative strength of ten crops percentage at village level which was taken into consideration for computing crop ranking. These ten crops are namely Jowar, Bajara, Wheat, Sugarcane, Maize, Fruits, Fodder crops, Vegetables Sunflower and Pulses. The cultivation of these crops is the result of soil types and irrigation besides farmer's decision. The ranking obtained for all these crops show the relative significance of individual crop in cropping pattern. Jowar, Bajara and Sugarcane have been identified as the first ranking crops in the study area. Jowar is the major crop which occupies as the first rank and is found to have largest coverage in 53 villages occupying 43.75 percent of net sown area in the study area. The application of Rafiullah's method shows the realistic picture of crop combination. Out of the 128 villages under this study area, Monoculture is observed in 119 villages. Jowar, Bajara and Sugarcane are the monoculture crops in 119 villages. Jowar is cultivated in 53 villages while Sugarcane is cultivated in 42 villages; Bajara is cultivated in 27 villages of Phaltan Tahsil. Two crop combination regions have been found in the study area. Two crop combination regions have been observed in 9 villages. Jowar, Sugarcane, Wheat and Bajara are included two crop combination region. These crops are cultivated on irrigation.

The crop diversification has been computed by applying Gibb's Martins Index formula. The result of crop diversification established relationship with physical and socio-economic conditions. The high crop diversification is found on 8839.62 hectares in 20 villages in Phaltan Tahsil its percent is 12.75. Moderate crop diversification is noticed in 90 villages of Phaltan Tahsil. Moderate crop diversification area is of 49078.28 hectares having 70.80 percent which has the largest coverage area in Phaltan Tahsil. The low crop diversification is observed on 11403.97 hectares having 16.45 percent in 18 villages of the study area.

The population is rapidly increasing and this rapidly increasing population needs the food 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. In Phaltan Tahsil, among all crops, the productivity shows increasing trend from the south to the north. In the southern part, due to adverse relief condition, coarse shallow soil and non-availability of irrigation has led to low productivity. So there is a need to provide financial support and integrated efforts for the development of agriculture to reduce regional disparities in Phaltan 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 productivity data, the data of each crop was collected during the field work both on yield and acreage basis for the selected villages. This data has been utilized to obtain crop productivity index for the following four sample villages: Barad, Sasakal, Dhaval and Padegaon. The highest jowar productivity has been found in Padegaon village. Its index of productivity is 140.73. The lowest jowar productivity is observed in Sasakal village its index productivity is 73.12. The highest productivity of bajara has been recorded in Padegaon village its index of productivity is 122.90. The lowest productivity is seen in Dhaval village its index of productivity is 83.87. The highest wheat productivity has been noticed in Padegaon village its index of productivity is 121.45. The lowest productivity has been found in Sasakal village its index of productivity is 72.87. The highest productivity of sugarcane

is observed in Padegaon village its index of productivity is 107.64. the lowest is found in Sasakal village its index of productivity is 78.93.

It is noticed that the spatial distribution of variable and agricultural development is not uniform in Phaltan Tahsil. It provides very significant information about level of agricultural development. The study highlights that the majority of tahsil comes under high development of agriculture. It is observed that agriculture is not developed in three revenue circles i.e. in Phaltan circle, Vidani circle and Barad circle and their productivity is low. For the development of agriculture, there is a need to provide proper irrigation facilities and its absence is hindering for the agricultural development of these revenue circles. The study also highlights the impact of location and agricultural productivity on agricultural development planning for Phaltan Tahsil.

8.2 Problems and Strategy:

On the basis of physiography, soil types, irrigational facility, transport, population density and geographical variations, the total area was divided into the eastern part and the western part area. These areas were studied to find out the problems and the solutions are suggested for better planning at the micro level.

8.2.1 The Eastern part of the Phaltan Tahsil:

The eastern part of the Phaltan Tahsil covers two revenue circles i.e. Barad and Vidani circles. The eastern part of the Phaltan Tahsil has 57 villages with low density of population and it has maximum land coverage under fallow land. It is noticed that the eastern area has rugged topography and it extends from the south to the north having steep slope towards the north. It has a coarse shallow soil having low moisture retentively. Irrigation facilities are least and hence the productivity is also less.

Problems:

After analysis of data the following problems have been noticed-

1. First problem is of quality of soil, the kind of soil is very important for the agriculture yield. The coarse soil has low yield and fertile soil has high yield.
2. The second problem of region is cultivation of jowar and bajara on the largest area of the tahsil. Jowar and Bajara are the only food

crops which dominate the area creating monoculture cropping in the study area.

3. The lack of proper irrigation facilities is the third problems in study area. Irrigation facilities are very important for development of agriculture in any region. There is lack of irrigation facilities in Phaltan Tahsil. It has made the farmers to depend on rainfall which results in reduction of agriculture yields.
4. It is noticed that there is no good infrastructure available in Phaltan Tahsil which is fourth problem. The area where road network is good can develop rapidly. The road network in the study area is very poor and hence the development of this area is hampered and confined.
5. The fifth problem is lack of agriculture market centres in Phaltan Tahsil. The market centres are very important to exchange goods and money. There are lacks of market centres in Phaltan Tahsil. It is problem of lack of market centre that limits the setting of agricultural product.
6. Last problem found is shortage of drinking water. There is shortage of drinking water in Phaltan Tahsil because it belong drought prone area. Shortage of drinking water is the major problem of this area it affects the farmers in this area.

Strategy:

1. This is scarcity zone where the watershed management works such as minor irrigation schemes, percolation tanks; contour bounding etc. should be taken up to overcome the problem of scarcity of water.
2. To save water and to bring maximum area under irrigation, modern irrigation facilities like Drip system, Sprinkler system etc. should be installed and the Government should provide adequate subsidies to the farmers in this area to install such modern irrigation facilities
3. In order to get more water agricultural water tanks should be constructed so as to facilitate new crop systems in this area.
4. People in the study area should be given the knowledge of rain water harvesting and rain water harvesting project should be encouraged

and implemented with the help of the Panchayat system and Government schemes.

5. 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.
6. The agro based industries should be encouraged. To help the region to develop economically the Government should take steps to convert fallow land into social forestry region which would support agro-based industries like dairy, poultry, piggery, goat and sheep rearing, organic farming etc.
7. The roads are very important for development of agriculture and improve infrastructure. Government should give priority to construct all weathered roads to increase easy access to market centres and the surrounding regions.
8. Easy access to market centres which play very crucial role in development of any region. New market centres should be created in the northern part of the Tahsil so that farmers may purchase agricultural raw material like seeds, fertilizers, equipment's etc. and which will also provide market facility to the agriculture commodity of the farmers in this area.
9. Today the development of the farmers and agriculture depends on the modern scientific methods of farming. Government should start agricultural counselling centres which give the knowledge to farmers about the farming. Agricultural Counselling Centres should be opened in these areas to facilitate the use of scientific methods and knowledge among farmers.

8.2.2 The Western part of Phaltan Tahsil:

The western part of Phaltan Tahsil is mainly agrarian land having 53.80 percent of the net sown area of the total geographical area. This area covers two revenue circles viz. Phaltan and Taradgaon circles. It covers 71 villages having high density of population and topography with deep fertile soil and high agricultural productivity. This area is drained by the Nira River and its tributaries. The Nira River lies in the northern part of Phaltan Tahsil. The Nira and the Banganga rivers are non-perennial. The river Banganga flows towards

the south to the north and it joins the Nira River in the northern part of Phaltan Tahsil. This area exhibits a rolling plain and its slope is in the north and the north-east direction.

Problems:

1. Irrigation is the boon to the farmers if it is used properly. If it is used recklessly it is curse. The reckless use of water to the land is called over irrigation. Over irrigation is the problem it affects agriculture yields and creates salinization of soil. The crop productivity is badly affected in this area due to salinity of soil. The farmers in Phaltan Tahsil have used water for irrigation recklessness' and it has created salinity of soil. It is great problem today in Phaltan Tahsil.
2. Today the processes of salinization have acquired greater speed. But the farmers in this region are not serious about this problem. They are neglecting it and they are seen to be reluctant to take any measures to stop the process of salinization. Such negligence to the problem of salinity of soil affects the productivity. This indifference to the salinity of soil is problem.
3. The negligence of the farmer to the salinity of soil has led to another sever problem. The salinity of soil has affected the quality of drinking water is polluted. Due to salinity of soil drinking water is polluted in this region. It has created health of problems of people living this area.
4. Due to slopes in this area soil is eroded. It leads the problem of soil erosion.
5. Non availability of market in region is a problem which hampers the progress of agriculture.
6. Due to hilly and remote area, there is no network of better roads in this region.
7. The quality of land affects the income of the farmers in the region. The income generated from the farming is inadequate and insufficient to meet their needs.

Strategy:

1. To stop reckless use of water farmer should use modern techniques of irrigation such as drip irrigation and sprinklers.

2. The process of salinization can be stopped. The problems of salinity of soil could be solved by preparing deep trenches in the agricultural fields to save the fertility of soil and the water.
3. Another strategy to stop the process of salinization is the rotation of crops. The rotation of crops will allow regaining soil fertility. This is mainly applicable for Sugarcane belt in this zone. The Sugarcane may be replaced for short duration by crops like Sunflower, Maize, Pulses and Vegetables which will reduce the pressure on soil.
4. The salinization of soil can be decreased by the proper use and management of water supply to the crop. Appropriate use and management of water through irrigation can reduce the salinization of soil.
5. To stop the pollution of drinking water the farmer should stop over irrigation use of chemical fertilizer and pesticide. They should stop use organic fertilizers which could stop pollution and quality of drinking water.
6. The speedy movement of perishable agriculture goods is essential to reach the goods to market place in time. For this better roads and infrastructure is essential because the agriculture produce needs better road network for speedy movement of agricultural goods.
7. The subsidiary activities of the agriculture should be encouraged to get additional income the subsidiary activities like dairy and poultry can be encouraged to get more income and to the region prosperous one.

8.3 Suggestions:

a) 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.
b) For the conservation of soil, the work of tree plantation should be under taken. To conserve and reclaim the clean and marshy soil, water loving plants like castor and eucalyptus should be planted in this area.
c) The cultivation of sugarcane is very harmful to the soil. To solve this problem, cultivation of fruit crops should be encouraged. The cultivation of Sugarcane crop should slowly be changed or replaced by

vegetables and fruits as there is greater demand in the market for vegetable and the fruits such as Grapes, Mangoes and Pomegranate in the study area.

d) There is lack of good village roads in the eastern and the western areas of Phaltan Tahsil. So the village roads should be constructed in the eastern and the western regions to mobilize agricultural resources from rural villages to market places and urban settlements.

e) Sub market centres should be developed to link small villages for purchasing agricultural inputs like agriculture equipment's, seeds, fertilizers, insecticides and pesticides in the east and the west regions for speedy development.

f) In order to improve economic condition of farmer subsidiary activities like dairy, poultry along with household activities should be introduced. This activity should be started in the southern part of the study area which would help to provide additional income and jobs for youth of rural area.

g) Watershed management works namely, minor irrigation projects, contour bounding, nalla banding, continuous contour trenches (C.C.T.) etc. should be introduced in northern region for conserving water and soil fertility. This would also help to increase the ground water table level.

h) The fallow land lying in the south should be utilized for planting trees under social forestry programmes.

i) To encourage dairy and to save milk from spoiling, chilling milk plants should be installed in the interior parts of the eastern and the western regions.

j) Floriculture can be sources of earning money to the farmers in Phaltan Tahsil. So floriculture activity should be introduced in the study area as there is an increasing demand of flowers throughout the year from the markets in Phaltan city and regions nearby Phaltan such Baramati, Pune etc.

8.4 Conclusion:

1. The first chapter deals with the objectives of study, review of literature, sources of data, methodology and limitations of the study. Phaltan Tahsil lies

between 17º 58´North to 18° 9´ North latitudes and 74° 10´ East to 74° 45' East longitudes. It is located at an altitude of 576 meters above mean sea level. The Phaltan tahsil lies in the eastern part of Satara district of Maharashtra. The study area is drained by the Nira River and its tributary-the Banganga. The study area consists of 129 villages and has 342667 populations (Census 2011). Population density is 287 people per square kilometres as per 2011 Census. The study area is mainly agrarian having 58.24 percent net sown area of the total geographical area. Primary and secondary data have obtained for 128 villages through questionnaires, interviews and data collected from Agriculture Department of Phaltan Tahsil. The data collected was then converted into percentage. Rafiullah's crop combination technique was applied to compute crop combination regions. Gibb's Martin Index had been applied for the Crop Diversification and computed for 128 villages in Phaltan Tahsil. Enyedi's Method was chosen to compute Crop Productivity for selected villages of Phaltan Tahsil.

2. Phaltan Tahsil has been characterized by the spatial variations in the physical factors which influence the development of Agricultural. In terms of climate, the study area is hot and dry throughout the year except from July to October. During this period, relative humidity is high. Rainfall occurs during short spells of high intensity. Because of such intensities and short duration of rain, most of the rain falling on the surface tends to flow away rapidly, leaving very little for the recharge of ground water. Most parts of Phaltan, Vidani, Taradgaon and Barad revenue circles experience water shortage for domestic and agriculture use every year. The "Deccan traps" present in the area are mainly basalts, generally uniform in composition and dark grey in color. Drainage in Phaltan Tahsil is greatly influenced by relief formed by sub Mahadeo hills mostly located in southern side of Tahsil. The River Nira and the Banganga form the main drainage systems in the area.

The soil of the study area derived from the Deccan trap. Medium black fertile soils rich in nitrogenous content are present in the Nira River valley. The southern part of Phaltan, Vidani, Taradgaon and Barad revenue circles has found to have shallow black and laterite soils, locally known as *Murmad*. These are well drained soils for fruit plantation, as they are light in nature but lack in nitrogenous content. Phaltan Tahsil records an average population

density of 287 persons per square kilometer, however, the Nira right bank canal (Northern region) tracts of this tahsil have supported most population number where the density of population is relatively more than southern hilly region. From the North to the Southward region population density has shown a decreasing trend. The dry months are characterized by acute shortage of water for drinking, domestic and crops as they receive insignificant amount of rainfall. In summer season, many villages in the southern hilly track face the problems of drinking water.

3. The discussion in above mentioned parts reveals spatio-temporal distribution of general land use in Phaltan Tahsil. During 1971 to 1991 and in later decades, net sown area is on declining trend. There is an average 12.79 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 cultivation waste is being used by the farmers for cultivation for growing crops. Moreover, increasing awareness, and mounting pressure of population land use pattern has brought this land under cultivation. The net sown area is steadily increasing since 1991 to 2001. It is seen from 32.93 percent (39199 hectares) area was under cultivation in 1991 and it has been stepped to 45.72 percent (54425 hectares) area under cultivation in 2001, registering an increase by 12.52 percent. This increase may be attributed to increasing awareness of improved agricultural techniques and introduction of use new improved seeds by farmers. The highest net sown area is recorded at Vajegaon (more than 95 percent) in the eastern part of the study area due to deep black soil and irrigation facility, whereas the lowest net sown area has been identified at Dhumalwadi village (9.96 percent). Non-agricultural land has been substantially decreased for the period 1991 to 2011. More land which has been put to non-agricultural use in the past brought under cultivation in the study area whereas barren and uncultivated land could not be brought under cultivation being *'barad'* soils because this soil is very poor in humus and naturally. It is less fertile. Cultivable waste has increased in the study area.

The general trend of decline in fallow land towards the north due to existence of fertile soil rising for cultivation. Forest cover is declining slowly

(0.11 percent). All the categories in the general land use have direct impact on the net sown area and hence this distribution is of prime importance.

4. The spatio-temporal analysis of ten selected crops has been studied in this chapter. The study area, being the semiarid and drought prone. It does not show considerable fluctuation as far as the aerial extents of these crops are concerned. The cultivation of jowar crop during the study period has increased. The maximum hectares of jowar declined in 2011 by 4.2 percent to total aerial extent of the study area. While sugarcane percent is increased in the north and the central parts. Sugarcane, bajara, wheat, fruits and vegetable crops have shown increasing trend during study period, due to rapid increase in irrigation facility in the study area. In Phaltan tahsil cultivation of fodder crops, sunflower and pulses show slightly decreasing trend. From 1991 to 2011 the total area under bajara cultivation in Phaltan tahsil is increased by 3.80 percent.

The spatio-temporal land use pattern of ten major crops namely jowar, bajara, wheat, sugarcane, maize, fruits, fodder crop, vegetables, sunflower and pulses have studied in this chapter. The increasing trend is found in area under wheat, sugarcane, fruits and vegetables cultivation while pulses sunflower, fodder crops show declining trend from 1991 to 2011 due to uneven rainfall distribution, relief, irrigation and distance from market, transportation and urbanization in the study area. In 1991 jowar has occupied first rank it was grown on 45.15 percent net sown area. In 2011, Bajara is another dominant crop after jowar. It is cultivated on 20.79 percent net sown area in the study area and it has increased by 3.8 percent during the study period. Wheat has increased by 1.15 percent during the study period.

Area under cultivation of fruits is found to be increased by 0.18 percent because of inclination of farmers to promote horticulture. A fodder crop occupies 0.46 percent net sown area, vegetables and sunflowers are cultivated on 5.25 percent and 0.21 percent respectively in 2011. Area under vegetables and pulses show slight increase by 0.19 and 0.07 percent respectively while area under cultivation of sunflower has decreased by 0.45 percent. The major controlling factors for changing the spatio-temporal land use in the study area are soil types, irrigation, rainfall distribution, transport and proximity of market centres.

5. In order to attempt an exposition of agricultural land use pattern in Phaltan Tahsil, village has been considered as unit for studying crop ranking, crop combination and crop diversification regions. Three crops have been identified as first ranking crops. These crops are Jowar, Bajara and Sugarcane. Jowar is the major crop and it is in first rank. It is found to have the largest coverage in fifty villages occupying 45.84 percent of net sown area in the study area. The application of Rafiullah's methods shows the realistic picture of crop combination. Monoculture crops are found in 119 villages. Jowar, Bajara and Sugarcane entered in this combination.

It is Jowar which is cultivated in fifty villages in the study area. Sugarcane is cultivated in forty-two villages and Bajara is cultivated in Twenty-seven villages in the study area. Two crop combination regions have been observed in nine villages. Sugarcane and Wheat are grown in this area on irrigation in three villages. The crop combination has been computed by applying Gibb's-Martins Index formula. The results of crop diversification establish relationship with physical and socio-economic conditions. High crop diversification is found in the twenty villages. Moderate crop diversification is observed in the ninety villages. It is the largest area of 49078.28 hectares in Phaltan Tahsil. The moderate diversification of crop covering almost 70.80 percent of gross cropped area is an indication of agricultural development in the study area.

6. The production aspect is an important indicator of agricultural development. Productivity is an important tool required for better planning and development. The figures obtained from this study area indicate that the productivity is higher in plain region and at the base of Shambu Mahadeo hills due to availability of plain land, irrigation, plateau land and intensive cropping pattern. The study of the Productivity of Jowar showed an increasing trend from the southern part to the northern part of Phaltan Tahsil. The highest Jowar productivity has been observed in Padegaon village while the lowest was observed in Sasakal village. But an inverse trend has been seen in case of Wheat production. It showed an increasing towards southern side. The highest Wheat productivity has been observed in Padegaon village while lowest was seen in Sasakal village due to silt land. Productivity of Bajara is higher in the north-western and the eastern part of study area. The highest productivity of

Bajara has been recorded in Padegaon village and while the lowest was seen in Dhaval village. The highest productivity of Sugarcane was seen in Padegaon village and the lowest in Sasakal village. This variation in productivity of Sugarcane is a result of various factors like topography, irrigation, farming methods etc. Due to small land holdings, most of the agricultural practices are done manually without using the modern techniques thereby affecting the productivity in the study area.

The spatial distribution of variables and agricultural development is not uniform in Phaltan Tahsil. This provides very significant information about the level of agricultural development. The study highlights that the majority of tahsil comes under low level agricultural development which is mainly located in the north-west and the western part of the study area. Amongst the four circles, agriculture is not developed in Phaltan circle, Vidani circle and Barad circle. This is due to non-industrialization, rugged topography and poor irrigation facilities. Taradgaon circle is found to be highly developed amongst these four circles. There is an urgent need of implementing and improvisation of irrigation facilities which is hampering the agricultural development of Phaltan circle, Vidani circle and Barad circle. The study also highlights the impact of location and agricultural productivity on agricultural development planning for the study area.

7. Phaltan Tahsil is drought prone area in Satara District. It also belongs to rain shadow region in Satara district where mean annual ranges between 400 to 500 mm. The study area has varied topography covering 58.24 percent of fertile land area. In addition to Jowar, Wheat and Sugarcane is highly valued and most cultivated crops in Phaltan Tahsil. It is the prime raw material for sugar industry in this study area. The fertile soil and irrigation have added for higher production of Sugarcane. Due to the proximity to Satara and Pune, the study area benefits in many folds and tries to improve the variety of seeds and production too. This has resulted into new planning strategy to improve and increase the yield from the land. Phaltan Tahsil is rapidly industrialised. Many agro based industries have been set up recently in Phaltan and Lonand M.I.D.C. Newly set-up industries like Wine Park, Dairy products etc. would significantly contribute in the overall Agricultural development of the study area. Innovative ideas of farmers and availability of capital for better land use

has resulted into rational land use. Research and Development activities, Case studies, Surveys, Awareness Programmes, Knowledge centres, Marketing and Promotion of the agricultural goods etc. may attract the attention of farmers and administrator to look into this sector with a different perspective. Thus, there is a broad scope for research, exploration, expansion, modernization and intensification of agricultural activities in Phaltan Tahsil.

BIBLIOGRAPHY

1. Adnaik N. S., (2005), "Spatio-Temporal Changes in Agricultural Productivity in the Drought Prone Region in Maharashtra State: A Geographical perspective", Unpublished Ph.D. Thesis submitted to Shivaji University, Kolhapur, Pp.91-102.
2. Agalave, P, (2000), "Research Methodology and Techniques", First edition, Vidya Publishing, Nagpur, PP. 423-425.
3. Ahmad, A. and Siddiqui, M. F. (1967),"Crop Association Pattern in the Luna Basin", Geographical Review of India, Vol. 14, Pp. 69-80.
4. Ali Mohammed, (1978), "Studies in Agricultural Geography", Rajesh Publications, New Delhi, pp-1-6.
5. Ali, M., (1978), "Studies in Agricultural Geography", Rajesh Publication,
6. Ali, Mohammad, (1978), "Studies in Agricultural Geography", Rajesh Publication, New Delhi.
7. Ali, Mohammad, (1979), "Dynamics of Agricultural Development in India", (Ed.), Concept Publication, Private Company, New Delhi.And II".
8. Arsud, S. S., (2000), "Characterizing Agro Climatic Environment of Bhima Basin"; Unpublished Ph.D. Thesis, University of Pune.
9. Aslam Mohmood, "Statistical Methods in Geography."
10. Ayyar, N.P. (1969), "Crop Regions of Madhya Pradesh-A Study in Methodology", Geographical Review of India, March, Pp. 1-19.
11. Baker, O. E., (1926), "Agricultural Regions of North America", Economic
12. Baker, O.E., (1926), "Agricultural Regions of North America", Economic Geography, (1932), pp.325-377, (1933), pp. 167-197.
13. Bansil P.C., (1998), "Water management in India", Concept Publishing Company, New Delhi.
14. Barlowe, R, (1963), "Land Resources Economics", Prentice Hall, Englewood Cliffs p.1.
15. Behead, N.K., (2005), "Present Status and Future Prospects of Agricultural Development in Pangoli Basin of Gondia District (M.S.), A Geographical Study", Unpublished Ph.D. Thesis, Nagpur University, Nagpur, pp. 14-17.

16. Bhatia, C. S., (1981), “Changing Land use and Cropping Pattern in Bihar”, Perspective in Agricultural Geography, Concept Publication, New Delhi.
17. Bhatia, S. S., (1965), “Pattern of Crop-combination and Diversification in India”. Economic Geography, pp- 40, 41, 53, 54.
18. Bhatia, S.S., (1965), “Pattern of Crop-combination and Diversification in India”. Economic Geography, Vol. 41, No. 1, pp. 38-50.
19. Bhatia, S.S., (1967), “A New Measurement of Agricultural efficiency in Utter Pradesh (India), “Economic Geography”, Vol. 43, No. 3, P.P. 244-266.
20. Bunting B. T., (1967), “The Geography of Soil”, Hutchinson, London.
21. Chandana R.C. and Sindhu M.S., (1980), “Introduction to population Geography”, Kalyani Publishers, New Delhi.
22. Chatterjee, (1952), “Land utilization survey of Howrah Districts”, Geographical Review of India. Vol. 14, No, 13.
23. Chowdaian C., (2001), “Productive land and its Misuse: A comparative analysis of Big, Small and Marginal farmers in Mysore District”, The Deccan Geographer, vol. 39. No.1-p-76
24. Cole,J.P, and King ,A. M, (1968), “ Quantitative Geography”, John Hilley and Sons,London PP. 176-178.
25. Cop pock, J. T. (1964), "Crop Livestock and Enterprise Combinations in England and Wales”, Economic Geography, Vol. 40, PP. 65-77.
26. Datye, V.S., (1983), “Spatial Analysis of Agricultural Land Use in Pune District”, Ph.D. Thesis (Unpublished), Department of Geography, University of Poona, pp. 17-22.
27. Desai S. D., (1971), “The Geology of Deccan Trap Formation of Sourashtra”, Journal of the Sayajirao University of Baroda, vol. 14, page 1–11.
28. Deshmukh Ram,(2005), “Fundamental Statistics”, Vidya Prakashan, Nagpur, pp.213, 214.
29. District Socio-economic Review and Statistical Abstract, Satara District, 1989,2001,2011,2012.

30. Doi, Kikukazu, (1959), “The Industrial Structure of Japanese Prefectures Tokyo”, proceeding of International Geographical Union, Section of Human Geography, Regional Conference in Japan 1957, pp. 310-316.
31. Eniyedi, G. Y., (1964), “Geographical Types of Agriculture”, Applied Geography in Hungary, Budapest.
32. Freeman T.W., (1968), “Geography and planning”, Hutchinson. University Library, London p.74.
33. Gaikawad, V.P., (2008), “A Geographical Analysis Of Rainwater Harvesting Potentiality In Phaltan Taluka of Satara District (M.S.)”, Unpublished M. Phil. Dissertation, Shivaji University, Kolhapur. Geography, Vol. 2, Pp. 459-493.
34. Gibbs, J.and W. Martin, (1962), “Urbanization, Technology and the Division of Labour: International Patterns”, American Sociological Review, pp.13.
35. Government of Maharashtra (1973), “The Report of the fact finding Committee for survey of Scarcity Areas”, M. S. Bombay.
36. Gujar R.K. & Lakshmi Shukla, (1998), “Water resources, Environment and the people”, Pointer Publishers, Jaipur.
37. Gupta,C.B,(1978), “An introduction to Statistical Methods”, Vikas Publication house, New Delhi.
38. http//www.wikipedia.com
39. http/www.mah.nic.in
40. http://www.indiastat.com
41. Husain M., (1979), “Agricultural Geography”, Inter India Publication, New Delhi, Page –116.
42. Husain, M., (1979), “Agricultural Geography”, Inter India Publication, 105, Anandnagar, Delhi, P. 62-63, 83-87.
43. Husain, Maid, (2004), “Agricultural geography” Rawat Publication, Jaipur.
44. Husain, Masid, (1996), "Systematic Agricultural Geography", Rawat Publication, New Delhi.
45. Jabir Singh and S.S. Dhillon, (2006), “Agricultural Geography” Tata McGraw-Hill Publishing Company Limited, New Delhi.

46. Jackson J.N. (1963), “Survey for Town and country planning”, Hutchinson University Library, London.p-109.
47. Jadhav, M.G., (1984), “Sugarcane Cultivation, A regional survey”, Himalaya Publishing House, Bombay, P.8
48. Jasbir Singh and Dhillon, (1994), “Agricultural Geography”, Rawat Publication, Jaipur.
49. Jasbir Singh,(1974), “An Agricultural Atlas of India-A Geographical Analysis”, Vishal Publication, Kurukshetra, India.
50. Karlekar Shrikant, and Kale Mohan,(2006),“Statistical Analysis of Geographical Data”, Diamond publication, Pune.
51. Karlekar, Shrikant, and Kale, Mohan, (2007), “Research Methods In Geography”, Diamond Publication, Pune.
52. Kashid Dhanaji Lahu., (2011), “Study of Agricultural Productivity in Sindhudurg District, A Geographical Analysis”, A Thesis Submitted To Shivaji University, Kolhapur.
53. Kasid, D.L., (2010), “Study of Agricultural Productivity in Sindhudurg District (1981-82 to2005-06)”, Unpublished Ph.D. thesis, submitted to the Shivaji University, Kolhapur.
54. Kulkarni S. R., (1973), “A post Deccan Trap Volcanic Brcia flow at Satara”, Brecia flow at Satara Bulletin of Earth Science, vol–2, pp. 45-48.
55. Kumar J., (1986), “Land use Analysis: A case study of Nalanda District”, Bihar Inter-India Publications, New Delhi.
56. Lillesand, T, M. and Kiefer R.W., (1987), “Remote sensing and Image Interpretation”, John Wiley and Sons, p-74.
57. McHarg, (1966), “To heal the Earth”, Island press, Washington, Pp. 203-242.
58. Mishra B. N., (1990), “Land utilization and management in India”, Chugh Publication, Allahabad.
59. Monkhouse F.J. and Wilkinson H. R, (1971), “Maps and Diagrams”, London, Methuen & Co. Page–195.
60. NageshwaraRao K. and Vaidyanathan R., (1981), “Land use capability studies from Arial Photo-Interpretation -A case study from Krishna Delta”, India Geographical Review of India, Vol.43, No.3 pp-226-236.

61. Nanavati M.B. and Anjaria J. J., (1951), “The Indian Rural Problem”, Vora and co. Bombay.
62. National Council of Educational Research and Council Statistics for Economics, First Edition (2006), New Delhi, P. 69-71.
63. Ogale, S.B., (2012), “Spatio-temporal Analysis of Agricultural Land use and Productivity of Baramati Tahsil, Pune District (Maharashtra)”, Unpublished Ph.D Thesis Submitted to T.M.V., Pune.
64. Patil, A. A., (2002), “Changes in Agricultural productivity in Upper Bhima and Upper Krishna Basin in Maharashtra-A Geographical Analysis”, Unpublished Ph.D. Thesis submitted to Shivaji University, Kolhapur p.94-102.
65. Patil, S., (2012), “Spatio-Temporal analysis of Agricultural Land use pattern in Pune Dist”, Unpublished Ph. D Thesis Submitted to T.M.V. Pune. Pp 65, 66.
66. Pawar C. T. and Shinde S. D., (1979), “Well irrigation in unplanned district of south Maharashtra region, A spatio-temporal perspective”, Geographical Review of India, vol. 41, No. 4, Page 134-320.
67. Pawar, C.T, (1989), “Impact of irrigation: A Regional Perspective”, Himalaya Publishing House, Bombay, Page-13.
68. Prakash Rao ., V. L. S., (1959), “The Role of Geographers in Land use Planning”, Bombay Geographical Magazine vol. VI-VII, No.2, pp.39-44.
69. Rafiullah, S.N., (1967), “Region, Regionalism and regionalization”, The Geographer, Aligarh, 14/1. pp. 36-37.
70. Rao and Jasbir Singh (1981), “Transformation of Agriculture”, Vishal Publication, Kurushetra, Hariyana.
71. Report on Agricultural Census, (1991 to 2011), “Maharashtra State, Part I Roy B. K., (1968). Op cit.
72. Sapre and Deshpande, V. D., (1964), “Inter District Variations in Agricultural Efficiency in Maharashtra State”, Indian Journal of Agricultural Economics, Vol. 19.
73. Sapre, S.G. and Deshpande V. D., (1964), “Inter district Variation in Agricultural Efficiency in Maharashtra State”, Indian Journal of Agricultural Economics, pp. 242-252.

74. Savanur S. K., (2008), “Research Methodology for Information Sciences”, Universal Prakashan, Pune, pp.145, 146.
75. Shaffi M., (1961), “Land utilization in western U. P.”, published by Aligarh Muslim University, Aligarh.
76. Shafi M., (1960), “Measurements of Agricultural Efficiency in Uttar Pradesh”, Economic Geography, 36 (4), pp. 296-305.
77. Shafi, M. (1972): “A New Approach to the Delimitation of Food Productivity Regions in India”, International Geography Congress Abstract No. 2, Canada, Pp. 756-757.
78. Shafi, M. (1974): "Perspective on the Measurement of Agricultural Productivity", The Geographer, Aligarh, Vol. 21, No. 1, Pp. 1-10
79. Shinde S. B. (1981), “Some Aspects of Agriculture of Satara District: A Geographical Analysis”, unpublished Ph.D. Thesis, Shivaji University, Kolhapur.
80. Shinde S. D., Jadhav M. G., More K. S. and Pawar C. T., (1987), “ Land use pattern and land use capability studies in south Maharashtra’s Western Ghats”, Major Project Report, sponsored by Dept. of Environment and Wild Life, Govt. of India, New Delhi.
81. Sing, J., Dhillon, S., (1976), “An Agricultural Geography of Hariyana”, Kurukshetra, Vishal Publications, pp. 131,135,138,159,187-190.
82. Singh and Dhillon, (1998), “Agricultural Geography”, Tata McGraw – Hill Publications, New Delhi.
83. Singh and Sadhu, (1991), “Agricultural Problems in India”, Himalaya Publishing House, Bombay, Page–59.
84. Singh J., (1974), “An Agricultural Atlas of Indian-A Geographical Analysis”, Vishal Publications, Kurukshetra.
85. Singh Jasbir, and Dhillon, S.S, (1984), “Agricultural Geography”, Tata-McGraw-Hill, Publishing Company Limited, New Delhi pp-14, 15, 62.
86. Singh R. L., (1979), “Element of Practical Geography”, Kalyani Publishers, New Delhi.
87. Singh R.L.,(1968), “Element of Practical Geography”, Students friends, Allahabad.
88. Singh, J., (1976), “Agricultural Atlas of India”, Vishal Publication, Kurukshetra, Haryana.

89. Singh, Jasbir, (1976), “An Agricultural Geography of Haryana”, Kurukshetra, Vishal Publications, pp. 131,135,138, 187-190.
90. Singh, Jasbir, (1982), “Determinants of Agricultural Productivity in Haryana: A Sample study of operational holdings for Lands Use Planning, Kurukshetra”, Vishal Publications, University campus, pp-128.
91. Singh,J.,(1974), “An Agricultural Geography of India: A Geographical Analysis”, Visual Publication Kurukshetra, Harayana.
92. Spate and Learmouth, (1967), “Understanding Monsoon to know its vagaries, Monsoon”, Geographical review American Geographical Society Journal, Vol.57, No.3.
93. Symons, Leslie (1978), “Agricultural Geography”, G. Bell, London.
94. Thomas D., (1963), “Agriculture in the wales during the Napoleonic Wars Cardiff”, University of Wales Press, 1963.
95. Topographical sheet No. 47K/1, 47K/5, 47K/9, 47J/8 and 47J/12.
96. Tripathi R.S and Vishwakarma J.P., (1988), “Land use cropping pattern and development levels in Banda district (U.P.)”, The Deccan Geographer vol. XXVI No.2-3 pp. 417-27.
97. Triwartha G. T. (1970), “A case for population Geography”, A Reader, Ed. Demka, Rose and Schemell, McGraw Hill, New York.
98. Vaidya, B.C., (1990), “Cropping Pattern in the Yashoda Basin”, The Deccan Geographer, Secunderabad, Vol. 28 No.2 and 3.
99. Vaidya, B.C., (1997), “Agricultural land use in India: A study of Yashoda Basin”, Manak publication Pvt. Ltd, New Delhi.
100. Vaidya, B.C., (1997), “Agricultural land use in India”, Manak Publication Pvt. ltd., New Delhi.
101. Vink, A.P.A., (1975), “Land use in Advancing Agricultural Springer Verlag Berlin”, Heidelberg, New York.
102. Wagh, A.S., (2013), “Agro Service Centers and Agricultural Development in Satara District, (1981 to 2001)”, Unpublished Ph.D. thesis, submitted to the Shivaji University, Kolhapur.
103. Weaver, J.C., (1954), “Crop Combination Regions in the Middle West”, The Geographical Review, Vol. 44 No. 2 Pp. 176-181.

Appendix - A
Phaltan Tahsil
General Land use (2011) in hectares

Sr. No.	Name of the Villages	Geog. Area	Net Sown Area	L.N.A. for C.	C. Waste	Fallow land	Forest Area
1	Waghoshi	629.59	140	12.06	8.5	230.01	239.02
2	Vadgaon	456.95	241	6.54	2	96.1	111.31
3	Korhale	551.54	180.27	3.2	5.8	199.1	163.17
4	Wakhari	1545.86	949	260.55	10	310.5	15.81
5	Wathar-nim	2140.9	1500	575.23	3	62.67	0
6	Dhaval	1032.07	532	131.13	5	277.65	86.29
7	Pirachiwadi	228.04	182.59	5	5	24.48	10.97
8	Sherewadi	572.42	350	85.06	15	122.36	0
9	Surawadi	1042.33	700	52.63	17	267.12	5.58
10	Kharadevadi	428.98	305	90.17	10	23.81	0
11	Ghadgemala	343.8	250	16.26	7	70.54	0
12	Nandal	1754.03	1101	35.2	15	362.4	240.43
13	Jinti	1201.42	735	278.68	22	155.38	10.36
14	Phartadvadi	478.63	346	90.76	10	31.87	0
15	Bhilkati	232.18	108	66.52	2	55.66	0
16	Nimbore	812.61	522	44.67	8	222	15.94
17	Dhavlevadi	547.5	319.31	35	15	175	3.19
18	Kashidvadi	327.31	207	42.56	9	60	8.75
19	Vadjal	259.81	124	61.13	2.8	60	11.88
20	Dalvadi	840.4	142	10	23	361.18	304.22
21	Upalave	1342.3	392	39.85	20	191.27	699.18
22	Sawantvadi	552.52	272.52	79	31	170	0
23	Daryachivadi	590.42	410.3	96.12	4	80	0
24	Jadhavnagar	340.48	270	13.98	6.5	50	0
25	Malvadi	1377	464	20.08	28	638.6	226.32
26	Khadaki	622	178	0.47	19	243.64	180.89
27	Mirgaon	1000	726	45.43	43	153.82	31.75
28	Tathvada	2089.38	301.87	10	50	907.19	820.32
29	Manevadi	363.96	201	37.16	11	114.8	0
30	Zadakwadi	412	287	3.79	9	111.66	0.55
31	Hol	770.94	351	157.14	30	232.8	0
32	Sakharwadi	772.6	466	141.1	18.5	147	0
33	Veloshi	441.53	110	15.24	9	172.46	134.83
34	Tardaf	1119.54	710	4.8	12.5	253.24	139
35	Miryachiwadi	540.24	350	32.31	17	140.93	0
36	Pharadvadi	492.28	253	217.14	9	13.14	0
37	Thakurki	965.29	695	210.2	34	12.35	13.74
38	Tawadi	469.73	323	10.64	15	9.32	111.77
39	Barad	2281.45	1721	59.19	85	360.35	55.91
40	Shereshindevadi	714.95	477	66.7	50.7	120.55	0
41	Nimbalak	1243.87	989	14.72	75.3	154.78	10.07
42	Mathachivadi	923.85	650	200.85	73	0	0
43	Pimparad	1300.09	550	26.23	90	633.86	0
44	Takalwade	567	256	40.77	10	56.22	204.01
45	Vadale	1804.22	1446.64	49.67	23	266.45	18.46
46	Mirde	1758.16	780	4.16	78	677.8	218.2
47	Naikbomvadi	825.93	425	65.67	100	235.26	0
48	Rajale	1365.38	764.33	433.35	25	131.83	10.87
49	Sathe	1033.61	802	68.58	75	88.03	0
50	Sarde	925.89	670	134.96	9.9	101.77	9.26
51	Gokhali	839.62	645	86	12.1	96.52	0

52	Khatkevasti	502.64	341	52.68	7.5	79.92	21.54
53	Vajegaon	56.57	54.28	2.29	0	0	0
54	Kurawali-bk	994.95	638	51.79	15	73.72	216.44
55	Dattanagar	1290.12	893	204.9	55.5	136.72	0
56	Andhrud	1184.92	619.95	77.91	103	135.73	248.33
57	Javali	2187.3	1051	15.1	97	805.98	218.22
58	Rajuri	926.14	548	135.39	21	177.92	43.83
59	Bhavaninagar	887.17	631	91.94	9	155.23	0
60	Asu	1642.25	1262	146.74	69	164.51	0
61	Dhavalevadi	441.39	361.6	3.63	15	61.16	0
62	Shindenagar	680.25	532.81	33.31	50	64.13	0
63	Pawarvadi	610.57	491.18	47.44	36	35.95	0
64	Hanamantwadi	594.06	502.18	7.75	23	61.13	0
65	Jadhavwadi	301.97	217.71	32.07	27	25.19	0
66	Gunaware	1896	1264	334.92	25	231.05	41.03
67	Munjawadi	1482.05	921	390.24	10	160.81	0
68	Girvi	2173.09	1652.58	108.13	120	0	292.38
69	Bodakewadi	1312.14	356	209.56	175	0	571.58
70	Kurawali-kh	998.87	326	68.16	32	572.71	0
71	Mandavkhadak	556.6	71.1	19.18	45	384.9	36.42
72	Nirgudi	555.69	329	90.06	12	111.31	13.32
73	Vinchurni	924.29	292	23.34	6	509.9	93.05
74	Khunte	770.75	545	95.37	5	125.38	0
75	Shindevadi	469.3	324	94.03	8	43.27	0
76	Chaudharwadi	955.21	791	90.01	10	64.2	0
77	Jadhavwadi	760.23	595.98	64	36	64.25	0
78	Kolki	815	615	32.73	45	122.27	0
79	Zirapwadi	710	590.33	18.42	25	76.25	0
80	Kambleshwar	957.13	749	67.25	14	107.74	19.14
81	Sastewadi	1141.9	918.15	78.81	22	122.94	0
82	Vidani	2186.6	1367	309.93	17	419.6	73.07
83	Dudhebavi	2197.13	1536.02	330.61	20	310.5	0
84	Tirakwadi	480.25	350	88.25	22	20	0
85	Bhadali-kh	846.1	398	73.1	56	319	0
86	Sonawadi-kh	513.27	205	13.02	45	125	125.25
87	Dhuldeo	405.97	274	68.4	51.2	12.37	0
88	Somathali	1032.12	687.1	30.27	71	240.01	3.74
89	Algudevadi	489.97	229	220.84	10	21.35	8.78
90	Sangavi	1762.28	1175.5	211.07	45	322	8.71
91	Songaon	708.35	387.43	65.88	72	183.04	0
92	Saskal	787.18	336	237.21	62	151.18	0
93	Dhumalwadi	1716.8	171	10	103	157.5	1275.3
94	Bhadali-bk	261.81	198	31.13	18	13	1.68
95	Sonawadi-bk	374	251	91	15	17	0
96	Padegaon	1435.17	866.52	121.74	17	423	6.91
97	Koregaon	511.56	353	68.6	21	58.38	10.58
98	Tambave	741.34	562.44	10	22	137.78	9.12
99	Salpe	1326.61	334.46	27.1	23	583.7	358.35
100	Koparde	271.12	130	53.2	18	63.53	6.39
101	Chambharwadi	252.79	162.25	17	54	19.54	0
102	Hingangaon	2438	1764.64	101.54	42	426.22	103.6
103	Sherechiwadi	672.86	336	90.9	11	234.08	0.88
104	Adarki-bk	1301	871	44.92	12	78	295.08
105	Adarki-kh	1510	749	75.36	26	171.42	488.22
106	Aradgaon	759.86	464.98	12	32	153.89	96.99
107	Chavanwadi	523.72	423.72	21.67	25	53.33	0
108	Kapadgaon	858.02	648	70.72	23	116.3	0
109	Mirewadi	359.26	183	164.11	11	1.15	0

110	Kusur	277.44	141	118.19	10	2.18	6.07
111	Malevadi	138.26	123.95	7.21	6	1.1	0
112	Shindemal	221.77	201.6	8.02	10	2.15	0
113	Saswad	2225.75	1795.4	90.77	22	176.29	141.29
114	Takubaichiwadi	225.95	203.73	3.56	4	14.66	0
115	Kalaj	1074.41	767	45	14	166	82.41
116	Khamgaon	880.64	498.5	82.43	56	239.17	4.54
117	Murum	574.64	317.98	32	51	173.79	0
118	Tadavale	579.97	336.77	23.31	21	160.41	38.48
119	Vitthalvadi	216.72	151.58	13	32	20.14	0
120	Taradgaon	2272.46	1658	106.62	52	179.1	276.74
121	Rawadi-kh	629.83	253	168.57	26	176.78	5.48
122	Rawdi-bk	700.63	500.02	88.66	12	99.95	0
123	Dombalwadi	260.16	133	75.69	7	44.43	0.04
124	Kapasi	832	632	57.32	19	112.19	11.49
124	Alajapur	1094.94	542	17.01	47	248.24	240.69
126	Ghadagevadi	665.72	375	46.78	16	109.27	118.67
127	Mulikwadi	908.97	409	237.4	41	199.1	22.47
128	Bibi	1284.11	513.6	168.14	24	362.12	216.25
129	Phaltan	3190.34	3.13	1090.99	9.2	1282.3	805.4
	Total	119029	69325	12115	3810	23009	10770

Appendix - B
Phaltan Tahsil
General Land use (2001) in hectares

Sr. No.	Name of the Villages	Geog. Area	Net Sown Area	L.N.A. for C.	C. Waste.	Fallow land	Forest Area
1	Waghoshi	629.59	90	37.06	33.5	230.01	239.02
2	Vadgaon	456.95	151	56.54	42	96.1	111.31
3	Korhale	551.54	150	33.47	5.8	199.1	163.17
4	Wakhari	1545.86	749	460.55	10	310.5	15.81
5	Wathar-nim	2140.9	950	575.23	206	409.67	0
6	Dhaval	1032.07	502	131.13	35	277.65	86.29
7	Pirachiwadi	228.04	175	12.59	5	24.48	10.97
8	Sherewadi	572.42	210	185.06	55	122.36	0
9	Surawadi	1042.33	325	427.63	17	267.12	5.58
10	Kharadevadi	428.98	255	140	10	23.81	0
11	Ghadgemala	343.8	175	91.26	7	70.54	0
12	Nandal	1754.03	901	213.2	15	362.4	262.43
13	Jinti	1201.42	735	278.68	22	155.38	10.36
14	Phartadvadi	478.63	306	130.76	10	31.87	0
15	Bhilkati	232.18	108	66.52	2	55.66	0
16	Nimbore	812.61	422	144.67	8	222	15.94
17	Dhavlevadi	547.5	209.31	145	15	175	3.19
18	Kashidvadi	327.31	150	92.56	16	60	8.75
19	Vadjal	259.81	124	61.13	2.8	60	11.88
20	Dalvadi	840.4	142	10	23	361.18	304.22
21	Upalave	1342.3	392	39.85	20	191.27	699.18
22	Sawantvadi	552.52	272.52	79	31	170	0
23	Daryachivadi	590.42	410.3	96.12	4	80	0
24	Jadhavnagar	340.48	270	13.98	6.5	50	0
25	Malvadi	1377	414	70.08	28	638.6	226.32
26	Khadaki	622	178	0.47	19	243.64	180.89
27	Mirgaon	1000	506	265.43	43	153.82	31.75
28	Tathvada	2089.38	251	60.87	50	907.19	820.32
29	Manevadi	363.96	201	37.16	11	114.8	0

30	Zadakwadi	412	180	110.79	9	111.66	0.55
31	Hol	770.94	351	157.14	30	232.8	0
32	Sakharwadi	772.6	466	141.1	18.5	147	0
33	Veloshi	441.53	110	15.24	9	172.46	134.83
34	Tardaf	1119.54	510	204.8	12.5	253.24	139
35	Miryachiwadi	540.24	150	232.31	17	140.93	0
36	Pharadvadi	492.28	253	217.14	9	13.14	0
37	Thakurki	965.29	495	410.2	34	12.35	13.74
38	Tawadi	469.73	223	110	15	9.32	111.77
39	Barad	2281.45	1471	309.19	85	360.35	55.91
40	Shereshindevadi	714.95	327	216.7	50.7	120.55	0
41	Nimbalak	1243.87	789	214.72	75.3	154.78	10.07
42	Mathachivadi	923.85	450	400.85	73	0	0
43	Pimparad	1300.09	450	126.23	90	633.86	0
44	Takalwade	567	256	40.77	10	56.22	204.01
45	Vadale	1804.22	921.64	574.67	23	266.45	18.46
46	Mirde	1758.16	680	104.16	78	677.8	218.2
47	Naikbomvadi	825.93	325	165.67	100	235.26	0
48	Rajale	1365.38	764.33	433.35	25	131.83	10.87
49	Sathe	1033.61	644.33	176.25	125	88.03	0
50	Sarde	925.89	530	274.96	9.9	101.77	9.26
51	Gokhali	839.62	505	226	12.1	96.52	0
52	Khatkevasti	502.64	341	52.68	7.5	79.92	21.54
53	Vajegaon	56.57	54.28	2.29	0	0	0
54	Kurawali-bk	994.95	438	251	15	73.72	216.44
55	Dattanagar	1290.12	693	404.9	55.5	136.72	0
56	Andhrud	1184.92	469.95	227.91	103	135.73	248.33
57	Javali	2187.3	775	291.1	97	805.98	218.22
58	Rajuri	926.14	448	235.39	21	177.92	43.83
59	Bhavaninagar	887.17	531	191.94	9	155.23	0
60	Asu	1642.25	1015	393.74	69	164.51	0
61	Dhavalevadi	441.39	261.6	103.63	15	61.16	0
62	Shindenagar	680.25	332.81	233.31	50	64.13	0
63	Pawarvadi	610.57	391.18	147.44	36	35.95	0
64	Hanamantwadi	594.06	402.18	107.75	23	61.13	0
65	Jadhavwadi	301.97	167.71	82.07	27	25.19	0
66	Gunaware	1896	1064	534.92	25	231.05	41.03
67	Munjawadi	1482.05	821	490.24	10	160.81	0
68	Girvi	2173.09	1252.58	458.13	120	0	342.38
69	Bodakewadi	1312.14	356	209.56	175	0	571.58
70	Kurawali-kh	998.87	326	68.16	32	572.71	0
71	Mandavkhadak	556.6	71.1	19.18	45	384.9	36.42
72	Nirgudi	555.69	229	190.06	12	111.31	13.32
73	Vinchurni	924.29	292	23.34	6	509.9	93.05
74	Khunte	770.75	445	195.37	5	125.38	0
75	Shindevadi	469.3	224	194.03	8	43.27	0
76	Chaudharwadi	955.21	691	190.01	10	64.2	0
77	Jadhavwadi	760.23	495.98	164	36	64.25	0
78	Kolki	815	215	432.73	45	122.27	0
79	Zirapwadi	710	340	268.75	25	76.25	0
80	Kambleshwar	957.13	549	267.25	14	107.74	19.14
81	Sastewadi	1141.9	718.15	278.81	22	122.94	0
82	Vidani	2186.6	1167	509.93	17	419.6	73.07
83	Dudhebavi	2197.13	1036.02	830.61	20	310.5	0
84	Tirakwadi	480.25	250	188.25	22	20	0
85	Bhadali-kh	846.1	398	73.1	56	319	0
86	Sonawadi-kh	513.27	155	63.02	45	125	125.25
87	Dhuldeo	405.97	274	68.4	51.2	12.37	0

88	Somathali	1032.12	587.1	130.27	71	240.01	3.74
89	Algudevadi	489.97	229	220.84	10	21.35	8.78
90	Sangavi	1762.28	1050.5	336.07	45	322	8.71
91	Songaon	708.35	387.43	65.88	72	183.04	0
92	Saskal	787.18	336.79	237.21	62	151.18	0
93	Dhumalwadi	1716.8	171	10	103	157.5	1275.3
94	Bhadali-bk	261.81	148	81.13	18	13	1.68
95	Sonawadi-bk	374	201	141	15	17	0
96	Padegaon	1435.17	816.52	171.74	17	423	6.91
97	Koregaon	511.56	253	168.6	21	58.38	10.58
98	Tambave	741.34	360.44	212	22	137.78	9.12
99	Salpe	1326.61	334.46	27.1	23	583.7	358.35
100	Koparde	271.12	125	58.2	18	63.53	6.39
101	Chambharwadi	252.79	112.25	67	54	19.54	0
102	Hingangaon	2438	1064.64	801.54	42	426.22	103.6
103	Sherechiwadi	672.86	306	120.9	11	234.08	0.88
104	Adarki-bk	1301	505	410.92	12	78	295.08
105	Adarki-kh	1510	605	219.36	26	171.42	488.22
106	Aradgaon	759.86	264.98	212	32	153.89	96.99
107	Chavanwadi	523.72	170.39	275	25	53.33	0
108	Kapadgaon	858.02	448	270.72	23	116.3	0
109	Mirewadi	359.26	183	164.11	11	1.15	0
110	Kusur	277.44	141	118.19	10	2.18	6.07
111	Malevadi	138.26	123.95	7.21	6	1.1	0
112	Shindemal	221.77	101.6	108.02	10	2.15	0
113	Saswad	2225.75	1295.4	590.77	22	176.29	141.29
114	Takubaichiwadi	225.95	103.73	103.56	4	14.66	0
115	Kalaj	1074.41	510	302	14	166	82.41
116	Khamgaon	880.64	398.5	182.43	56	239.17	4.54
117	Murum	574.64	217.98	132	51	173.79	0
118	Tadavale	579.97	236.77	123.31	21	160.41	38.48
119	Vitthalvadi	216.72	151.58	13	32	20.14	0
120	Taradgaon	2272.46	1158	606.62	52	179.1	276.74
121	Rawadi-kh	629.83	253	168.57	26	176.78	5.48
122	Rawdi-bk	700.63	400.02	188.66	12	99.95	0
123	Dombalwadi	260.16	133	75.69	7	44.43	0.04
124	Kapasi	832	532	157.32	19	112.19	11.49
124	Alajapur	1094.94	542	17.01	47	248.24	240.69
126	Ghadagevadi	665.72	275	146.78	16	109.27	118.67
127	Mulikwadi	908.97	409	237.4	41	199.1	22.47
128	Bibi	1284.11	513.6	168.14	24	362.12	216.25
129	Phaltan	3190.34	3.73	1040.99	9.2	1282.3	855.4
	Total	119029	54425	26150	4205	23356	10892

Appendix - C
Phaltan Tahsil
General Land use (1991) in hectares

Sr. No.	Name of the Villages	Geog. Area	Net Sown Area	L.N.A. for C.	C. Waste	Fallow land	Forest Area
1	Waghoshi	629.59	90	227.06	33.5	40.01	239.02
2	Vadgaon	456.95	125	81.54	43	96.1	111.31
3	Korhale	551.54	135	133.47	20.8	99.1	163.17
4	Wakhari	1545.86	349	760.55	60	360.5	15.81
5	Wathar-nim	2140.9	560	1207.33	163.9	209.67	0
6	Dhaval	1032.07	350	470	70	55.78	86.29
7	Pirachiwadi	228.04	120	50	27	20.07	10.97
8	Sherewadi	572.42	150	335.06	55	32.36	0
9	Surawadi	1042.33	325	607.27	50	54.48	5.58
10	Kharadevadi	428.98	105	230	25	68.98	0
11	Ghadgemala	343.8	140	80.26	45	78.54	0
12	Nandal	1754.03	650	360	25	456.6	262.43
13	Jinti	1201.42	435	678.68	22	55.38	10.36
14	Phartadvadi	478.63	160	270	16.76	31.87	0
15	Bhilkati	232.18	108	70	12	42.18	0
16	Nimbore	812.61	300	394.67	22	80	15.94
17	Dhavlevadi	547.5	150	292	50	52.31	3.19
18	Kashidvadi	327.31	140	92.56	26	60	8.75
19	Vadjal	259.81	104	61.13	2.8	80	11.88
20	Dalvadi	840.4	142	310	23	61.18	304.22
21	Upalave	1342.3	342	189.85	20	91.27	699.18
22	Sawantvadi	552.52	172	279	31.52	70	0
23	Daryachivadi	590.42	250	245	0	95.42	0
24	Jadhavnagar	340.48	160	113.98	16.5	50	0
25	Malvadi	1377	315	775	38.6	22.08	226.32
26	Khadaki	622	128	200	19	94.11	180.89
27	Mirgaon	1000	350	343.33	45	229.92	31.75
28	Tathvada	2089.38	251	860.87	50	107.19	820.32
29	Manevadi	363.96	151	187.16	11	14.8	0
30	Zadakwadi	412	130	230	25	26.45	0.55
31	Hol	770.94	351	357.14	30	32.8	0
32	Sakharwadi	772.6	366	241.1	18.5	147	0
33	Veloshi	441.53	110	15.24	9	172.46	134.83
34	Tardaf	1119.54	410	304.8	12.5	253.24	139
35	Miryachiwadi	540.24	150	232.31	17	140.93	0
36	Pharadvadi	492.28	150	317.14	16.14	9	0
37	Thakurki	965.29	195	510.2	34	212.35	13.74
38	Tawadi	469.73	150	110	15	82.96	111.77
39	Barad	2281.45	971	621.54	48	585	55.91
40	Shereshindevadi	714.95	250	306.7	10	148.25	0
41	Nimbalak	1243.87	406	615.02	58	154.78	10.07
42	Mathachivadi	923.85	250	450.85	23	200	0
43	Pimparad	1300.09	400	826.23	40	33.86	0
44	Takalwade	567	190	20.77	76	76.22	204.01
45	Vadale	1804.22	321	1174.76	23	267	18.46
46	Mirde	1758.16	580	704	78.16	177.8	218.2
47	Naikbomvadi	825.93	325	215.67	50	235.26	0
48	Rajale	1365.38	500	500	15	339.51	10.87
49	Sathe	1033.61	550	276.25	25	182.36	0
50	Sarde	925.89	408	95	45	368.63	9.26
51	Gokhali	839.62	450	250	54	85.62	0

52	Khatkevasti	502.64	250	70	23	138.1	21.54
53	Vajegaon	56.57	36	10	10.57	0	0
54	Kurawali-bk	994.95	250	251	20	257.51	216.44
55	Dattanagar	1290.12	450	460	10	370.12	0
56	Andhrud	1184.92	469.95	275	25	166.64	248.33
57	Javali	2187.3	725	350	50	844.08	218.22
58	Rajuri	926.14	390	250	25	217.31	43.83
59	Bhavaninagar	887.17	400	200	45	242.17	0
60	Asu	1642.25	740	400	75	427.25	0
61	Dhavalevadi	441.39	250	100	20	71.39	0
62	Shindenagar	680.25	250	240	70	120.25	0
63	Pawarvadi	610.57	250	150	45	165.57	0
64	Hanamantwadi	594.06	350	110	30	104.06	0
65	Jadhavwadi	301.97	150	90	30	31.97	0
66	Gunaware	1896	764	550	40	500.97	41.03
67	Munjawadi	1482.05	600	510	10	362.05	0
68	Girvi	2173.09	750	592	12	476.71	342.38
69	Bodakewadi	1312.14	356	250	25	109.56	571.58
70	Kurawali-kh	998.87	326	68.16	32	572.71	0
71	Mandavkhadak	556.6	71.1	59.18	5	384.9	36.42
72	Nirgudi	555.69	229	190.06	12	111.31	13.32
73	Vinchurni	924.29	292	23.34	6	509.9	93.05
74	Khunte	770.75	200	445	0.37	125.38	0
75	Shindevadi	469.3	200	195	50	24.3	0
76	Chaudharwadi	955.21	500	190.01	10	255.2	0
77	Jadhavwadi	760.23	300	200	15	245.23	0
78	Kolki	815	215	470	7.73	122.27	0
79	Zirapwadi	710	200	250	50	210	0
80	Kambleshwar	957.13	350	250	25	312.99	19.14
81	Sastewadi	1141.9	515	275	50	301.9	0
82	Vidani	2186.6	850	510	20	733.53	73.07
83	Dudhebavi	2197.13	601.4	1094.21	50	451.52	0
84	Tirakwadi	480.25	190	200	30	60.25	0
85	Bhadali-kh	846.1	250	125	10	461.1	0
86	Sonawadi-kh	513.27	155	63.02	45	125	125.25
87	Dhuldeo	405.97	210	120	10	65.97	0
88	Somathali	1032.12	550	150	20	308.38	3.74
89	Algudevadi	489.97	150	215	45	71.19	8.78
90	Sangavi	1762.28	710	580	10	453.57	8.71
91	Songaon	708.35	300	65	0	343.35	0
92	Saskal	787.18	236.79	387.83	12	151.18	0
93	Dhumalwadi	1716.8	160	70	54	157.5	1275.3
94	Bhadali-bk	261.81	125	80	20	35.13	1.68
95	Sonawadi-bk	374	90	250	20	14	0
96	Padegaon	1435.17	450	370	25	583.26	6.91
97	Koregaon	511.56	210	160	20	110.98	10.58
98	Tambave	741.34	200	325	30	177.22	9.12
99	Salpe	1326.61	330	30	20	588.26	358.35
100	Koparde	271.12	105	60	20	79.73	6.39
101	Chambharwadi	252.79	100	90	50	12.79	0
102	Hingangaon	2438	650	1000	5	679.4	103.6
103	Sherechiwadi	672.86	220	130	0	321.98	0.88
104	Adarki-bk	1301	320	510	30	145.92	295.08
105	Adarki-kh	1510	450	220	27	324.78	488.22
106	Aradgaon	759.86	250	220	40	152.87	96.99
107	Chavanwadi	523.72	170	250	30	73.72	0
108	Kapadgaon	858.02	320	275	30	233.02	0
109	Mirewadi	359.26	150	190	15	4.26	0

110	Kusur	277.44	120	120	15	16.37	6.07
111	Malevadi	138.26	90	10	7	31.26	0
112	Shindemal	221.77	90	95	12	24.77	0
113	Saswad	2225.75	805	660	30	589.46	141.29
114	Takubaichiwadi	225.95	85	100	10	30.95	0
115	Kalaj	1074.41	410	340	20	222	82.41
116	Khamgaon	880.64	300	280	10	286.1	4.54
117	Murum	574.64	190	180	10	194.64	0
118	Tadavale	579.97	236.77	123.31	21	160.41	38.48
119	Vitthalvadi	216.72	140	20	30	26.72	0
120	Taradgaon	2272.46	650	950	50	345.72	276.74
121	Rawadi-kh	629.83	240	150	30	204.35	5.48
122	Rawdi-bk	700.63	210	190	30	270.63	0
123	Dombalwadi	260.16	130	75	7	48.12	0.04
124	Kapasi	832	350	160	20	290.51	11.49
124	Alajapur	1094.94	440	220	20	174.25	240.69
126	Ghadagevadi	665.72	260	140	20	127.05	118.67
127	Mulikwadi	908.97	300	250	50	286.5	22.47
128	Bibi	1284.11	450	150	30	437.86	216.25
129	Phaltan	3190.34	0	2032.99	11.65	282.3	863.4
	Total	119029	39199	39740	3697	25493	10900

Appendix-D
Phaltan Tahsil
Net Sown Area (2011)

Sr. No.	Name of the Villages	Geographical Area in hectares	Net Sown Area in hectares	Percentage
1	Waghoshi	629.59	140	22.24
2	Vadgaon	456.95	241	52.74
3	Korhale	551.54	180.27	32.68
4	Wakhari	1545.86	949	61.39
5	Wathar-nim	2140.9	1500	70.06
6	Dhaval	1032.07	532	51.55
7	Pirachiwadi	228.04	182.59	80.07
8	Sherewadi	572.42	350	61.14
9	Surawadi	1042.33	700	67.16
10	Kharadevadi	428.98	305	71.10
11	Ghadgemala	343.8	250	72.72
12	Nandal	1754.03	1101	62.77
13	Jinti	1201.42	735	61.18
14	Phartadvadi	478.63	346	72.29
15	Bhilkati	232.18	108	46.52
16	Nimbore	812.61	522	64.24
17	Dhavlevadi	547.5	319.31	58.32
18	Kashidvadi	327.31	207	63.24
19	Vadjal	259.81	124	47.73
20	Dalvadi	840.4	142	16.90
21	Upalave	1342.3	392	29.20
22	Sawantvadi	552.52	272.52	49.32

23	Daryachivadi	590.42	410.3	69.49
24	Jadhavnagar	340.48	270	79.30
25	Malvadi	1377	464	33.70
26	Khadaki	622	178	28.62
27	Mirgaon	1000	726	72.60
28	Tathvada	2089.38	501.87	14.45
29	Manevadi	363.96	201	55.23
30	Zadakwadi	412	287	69.66
31	Hol	770.94	351	45.53
32	Sakharwadi	772.6	466	60.32
33	Veloshi	441.53	110	24.91
34	Tardaf	1119.54	710	63.42
35	Miryachiwadi	540.24	350	64.79
36	Pharadvadi	492.28	253	51.39
37	Thakurki	965.29	695	72.00
38	Tawadi	469.73	323	68.76
39	Barad	2281.45	1521	75.43
40	Shereshindevadi	714.95	477	66.72
41	Nimbalak	1243.87	989	79.51
42	Mathachivadi	923.85	650	70.36
43	Pimparad	1300.09	550	42.30
44	Takalwade	567	256	45.15
45	Vadale	1804.22	1446.64	80.18
46	Mirde	1758.16	780	44.36
47	Naikbomvadi	825.93	425	51.46
48	Rajale	1365.38	764.33	55.98
49	Sathe	1033.61	802	77.59
50	Sarde	925.89	670	72.36
51	Gokhali	839.62	645	76.82
52	Khatkevasti	502.64	341	67.84
53	Vajegaon	56.57	54.28	95.95
54	Kurawali-bk	994.95	638	64.12
55	Dattanagar	1290.12	893	69.22
56	Andhrud	1184.92	619.95	52.32
57	Javali	2187.3	1051	48.05
58	Rajuri	926.14	548	59.17
59	Bhavaninagar	887.17	631	71.13
60	Asu	1642.25	1262	76.85
61	Dhavalevadi	441.39	361.6	81.92
62	Shindenagar	680.25	532.81	78.33
63	Pawarvadi	610.57	491.18	80.45
64	Hanamantwadi	594.06	502.18	84.53
65	Jadhavwadi	301.97	217.71	72.10
66	Gunaware	1896	1264	66.67
67	Munjawadi	1482.05	921	62.14
68	Girvi	2173.09	1652.58	76.05
69	Bodakewadi	1312.14	356	27.13
70	Kurawali-kh	998.87	326	32.64

71	Mandavkhadak	556.6	71.1	12.77
72	Nirgudi	555.69	329	59.21
73	Vinchurni	924.29	292	31.59
74	Khunte	770.75	545	70.71
75	Shindevadi	469.3	324	69.04
76	Chaudharwadi	955.21	791	82.81
77	Jadhavwadi	760.23	595.98	78.39
78	Kolki	815	615	75.46
79	Zirapwadi	710	590.33	83.15
80	Kambleshwar	957.13	749	78.25
81	Sastewadi	1141.9	918.15	80.41
82	Vidani	2186.6	1367	62.52
83	Dudhebavi	2197.13	1536.02	69.91
84	Tirakwadi	480.25	350	72.88
85	Bhadali-kh	846.1	398	47.04
86	Sonawadi -kh	513.27	205	39.94
87	Dhuldeo	405.97	274	67.49
88	Somathali	1032.12	687.1	66.57
89	Algudevadi	489.97	229	46.74
90	Sangavi	1762.28	1175.5	66.70
91	Songaon	708.35	387.43	54.69
92	Saskal	787.18	336	42.68
93	Dhumalwadi	1716.8	171	9.96
94	Bhadali-bk	261.81	198	75.63
95	Sonawadi -bk	374	251	67.11
96	Padegaon	1435.17	866.52	60.38
97	Koregaon	511.56	353	69.00
98	Tambave	741.34	562.44	75.87
99	Salpe	1326.61	334.46	25.21
100	Koparde	271.12	130	47.95
101	Chambharwadi	252.79	162.25	64.18
102	Hingangaon	2438	1764.64	72.38
103	Sherechiwadi	672.86	336	49.94
104	Adarki-bk	1301	871	66.95
105	Adarki-kh	1510	749	49.60
106	Aradgaon	759.86	464.98	61.19
107	Chavanwadi	523.72	423.72	80.91
108	Kapadgaon	858.02	648	75.52
109	Mirewadi	359.26	183	50.94
110	Kusur	277.44	141	50.82
111	Malevadi	138.26	123.95	89.65
112	Shindemal	221.77	201.6	90.90
113	Saswad	2225.75	1795.4	80.66
114	Takubaichiwadi	225.95	203.73	90.17
115	Kalaj	1074.41	767	71.39
116	Khamgaon	880.64	498.5	56.61
117	Murum	574.64	317.98	55.34
118	Tadavale	579.97	336.77	58.07

119	Vitthalvadi	216.72	151.58	69.94
120	Taradgaon	2272.46	1658	72.96
121	Rawadi-kh	629.83	253	40.17
122	Rawdi-bk	700.63	500.02	71.37
123	Dombalwadi	260.16	133	51.12
124	Kapasi	832	632	75.96
124	Alajapur	1094.94	542	49.50
126	Ghadagevadi	665.72	375	56.33
127	Mulikwadi	908.97	409	45.00
128	Bibi	1284.11	513.6	40.00
129	Phaltan	3190	3.13	0.10
	Total	119029	69325	

Appendix-E
Agriculture Cropping Pattern-2011 (Area in hectares)

Sr. No.	Name of the Village	N.S.A.	J	B	W	S	M	F	FC	V	Sun	P
1	Waghoshi	140	70	85	12	5	6	3	7	10	3	9
2	Vadgaon	241	220	171	15	2	8	2	4	14	14	11
3	Korhale	180.27	116	116	15	14	10	4	5	20	4	8
4	Wakhari	949	324	231	69	5	10	7	8	21	11	5
5	Wathar-nim	1500	288	214	41	15	80	20	15	32	12	14
6	Dhaval	532	257	243	34	2	38	10	17	4	3	7
7	Pirachiwadi	182.59	90	90	9	1	28	9	17	3	3	9
8	Sherewadi	350	138	70	23	1	32	7	16	2	2	6
9	Surawadi	700	25	41	54	190	25	60	18	40	7	4
10	Kharadevadi	305	20	45	35	59	10	17	15	27	5	3
11	Ghadgemala	250	104	102	15	30	9	15	17	21	7	4
12	Nandal	1101	398	618	28	30	7	18	8	58	9	9
13	Jinti	735	312	290	190	350	50	45	50	40	9	4
14	Phartadvadi	346	45	30	70	250	20	60	25	40	2	1
15	Bhilkati	108	40	30	50	51	20	50	15	8	3	2
16	Nimbore	522	30	17	45	50	10	20	21	17	7	15
17	Dhavlevadi	319.31	90	75	15	3	5	10	7	2	5	2
18	Kashidvadi	207	80	50	10	7	3	7	8	3	1	2
19	Vadjal	124	10	15	25	25	5	7	10	10	2	1
20	Dalvadi	142	124	124	20	7	35	7	1	5	1	5
21	Upalave	392	109	93	30	1	50	10	2	7	2	9
22	Sawantvadi	272.52	70	85	5	2	10	14	2	13	17	21
23	Daryachivadi	410.3	85	25	20	5	27	20	4	27	20	28
24	Jadhavnagar	270	90	80	20	7	19	20	9	30	5	7
25	Malvadi	464	365	166	45	7	35	15	2	35	2	15
26	Khadaki	178	175	147	32	3	24	9	2	50	2	8
27	Mirgaon	726	375	250	52	2	45	10	2	45	2	10
28	Tathvada	501.87	403	403	4	10	30	7	2	5	2	10
29	Manevadi	201	195	190	3	13	5	6	3	4	1	6
30	Zadakwadi	287	225	205	1	15	5	5	2	3	1	6
31	Hol	351	20	35	75	204	10	20	15	7	2	1
32	Sakharwadi	466	35	70	85	310	20	20	18	30	2	1
33	Veloshi	110	88	88	10	9	10	7	5	30	3	16
34	Tardaf	710	680	510	25	25	30	10	15	66	5	17
35	Miryachiwadi	350	225	190	10	10	10	9	8	15	6	16

36	Pharadvadi	253	185	185	43	9	15	11	8	15	10	3
37	Thakurki	695	242	235	39	15	13	10	7	11	5	4
38	Tawadi	323	235	189	28	3	8	10	7	8	9	3
39	Barad	1521	275	269.4	112	93.4	75	10	11	22.9	3	2.5
40	Shereshindeva	477	55	75	41	16.6	17.4	20	9	4	1	1.5
41	Nimbalak	989	40	70.50	40.1	440	80.4	17	8	14	3	20.3
42	Mathachivadi	650	17	60	60	460.3	80.3	14	7	10.8	2	14.2
43	Pimparad	550	15	15	132	412	110	15	12	25	5	51
44	Takalwade	256	10	10	86	216	82	12	10	15	6	14
45	Vadale	1446.64	480.2	327	25.4	3.4	3	13	12	23.3	1.20	5.7
46	Mirde	780	229.1	257.1	15	11	2	3	7	11	3	4.4
47	Naikbomvadi	425	63.5	128	10	9	1.8	6	5	4	1	1.4
48	Rajale	764.33	14.4	110	109.4	285	92.4	31	2	25	8	2
49	Sathe	802	7	52	95.4	213	54.5	21	4	10.5	3	4
50	Sarde	670	15	88	112	285	56.6	25	6	30	3.20	3
51	Gokhali	645	20.50	50.85	95	291	20.17	18	5	9	9	2
52	Khatkevasti	341	10	33	70	146	25	9	5	9	5	1
53	Vajegaon	54.28	7	15	10	20	2	2	3	3	2.1	3.4
54	Kurawali-bk	638	50	155	70	50	45	12	1	5	3	5
55	Dattanagar	893	65	90	85	117	60	33	4	7	2	7
56	Andhrud	619.95	290	260	20	11	110	26	7	45	5	20
57	Javali	1051	402	345	25	99	105	39	8	140	5	19
58	Rajuri	548	42	57	57	484.4	35	40	5	10.1	35	3
59	Bhavaninagar	631	31	29	67	377.7	82	25	6	9.5	82	1.5
60	Asu	1262	100	197	200	593	118	24	5	16	5	10
61	Dhavalevadi	361.6	40	40	50	130	15	22	8	15	7	5
62	Shindenagar	532.81	233	211	38	120	25	13	1	46	3	10
63	Pawarvadi	491.18	14.4	33	38.4	393.1	32.4	14	8	7.5	3.4	10.7
64	Hanamantwad	502.18	31.5	38	65.4	394	23.4	9	9	7.7	6.5	12.7
65	Jadhavwadi	217.71	35.4	18.3	39.5	138.2	34.8	11	2	14.2	5.5	8.9
66	Gunaware	1264	32.5	58.4	85.2	664.1	121.4	36	9	8	6.8	3.8
67	Munjawadi	921	35.2	48.4	35.2	496.8	105	40	11	7	4.1	3.4
68	Girvi	1652.58	525	610	70	20	65	27	21	65	90	25
69	Bodakewadi	356	90	70	85	10	81	35	19	27	30	10
70	Kurawali-kh	326	185	69	14	6	3	17	1	1	1	3
71	Mandavkhada	71.1	63	33	11	1	2	21	2	1	1	2
72	Nirgudi	329	130	45	35	14	42	7	2	5	2	10
73	Vinchurni	292	205	175	25	12	19	15	2	6	1	5
74	Khunte	545	15	100	90	262	30	10	45	20	4	2
75	Shindevadi	324	20	50	30	220	15	7	20	30	3	1
76	Chaudharwadi	791	22	110	60	423	40	21	70	20	5	1
77	Jadhavwadi	595.98	37	31	7	2	5	7	2	6	2	6
78	Kolki	615	59	47	10	10	12	15	3	5	2	13
79	Zirapwadi	590.33	295	257	15	5	15	17	3	10	2	18
80	Kambleshwar	749	40	70	25	340	62	90	102	25	5	3
81	Sastewadi	918.15	35	90.70	70	359	108	105	87	65	10	15
82	Vidani	1367	290	230	210	510	168	70	120	70	5	10
83	Dudhebavi	1536.02	269	235	190	85	170	55	80	81	10	9
84	Tirakwadi	350	170	185	85	75	110	20	71	60	20	10
85	Bhadali-kh	398	90	110	70	20	95	65	20	30	40	20
86	Sonawadi-kh	205	85	95	65	15	91	55	10	15	27	19
87	Dhuldeo	274	15	25	45	90	20	10	25	5	1	6
88	Somathali	687.1	25	50	55	259	35	12	70	7	1	2
89	Algudevadi	229	20	30	55	127	25	15	21	3	1	4
90	Sangavi	1175.5	7	125	270	425	280	10	75	40	5	5
91	Songaon	387.43	10	20	95	30	150	9	35	20	5	4
92	Saskal	336	70	140	47	48	60	17	2	5	1	5
93	Dhumalwadi	171	65	110	35	2	49	29	3	5	1	2

94	Bhadali-bk	198	90	70	25	10	35	21	27	26	12	14
95	Sonawadi-bk	251	115	117	90	20	27	19	19	15	20	4
96	Padegaon	866.52	72	145	88	255	19	7	9	15	-	2
97	Koregaon	353	46	208	125	102	11	6	7	8	-	1
98	Tambave	562.44	251	250	120	20	20	5	2	6	3	4
99	Salpe	334.46	250	252	65	41	22	7	6	7	5	7
100	Koparde	130	50	87	22	2	14	9	2	4	1	3
101	Chambharwad	162.25	75	103	65	9	8	3	1	1	5	6
102	Hingangaon	1764.64	615	60	250	250	50	17	150	30	-	11
103	Sherechiwadi	336	160	160	30	15	5	9	30	5	-	5
104	Adarki-bk	871	315	335	9	18	9	3	7	13	-	18
105	Adarki-kh	749	305	325	8	12	8	4	5	8	-	15
106	Aradgaon	464.98	252	308	19	20	10	-	1	1	7	2
107	Chavanwadi	423.72	201	266	16	13	6	1	1	1	2	3
108	Kapadgaon	648	224	238	32	31	8	1	1	1	2	3
109	Mirewadi	183	157	160	91	101	81	5	2	14	2	2
110	Kusur	141	21	26	25	24	14	2	2	3	2	2
111	Malevadi	123.95	24	63	6	10	10	1	3	4	2	1
112	Shindemal	201.6	60	78	4	21	27	2	2	2	1	1
113	Saswad	1795.4	1125	615	25	17	1	30	2	5	2	6
114	Takubaichiwa	203.73	91	40	7	4	2	2	2	5	2	12
115	Kalaj	767	390	215	20	80	2	7	2	3	2	15
116	Khamgaon	498.5	15	28	128	160	30	4	14	51	2	3
117	Murum	317.98	16	21	129	138	12	4	16	32	2	3
118	Tadavale	336.77	10	63	105	147	6	11	9	5	2	2
119	Vitthalvadi	151.58	80	77	20	20	20	12	11	5	20	3
120	Taradgaon	1658	370	315	50	60	70	25	13	10	10	23
121	Rawadi-kh	253	10	23	40	70	52	7	10	11	6	6
122	Rawdi-bk	500.02	15	20	50	60	41	15	29	9	6	5
123	Dombalwadi	133	12	30	35	40	19	9	13	10	2	4
124	Kapasi	632	330	330	50	35	27	2	28	10	3	4
124	Alajapur	542	360	360	100	35	35	3	27	10	2	4
126	Ghadagevadi	375	241	145	24	5	25	3	24	8	2	8
127	Mulikwadi	409	185	180	18	12	20	3	35	30	3	10
128	Bibi	513.6	300	290	55	10	25	2	41	68	2	8

Note: J= Jowar, B= Bajara, W= Wheat, S= Sugarcane, M= Maize, F= Fruits, Fc= Fodder crops, V= Vegetables, Su= Sunflawors, P= Pules

Appendix - F
Phaltan Tahsil
General Land Use Ranking, 2011

Sr. No.	Name of the Villages	J	B	W	S	M	F	Fc	V	Sun	P
1	Waghoshi	2	1	3	8	7	9	6	4	10	5
2	Vadgaon	1	2	3	9	7	10	8	4	5	6
3	Korhale	1	2	4	5	6	9	8	3	10	7
4	Wakhari	1	2	3	9	6	8	7	4	5	10
5	Wathar-nim	1	2	4	8	3	6	7	5	10	9
6	Dhaval	1	2	4	10	3	6	5	8	9	7
7	Pirachiwadi	2	1	7	10	3	6	4	9	8	5
8	Sherewadi	1	2	4	10	3	6	5	8	9	7
9	Surawadi	7	4	3	1	6	2	8	5	9	10
10	Kharadevadi	5	2	3	1	8	6	7	4	9	10
11	Ghadgemala	1	2	7	3	8	6	5	4	9	10
12	Nandal	2	1	5	4	10	6	9	3	7	8
13	Jinti	2	3	4	1	5	7	6	8	9	10
14	Phartadvadi	4	6	2	1	8	3	7	5	9	10
15	Bhilkati	4	5	2	1	6	3	7	8	9	10
16	Nimbore	3	6	2	1	9	5	4	7	10	8
17	Dhavlevadi	1	2	3	8	6	4	5	9	7	10
18	Kashidvadi	1	2	3	6	7	5	4	8	10	9
19	Vadjal	4	3	2	1	8	7	5	6	9	10
20	Dalvadi	1	2	4	5	3	6	9	7	10	8
21	Upalave	1	2	4	10	3	5	9	7	8	6
22	Sawantvadi	2	1	8	9	7	5	10	6	4	3
23	Daryachivadi	1	5	6	9	4	7	10	3	8	2
24	Jadhavnagar	1	2	5	8	6	4	7	3	10	9
25	Malvadi	1	2	3	8	4	6	9	5	10	7
26	Khadaki	1	2	4	8	5	6	9	3	10	7
27	Mirgaon	1	2	3	8	5	6	9	4	10	7
28	Tathvada	1	2	8	4	3	6	9	7	10	5
29	Manevadi	1	2	9	3	6	4	8	7	10	5
30	Zadakwadi	1	2	9	3	5	6	8	7	10	4
31	Hol	4	3	2	1	7	5	6	8	9	10
32	Sakharwadi	4	3	2	1	7	6	8	5	9	10
33	Veloshi	1	2	5	7	6	8	9	3	10	4
34	Tardaf	1	2	6	5	4	9	8	3	10	7
35	Miryachiwadi	1	2	5	6	7	8	9	4	10	3
36	Pharadvadi	1	2	3	8	4	6	9	5	7	10
37	Thakurki	1	2	3	4	5	7	8	6	9	10
38	Tawadi	1	2	3	9	7	4	8	6	5	10
39	Barad	1	2	3	4	5	8	7	6	9	10
40	Shereshindevadi	2	1	3	6	5	4	7	8	10	9
41	Nimbalak	5	3	4	1	2	7	9	8	10	6
42	Mathachivadi	5	4	3	1	2	7	9	8	10	6
43	Pimparad	7	8	2	1	3	6	9	5	10	4
44	Takalwade	8	7	2	1	3	6	9	4	10	5
45	Vadale	1	2	3	8	9	5	6	4	10	7
46	Mirde	2	1	3	4	10	9	6	5	8	7
47	Naikbomvadi	2	1	3	4	8	5	6	7	10	9
48	Rajale	7	2	3	1	4	5	9	6	8	10
49	Sathe	7	4	2	1	3	5	8	6	10	9
50	Sarde	7	3	2	1	4	6	8	5	9	10
51	Gokhali	4	3	2	1	5	6	9	7	8	10

52	Khatkevasti	5	3	2	1	4	6	8	7	9	10
53	Vajegaon	4	2	3	1	10	9	7	6	8	5
54	Kurawali-bk	4	1	2	3	5	6	10	7	9	8
55	Dattanagar	4	2	3	1	5	6	9	7	10	8
56	Andhrud	1	2	6	8	3	5	9	4	10	7
57	Javali	1	2	7	5	4	6	9	3	10	8
58	Rajuri	4	3	2	1	6	5	9	8	7	10
59	Bhavaninagar	5	6	4	1	2	7	9	8	3	10
60	Asu	5	3	2	1	4	6	10	7	9	8
61	Dhavalevadi	4	3	2	1	6	5	8	7	9	10
62	Shindenagar	1	2	5	3	6	7	10	4	9	8
63	Pawarvadi	5	3	2	1	4	6	8	9	10	7
64	Hanamantwadi	4	3	2	1	5	7	9	8	10	6
65	Jadhavwadi	3	5	2	1	4	7	10	6	9	8
66	Gunaware	5	4	3	1	2	6	7	8	9	10
67	Munjawadi	5	3	6	1	2	4	7	8	9	10
68	Girvi	2	1	4	10	6	7	9	5	3	8
69	Bodakewadi	1	4	2	9	3	5	8	7	6	10
70	Kurawali-kh	1	2	4	5	6	3	10	9	8	7
71	Mandavkhadak	1	2	4	8	5	3	6	9	10	7
72	Nirgudi	1	2	4	5	3	7	9	8	10	6
73	Vinchurni	1	2	3	6	4	5	9	7	10	8
74	Khunte	7	2	3	1	5	8	4	6	9	10
75	Shindevadi	6	2	3	1	7	8	5	4	9	10
76	Chaudharwadi	6	2	4	1	5	7	3	8	9	10
77	Jadhavwadi	1	2	3	8	7	4	9	5	10	6
78	Kolki	1	2	7	6	5	3	9	8	10	4
79	Zirapwadi	1	2	6	8	5	4	9	7	10	3
80	Kambleshwar	6	4	7	1	5	3	2	8	9	10
81	Sastewadi	8	4	6	1	2	3	5	7	10	9
82	Vidani	2	3	4	1	5	7	6	8	10	9
83	Dudhebavi	1	2	3	5	4	8	7	6	9	10
84	Tirakwadi	2	1	4	5	3	8	6	7	9	10
85	Bhadali-kh	3	1	4	8	2	5	9	7	6	10
86	Sonawadi -kh	3	1	4	10	2	5	9	8	6	7
87	Dhuldeo	6	3	2	1	5	7	4	9	10	8
88	Somathali	6	4	3	1	5	7	2	8	10	9
89	Algudevadi	6	3	2	1	4	7	5	9	10	8
90	Sangavi	8	4	3	1	2	7	5	6	9	10
91	Songaon	7	5	4	1	2	8	3	6	9	10
92	Saskal	2	1	5	4	3	6	9	7	10	8
93	Dhumalwadi	2	1	4	8	3	5	7	6	10	9
94	Bhadali-bk	1	2	6	10	3	7	4	5	9	8
95	Sonawadi -bk	2	1	3	5	4	7	8	9	6	10
96	Padegaon	4	2	3	1	5	8	7	6	10	9
97	Koregaon	4	1	2	3	5	8	7	6	10	9
98	Tambave	1	2	3	4	5	7	10	6	9	8
99	Salpe	2	1	3	4	5	6	9	7	10	8
100	Koparde	2	1	3	8	4	5	9	6	10	7
101	Chambharwadi	2	1	3	4	5	8	9	10	7	6
102	Hingangaon	1	5	2	3	6	8	4	7	10	9
103	Sherechwadi	1	2	3	5	7	6	4	8	10	9
104	Adarki-bk	2	1	6	3	7	9	8	5	10	4
105	Adarki-kh	2	1	5	4	6	9	8	7	10	3
106	Aradgaon	2	1	4	3	5	10	9	8	6	7
107	Chavanwadi	2	1	3	4	5	10	9	8	7	6
108	Kapadgaon	2	1	3	4	5	10	9	8	7	6
109	Mirewadi	2	1	4	3	5	7	8	6	9	10

110	Kusur	4	1	2	3	5	7	8	6	9	10
111	Malevadi	2	1	5	3	4	10	7	6	8	9
112	Shindemal	2	1	5	4	3	6	7	8	9	10
113	Saswad	1	2	4	5	10	3	9	7	8	6
114	Takubaichiwad	1	2	4	6	7	8	9	5	10	3
115	Kalaj	1	2	4	3	8	6	9	7	10	5
116	Khamgaon	6	5	2	1	4	8	7	3	9	10
117	Murum	5	4	2	1	7	8	6	3	10	9
118	Tadavale	5	3	2	1	7	4	6	8	9	10
119	Vitthalvadi	1	2	3	4	5	7	8	9	6	10
120	Taradgaon	1	2	5	4	3	6	8	9	10	7
121	Rawadi-kh	6	4	3	1	2	8	7	5	9	10
122	Rawdi-bk	6	5	2	1	3	7	4	8	9	10
123	Dombalwadi	6	3	2	1	4	8	5	7	10	9
124	Kapasi	1	2	3	4	6	10	5	7	9	8
124	Alajapur	1	2	3	4	5	9	6	7	10	8
126	Ghadagevadi	1	2	4	8	3	9	5	6	10	7
127	Mulikwadi	1	2	6	7	5	10	3	4	9	8
128	Bibi	1	2	4	7	6	10	5	3	9	8

Note: J= Jowar, B= Bajara, W= Wheat, S= Sugarcane, M= Maize, F= Fruits, Fc= Fodder crops, V= Vegetables, Su= Sunflowers, P= Pules

Appendix-G
Phaltan Tahsil
Occupational Structure 1991 to 2011 and Volume of Change
Cultivators (percentage)

Sr. No.	Name of the Villages	1991	%	2001	%	Volume change	2011	%	Volume change
1	Waghoshi	162	24.8	129	19.3	-5.5	208	29.7	10.4
2	Vadgaon	60	9.6	97	14.4	4.8	202	29.0	14.6
3	Korhale	131	14.8	216	38.2	23.4	218	34.4	-3.8
4	Wakhari	410	19.2	621	28.4	9.2	1117	44.6	16.2
5	Wathar-nim	513	17.1	417	11.9	-5.2	549	13.8	1.9
6	Dhaval	412	15.8	873	32.3	16.5	1008	32.0	-0.3
7	Pirachiwadi	148	35.2	87	20	-15.2	166	38.5	18.5
8	Sherewadi	274	31.6	298	32.8	1.2	492	47.3	14.5
9	Surawadi	459	20.5	502	17.3	-3.2	805	21.5	4.2
10	Kharadevadi	43	5.5	112	9.18	3.7	256	21.0	11.8
11	Ghadgemala	NA	NA	119	17.2	17.2	202	27.0	9.8
12	Nandal	564	23.3	444	19.1	-4.2	758	26.5	7.4
13	Jinti	443	11.6	492	11.7	0.1	472	11.7	0.0
14	Phartadvadi	246	9.8	246	9.5	-0.3	367	13.0	3.5
15	Bhilkati	108	15.1	159	19.5	4.4	108	12.8	-6.7
16	Nimbore	248	13.6	302	14.3	0.7	367	15.2	-0.9
17	Dhavlevadi	147	21.5	162	20.4	-1.1	188	23.2	2.8
18	Kashidvadi	48	11.2	67	13.9	2.7	220	39.1	25.2
19	Vadjal	122	20.3	119	15.1	-5.2	261	28.6	13.5
20	Dalvadi	379	36.0	423	35.1	-0.9	318	21.8	-13.3
21	Upalave	949	43.8	1027	39.5	-4.3	1075	40.0	0.5
22	Sawantvadi	NA	NA	NA	NA	NA	NA	NA	NA
23	Daryachivadi	NA	NA	NA	NA	NA	NA	NA	NA
24	Jadhavnagar	NA	NA	73	23.1	23.1	211	19.6	-3.5
25	Malvadi	306	29.7	426	36.2	6.5	537	31.4	-4.8

26	Khadaki	74	19.8	76	14.5	-5.3	119	21.9	7.4
27	Mirgaon	366	26.7	293	16.9	-9.8	414	20.6	3.7
28	Tathvada	216	20.8	393	25.7	4.9	146	8.6	-17.1
29	Manevadi	87	18.4	176	37.9	19.5	191	37.8	-0.1
30	Zadakwadi	86	22.2	207	45	22.8	30	5.5	-39.5
31	Hol	459	18.0	565	24.2	6.2	301	13.8	-10.4
32	Sakharwadi	507	5.3	510	5.0	-0.3	653	6.8	1.8
33	Veloshi	222	47.7	194	31.3	-16.4	264	34.3	3.0
34	Tardaf	525	35.6	651	40.8	5.2	662	39.0	-1.8
35	Miryachiwad	NA	NA	126	10.4	NA	NA	10.8	0.4
36	Pharadvadi	367	25.6	300	15.9	-9.7	305	13.5	-2.4
37	Thakurki	392	20.1	463	18.0	-2.1	447	14.7	-3.3
38	Tawadi	175	18.1	429	36.5	18.4	526	44.5	8.0
39	Barad	1096	26.1	1145	25.8	-0.3	1165	26.5	0.7
40	Shereshindeva	99	28.9	334	42.8	13.9	363	34.1	-8.7
41	Nimbalak	728	19.1	1106	25.6	6.5	852	20.3	-5.3
42	Mathachivadi	740	24.3	929	28.7	4.4	682	20.5	-8.2
43	Pimparad	634	23.4	749	21.9	-1.5	567	15.3	-6.6
44	Takalwade	267	17.9	539	34.3	16.4	496	31.6	-2.7
45	Vadale	381	21.4	280	14.7	-6.7	577	24.7	10.0
46	Mirde	236	21.0	344	27.8	6.8	546	26.7	-1.1
47	Naikbomvadi	275	36.8	113	19.8	-17.0	184	25.4	5.6
48	Rajale	928	26.9	977	22.9	-4.0	814	17.4	-5.5
49	Sathe	260	12.3	454	19.2	6.9	373	15.8	-3.4
50	Sarde	380	11.5	457	12.0	0.5	660	15.3	3.3
51	Gokhali	528	15.1	770	20.8	5.7	814	21.4	0.6
52	Khatkevasti	230	11.1	273	11.8	0.7	521	19.0	7.2
53	Vajegaon	NA	NA	NA	NA	NA	97	12.3	00
54	Kurawali-bk	416	24.8	812	37.9	13.1	327	29.8	-8.1
55	Dattanagar	00	0.0	00	00	0.0	494	33.5	NA
56	Andhrud	436	26.2	568	29.1	2.9	737	34.8	5.7
57	Javali	286	16.8	432	21.2	4.4	475	19.2	-2.0
58	Rajuri	1064	37.1	1210	31.8	-5.3	629	22.5	-9.3
59	Bhavaninagar	NA	NA	NA	NA	NA	460	27.7	NA
60	Asu	589	11.8	888	17.2	5.4	900	15.3	-1.9
61	Dhavalevadi	147	24.7	168	27.0	2.3	108	16.9	-10.1
62	Shindenagar	242	14.9	211	16.3	1.4	198	18.0	1.7
63	Pawarvadi	332	11.4	328	10.8	-0.6	332	10.9	0.1
64	Hanamantwa	562	30.2	401	21.0	-9.2	576	29.2	8.2
65	Jadhavwadi	84	8.1	375	33.6	25.5	390	36.3	2.7
66	Gunaware	1089	18.4	1192	19.6	1.2	1290	19.5	-0.1
67	Munjawadi	771	22.3	1427	35.0	12.7	1197	28.9	-6.1
68	Girvi	743	18.0	914	18.9	0.9	1216	24.0	5.1
69	Bodakewadi	89	14.8	233	39.4	24.6	274	50.2	10.8
70	Kurawali-kh	143	13.3	413	25.4	12.1	314	16.6	-8.8
71	Mandavkhadak	125	18.7	255	28.7	10.0	222	24.2	-4.5
72	Nirgudi	403	16.3	363	13.4	-2.9	731	24.8	11.4
73	Vinchurni	75	11.4	129	17.7	6.3	123	13.8	-3.9
74	Khunte	356	14.6	327	13.0	-1.6	321	11.7	-1.3
75	Shindevadi	365	22.5	318	14.3	-8.2	453	19.2	4.9
76	Chaudharwadi	342	11.8	535	16.2	4.4	605	15.8	-0.4
77	Jadhavwadi	131	20.3	27	1.6	-18.7	214	6.4	4.8
78	Kolki	340	10.6	262	4.8	-5.8	275	3.4	-1.4
79	Zirapwadi	219	13.0	371	18.8	5.8	299	13.6	-5.2
80	Kambleshwar	325	21.1	618	32.0	10.9	739	34.5	2.5
81	Sastewadi	293	9.3	480	12.8	3.5	421	10.4	-2.4
82	Vidani	1818	22.2	1799	19.7	-2.5	2614	25.0	5.3
83	Dudhebavi	1156	32.6	765	19.9	-12.7	992	23.1	3.2

84	Tirakwadi	228	21.0	206	19.6	-1.4	315	27.5	7.5
85	Bhadali-kh	168	18.8	181	25.7	7.0	112	14.3	-11.4
86	Sonawadi -kh	133	16.7	96	10.2	-6.5	366	34.3	24.1
87	Dhuldeo	252	7.8	279	6.0	-1.8	271	9.1	3.1
88	Somathali	641	19.7	831	21.8	2.1	937	24.0	2.2
89	Algudevadi	366	18.1	175	7.5	-10.6	200	8.4	0.9
90	Sangavi	96	2.1	1047	19.9	17.8	1341	22.6	2.7
91	Songaon	380	28.0	126	8.7	-19.3	247	13.8	5.0
92	Saskal	231	16.4	309	20.8	4.4	343	21.0	0.2
93	Dhumalwadi	80	9.1	346	32.0	22.9	408	33.6	1.6
94	Bhadali-bk	139	23.6	181	17.7	-5.9	208	17.0	-0.7
95	Sonawadi-bk	136	12.8	180	14.5	1.7	200	13.7	-0.8
96	Padegaon	663	15.7	911	17.9	2.2	912	18.1	0.2
97	Koregaon	202	23.6	294	28.7	5.1	273	25.3	-3.4
98	Tambave	318	12.3	716	30.4	18.1	634	24.9	-5.5
99	Salpe	208	12.6	279	15.0	2.4	428	20.5	5.5
100	Koparde	13	0.0	17	21.7	21.7	28	37.8	16.1
101	Chambharwad	81	17.6	80	13.3	-4.3	216	33.5	20.2
102	Hingangaon	769	24.6	984	24.9	0.3	1229	28.3	3.4
103	Sherechiwadi	135	17.0	298	31.9	14.9	285	22.6	-9.3
104	Adarki-bk	445	19.2	516	19.2	0.0	536	19.8	0.6
105	Adarki-kh	422	20.8	400	18.8	-2.0	532	22.5	3.7
106	Aradgaon	173	15.5	249	20.7	5.2	251	21.8	1.1
107	Chavanwadi	414	32.5	423	31.9	-0.6	479	30.7	-1.2
108	Kapadgaon	232	17.7	271	17.9	0.2	366	20.3	2.4
109	Mirewadi	193	37.9	421	64.7	26.8	441	60.1	-4.6
110	Kusur	255	27.8	194	18.6	-9.2	378	31.7	13.1
111	Malevadi	89	13.0	103	14.4	1.4	158	19.2	4.8
112	Shindemal	94	14.1	95	13.7	-0.4	121	15.4	1.7
113	Saswad	791	27.5	913	26.1	-1.4	944	26.7	0.6
114	Takubaichiwadi	281	41.0	123	23.3	-17.7	95	15.8	-7.5
115	Kalaj	244	16.1	311	18.2	2.1	469	22.7	4.5
116	Khamgaon	275	10.8	272	7.9	-2.9	385	9.3	1.4
117	Murum	181	18.7	311	23.5	4.8	412	27.3	3.8
118	Tadavale	177	13.0	312	20.8	7.8	264	16.5	-4.3
119	Vitthalvadi	115	13.8	144	16.2	2.4	369	34.7	18.5
120	Taradgaon	812	13.8	1044	17.6	3.8	1107	15.0	-2.6
121	Rawadi-kh	98	11.8	270	29.7	17.9	220	19.0	-10.7
122	Rawdi-bk	163	11.7	338	24.1	12.4	193	12.4	-11.7
123	Dombalwadi	121	20.1	126	30.7	10.6	151	15.4	-15.3
124	Kapasi	367	31.2	309	22.9	-8.3	502	33.4	10.5
124	Alajapur	234	17.6	273	19.4	1.8	553	34.1	14.7
126	Ghadagevadi	362	31.8	275	20.1	-11.7	371	24.8	4.7
127	Mulikwadi	172	15.1	197	18.4	3.3	359	29.1	10.7
128	Bibi	418	19.7	578	25.1	5.4	478	21.2	-3.9

Appendix-H
Phaltan Tahsil
Occupational Structure 1991 to 2011 and Volume of Change
Agricultural Labours

Sr. No.	Name of the Villages	1991	%	2001	%	Volume Change	2011	%	Volume Change
1	Waghoshi	50	7.7	30	4.4	-3.3	155	22.2	17.8
2	Vadgaon	100	15.9	24	3.5	-12.4	137	19.7	16.2
3	Korhale	56	6.3	20	3.5	-2.8	54	8.5	5.0
4	Wakhari	203	9.5	221	10.1	0.6	334	13.3	3.2
5	Wathar-nim	322	10.7	332	9.5	-1.2	523	13.2	3.7
6	Dhaval	193	7.4	248	9.2	1.8	284	9.0	-0.2
7	Pirachiwadi	19	4.5	28	6.8	2.3	68	15.7	9.3
8	Sherewadi	49	5.7	17	1.8	-3.9	44	4.2	2.4
9	Surawadi	245	11.0	257	8.8	-2.2	530	14.2	5.4
10	Kharadevadi	213	27.3	257	3.3	-24.0	243	19.9	16.6
11	Ghadgemala	NA	NA	22	3.1	3.1	36	4.8	1.7
12	Nandal	142	5.9	122	5.2	-0.7	523	18.3	13.1
13	Jinti	907	23.8	709	16.9	-6.9	972	24.4	7.5
14	Phartadvadi	478	19.0	254	9.8	-9.2	446	15.8	6.0
15	Bhilkati	176	24.7	164	20.1	-4.6	167	19.8	-0.3
16	Nimbore	227	12.5	218	10.3	-2.2	318	13.2	2.9
17	Dhavlevadi	38	5.6	14	1.7	-3.9	49	6.0	4.3
18	Kashidvadi	88	20.6	83	17.3	-3.3	51	9.0	-8.3
19	Vadjal	66	11.0	49	6.2	-4.8	106	11.6	5.4
20	Dalvadi	93	8.8	151	12.5	3.7	214	14.7	2.2
21	Upalave	87	4.0	153	5.8	1.8	147	5.4	-0.4
22	Sawantvadi	NA	NA	NA	NA	NA	NA	NA	NA
23	Daryachivadi	NA	NA	NA	NA	NA	NA	NA	NA
24	Jadhavnagar	NA	NA	NA	NA	NA	NA	NA	NA
25	Malvadi	39	3.8	29	2.4	-1.4	53	3.1	0.7
26	Khadaki	03	0.8	7	1.3	0.5	10	1.8	0.5
27	Mirgaon	215	15.7	105	6.0	-9.7	361	17.9	11.9
28	Tathvada	73	7.0	168	10.9	3.9	377	22.4	11.5
29	Manevadi	47	9.9	8	1.7	-8.2	26	5.1	3.4
30	Zadakwadi	19	4.9	22	4.7	-0.2	10	1.8	-2.9
31	Hol	599	23.5	447	19.1	-4.4	380	17.4	-1.7
32	Sakharwadi	659	6.9	1235	12.2	5.3	1266	13.2	1.0
33	Veloshi	19	4.1	23	3.7	-0.4	145	18.8	15.7
34	Tardaf	98	6.7	39	2.4	-4.3	128	7.5	5.1
35	Miryachiwadi	95	9.2	105	8.67	-0.6	160	13.0	4.33
36	Pharadvadi	195	13.6	202	10.7	-2.9	184	8.2	-2.5
37	Thakurki	333	17.1	86	3.3	-13.8	282	9.3	6.0
38	Tawadi	168	17.4	191	16.2	-1.2	35	2.9	-13.3
39	Barad	763	18.2	580	9.6	-8.6	598	13.6	4.0
40	Shereshindeva.	26	7.6	114	14.6	7.0	294	27.6	13.0
41	Nimbalak	809	21.2	867	20.1	-1.1	842	20.1	0.0
42	Mathachivadi	546	17.9	328	10.1	-7.8	450	13.5	3.4
43	Pimparad	504	18.6	462	13.5	-5.1	868	23.5	10.0
44	Takalwade	331	22.2	236	15.0	-7.2	229	14.5	0.5
45	Vadale	185	10.4	91	4.8	-5.6	297	12.6	7.8
46	Mirde	199	17.7	78	6.3	-11.4	184	9.0	3.3
47	Naikbomvadi	16	2.1	11	1.9	-0.2	34	4.7	2.8
48	Rajale	545	15.8	500	11.7	-4.1	751	16.0	4.3
49	Sathe	513	24.3	518	21.9	-2.4	517	21.8	-0.1
50	Sarde	699	21.2	330	8.6	-12.6	868	20.2	11.6

51	Gokhali	958	27.4	803	34.8	7.4	519	13.6	-21.2
52	Khatkevasti	418	20.3	401	17.4	-2.9	763	27.8	10.4
53	Vajegaon	NA	NA	NA	NA	NA	65	8.3	NA
54	Kurawali bk	248	14.8	241	11.2	-3.6	395	36.0	24.8
55	Dattanagar	NA	NA	NA	NA	NA	190	12.9	NA
56	Andhrud	181	10.9	264	13.5	2.6	173	8.1	-5.4
57	Javali	339	19.9	181	8.9	-11.0	422	17.0	8.1
58	Rajuri	220	7.7	434	11.4	3.7	290	10.4	-1.0
59	Bhavaninagar	NA	NA	214	14.8	14.8	37	2.2	-12.6
60	Asu	965	19.3	916	17.7	-1.6	1090	18.5	0.8
61	Dhavalevadi	156	26.2	101	16.2	-10.0	148	23.1	6.9
62	Shindenagar	280	17.2	295	22.9	5.7	170	15.4	-7.5
63	Pawarvadi	809	27.8	675	22.2	-5.6	443	14.5	-7.7
64	Hanamantwadi	413	22.2	362	19.0	-3.2	203	10.3	-8.7
65	Jadhavwadi	35	3.4	172	15.4	12.0	94	8.7	-6.7
66	Gunaware	1197	20.2	1128	18.5	-1.7	1465	22.1	3.6
67	Munjawadi	514	14.9	571	14.0	-0.9	666	16.1	2.1
68	Girvi	542	13.1	755	15.6	2.5	732	14.4	-1.2
69	Bodakewadi	27	4.5	28	4.7	0.2	23	4.2	-0.5
70	Kurawali-kh	116	10.8	183	11.2	0.4	268	14.1	2.9
71	Mandavkhadak	95	14.2	131	14.7	0.5	200	21.8	7.1
72	Nirgudi	375	15.2	151	5.5	-9.7	524	17.7	12.2
73	Vinchurni	108	16.4	92	12.6	-3.8	185	20.9	8.3
74	Khunte	461	18.9	99	3.9	-15.0	403	14.7	10.8
75	Shindevadi	240	14.8	384	17.3	2.5	430	18.2	0.9
76	Chaudharwadi	550	19.0	490	14.8	-4.2	739	19.3	4.5
77	Jadhavwadi	123	19.0	28	1.7	-17.3	40	1.2	-0.5
78	Kolki	173	5.4	232	4.2	-1.2	302	3.8	-0.4
79	Zirapwadi	130	7.7	219	11.1	3.4	145	6.6	-4.5
80	Kambleshwar	214	13.9	184	9.5	-4.4	233	10.8	1.3
81	Sastewadi	772	24.5	561	15.0	-9.5	920	22.9	7.9
82	Vidani	633	7.7	804	8.8	1.1	910	8.7	-0.1
83	Dudhebavi	157	4.4	281	7.3	2.9	461	10.7	3.4
84	Tirakwadi	93	8.6	127	12.1	3.5	104	9.0	-3.1
85	Bhadali-kh	77	8.6	59	8.3	-0.3	175	22.4	14.1
86	Sonawadi -kh	108	13.6	73	7.7	-5.9	84	7.8	0.1
87	Dhuldeo	1319	41.1	1165	25.0	-16.1	339	11.4	-13.6
88	Somathali	575	17.7	585	15.3	-2.4	502	12.8	-2.5
89	Algudevadi	157	7.8	342	14.8	7.0	467	19.6	4.8
90	Sangavi	735	16.4	1076	20.5	4.1	1089	18.4	-2.1
91	Songaon	414	30.5	358	24.8	-5.7	618	34.5	9.7
92	Saskal	186	13.2	192	12.9	-0.3	244	14.9	2.0
93	Dhumalwadi	150	17.0	114	10.5	-6.5	100	8.2	-2.3
94	Bhadali-bk	26	4.4	39	3.8	-0.6	199	16.3	12.5
95	Sonawadi-bk	92	8.6	201	16.2	7.6	288	19.7	3.5
96	Padegaon	824	19.6	835	16.4	-3.2	847	16.8	0.4
97	Koregaon	122	14.3	83	8.1	-6.2	100	9.2	1.1
98	Tambave	121	4.7	142	6.0	1.3	221	8.6	2.6
99	Salpe	135	8.2	75	4.0	-4.2	57	2.7	-1.3
100	Koparde	NA	NA	7	8.9	8.9	25	32.5	23.1
101	Chambharwadi	141	30.6	25	4.1	-26.5	65	10.0	5.9
102	Hingangaon	265	8.5	378	9.5	1.0	738	17.0	7.5
103	Sherechiwadi	98	12.3	125	13.4	1.1	294	23.4	10.0
104	Adarki-bk	197	8.5	123	4.5	-4.0	341	12.6	8.1
105	Adarki-kh	214	10.5	232	10.9	0.4	318	13.4	2.5
106	Aradgaon	195	17.5	122	10.1	-7.4	198	17.2	7.1
107	Chavanwadi	82	6.4	82	6.1	-0.3	308	19.7	13.6
108	Kapadgaon	218	16.6	265	17.5	0.9	242	13.4	-4.1

109	Mirewadi	108	21.2	172	26.4	5.2	173	18.9	-7.5
110	Kusur	221	24.1	251	24.0	-0.1	206	17.3	-6.7
111	Malevadi	180	26.4	222	31.0	4.6	111	13.5	-17.5
112	Shindemal	88	13.2	88	12.7	-0.5	227	28.9	16.2
113	Saswad	318	11.1	485	13.8	2.7	334	9.4	-4.4
114	Takubaichiwadi	41	6.0	65	12.3	6.3	53	8.8	-3.5
115	Kalaj	143	9.4	169	9.9	0.5	217	10.5	0.6
116	Khamgaon	489	19.1	319	9.3	-9.8	706	17.1	708
117	Murum	58	6.0	159	12.0	6.0	195	12.9	0.9
118	Tadavale	173	12.7	225	15.0	2.3	265	16.5	NA
119	Vitthalvadi	91	11.0	28	3.1	-7.9	95	8.9	5.8
120	Taradgaon	503	8.5	670	9.6	1.1	223	12.5	2.9
121	Rawadi-kh	114	13.7	197	21.6	7.9	115	10	-11.6
122	Rawdi-bk	223	16.0	199	14.2	-1.8	272	17.5	3.3
123	Dombalwadi	50	8.3	32	4.5	-3.8	314	32.1	27.6
124	Kapasi	105	8.9	66	4.9	-4.0	173	11.5	6.6
124	Alajapur	152	11.4	141	10.0	-1.4	164	10.1	0.1
126	Ghadagevadi	10	0.9	36	2.6	1.7	17	1.1	-1.5
127	Mulikwadi	125	11.0	56	5.2	-5.8	534	43.3	38.1
128	Bibi	165	7.8	199	8.6	0.8	375	16.6	8.0

Appendix-I
Phaltan Tahsil
Occupational Structure 1991 to 2011 and Volume of Change
Other workers

Sr. No.	Name of the Villages	1991	%	2001	%	Volume Change	2011	%	Volume Change
1	Waghoshi	54	8.3	37	5.5	-2.8	23	3.2	-2.3
2	Vadgaon	68	10.8	29	4.3	-6.5	74	10.6	6.3
3	Korhale	20	2.3	45	1.6	-0.7	39	6.1	4.5
4	Wakhari	82	3.8	122	5.5	1.7	218	8.7	3.2
5	Wathar-nim	312	10.4	326	9.3	-1.1	347	8.7	-0.6
6	Dhaval	284	10.9	141	4.3	-6.6	104	2.9	-1.4
7	Pirachiwadi	28	6.7	55	12.6	5.9	36	8.3	-4.3
8	Sherewadi	42	4.8	48	5.2	0.4	71	6.8	1.6
9	Surawadi	189	8.5	202	6.9	-1.6	597	16.0	9.1
10	Kharadevadi	-144	-18	96	7.8	26.3	60	4.9	-2.9
11	Ghadgemala	NA	NA	56	8.1	8.1	94	12.6	4.5
12	Nandal	142	5.9	306	13.2	7.3	197	6.9	-6.3
13	Jinti	200	5.2	235	5.6	0.4	228	5.7	0.1
14	Phartadvadi	188	7.5	180	7.0	-0.5	274	9.7	2.7
15	Bhilkati	22	3.1	65	7.9	4.8	51	6.0	-1.9
16	Nimbore	160	8.8	167	7.9	-0.9	212	8.8	0.9
17	Dhavlevadi	42	6.1	88	11.0	4.9	109	13.4	2.4
18	Kashidvadi	30	7.0	72	15.0	8.0	36	6.4	-8.6
19	Vadjal	75	12.5	90	11.4	-1.1	38	4.1	-7.3
20	Dalvadi	50	4.8	46	3.8	-1.0	113	7.7	3.9
21	Upalave	56	2.6	86	3.0	0.4	150	6.0	3.0
22	Sawantvadi	NA	NA	NA	NA	NA	NA	NA	NA
23	Daryachivadi	NA	NA	NA	NA	NA	NA	NA	NA
24	Jadhavnagar	NA	NA	NA	NA	NA	NA	NA	NA
25	Malvadi	80	7.8	93	7.9	0.1	188	11.0	3.1
26	Khadaki	35	9.4	74	14.1	4.7	23	4.2	-9.9
27	Mirgaon	112	8.2	148	8.5	0.3	49	2.4	-6.1
28	Tathvada	77	7.4	73	4.7	-2.7	209	12.4	7.7

29	Manevadi	NA	NA	24	5.1	5.1	30	5.9	0.8
30	Zadakwadi	-15	-3.9	12	2.6	6.5	7	1.3	-1.3
31	Hol	163	6.4	166	7.1	0.7	127	5.8	-1.3
32	Sakharwadi	1960	20.4	1328	13.1	-7.3	1558	16.2	3.1
33	Veloshi	12	2.6	21	3.3	0.7	17	2.2	-1.1
34	Tardaf	58	3.9	53	3.3	-0.6	120	7.0	3.7
35	Miryachiwadi	629	61.1	20	1.65	-59.5	30	2.4	NA
36	Pharadvadi	165	11.5	335	17.8	6.3	408	18.1	0.3
37	Thakurki	208	10.7	222	8.6	-2.1	423	13.9	5.3
38	Tawadi	100	10.3	41	3.4	-6.9	45	2.8	-0.6
39	Barad	306	7.3	437	9.5	2.2	298	6.7	-2.71
40	Shereshindeva	25	7.3	59	7.5	0.2	68	6.4	-1.1
41	Nimbalak	175	4.6	259	6.0	1.4	292	6.9	0.9
42	Mathachivadi	82	2.7	133	4.1	1.4	295	8.9	4.8
43	Pimparad	142	5.2	188	5.5	0.3	200	5.4	-0.1
44	Takalwade	63	4.2	50	12.4	8.2	56	3.5	0.4
45	Vadale	111	6.2	236	12.4	6.2	231	9.8	-2.6
46	Mirde	50	4.4	47	3.8	-0.6	312	15.2	11.4
47	Naikbomvadi	25	3.3	37	6.4	3.1	54	7.4	1.0
48	Rajale	207	6.0	382	8.9	2.9	415	8.8	-0.1
49	Sathe	114	5.4	77	3.2	-2.2	158	6.6	3.4
50	Sarde	102	3.1	285	7.5	4.4	232	5.4	-2.1
51	Gokhali	168	4.8	188	5.0	0.2	235	6.2	1.2
52	Khatkevasti	174	8.4	90	3.9	-4.5	97	3.5	-0.4
53	Vajegaon	NA	NA	NA	NA	NA	99	12.6	NA
54	Kurawali bk	110	6.6	61	2.8	-3.8	19	1.7	-1.1
55	Dattanagar	NA	NA	NA	NA	NA	89	6.0	NA
56	Andhrud	89	5.4	79	4.0	-1.4	95	4.4	0.4
57	Javali	91	5.3	122	6.0	0.7	210	8.5	2.5
58	Rajuri	66	2.3	207	5.4	3.1	97	3.4	-2.0
59	Bhavaninagar	NA	NA	75	5.2	5.2	68	4.0	-1.2
60	Asu	368	7.4	513	9.93	2.6	377	6.41	-3.52
61	Dhavalevadi	15	2.5	39	6.2	3.7	35	5.4	-0.8
62	Shindenagar	248	15.3	29	2.2	-13.1	78	7.1	4.9
63	Pawarvadi	229	7.9	221	7.2	-0.7	211	6.9	-0.3
64	Hanamantwadi	-126	-6.8	43	2.2	9.0	58	2.9	0.7
65	Jadhavwadi	231	22.2	27	2.4	-19.8	50	4.6	2.2
66	Gunaware	190	3.2	282	4.6	1.4	300	4.5	-0.1
67	Munjawadi	90	2.6	70	1.7	-0.9	117	0.4	-0.3
68	Girvi	371	9.0	358	7.4	-1.6	295	5.8	-1.6
69	Bodakewadi	80	13.3	54	9.1	-4.2	19	3.4	-5.7
70	Kurawali-kh	108	10.0	148	9.1	-0.9	157	8.3	-0.8
71	Mandavkhadak	48	7.2	57	6.4	-0.8	56	6.1	-0.3
72	Nirgudi	182	7.4	251	9.2	1.8	201	6.8	-2.4
73	Vinchurni	42	6.4	63	8.6	2.2	86	9.7	1.1
74	Khunte	123	5.1	115	4.5	-0.6	220	8.0	3.5
75	Shindevadi	67	4.1	190	8.5	4.4	234	9.9	1.4
76	Chaudharwadi	213	7.4	403	12.2	4.8	274	7.1	-5.1
77	Jadhavwadi	-22	-3.4	414	25.1	28.5	501	15.0	-10.1
78	Kolki	1031	32.0	1200	22.0	10.0	1484	18.8	-3.2
79	Zirapwadi	206	12.2	255	12.9	0.7	263	12.0	-0.9
80	Kambleshwar	27	1.8	161	8.3	6.5	123	5.7	-2.6
81	Sastewadi	194	6.2	303	8.1	1.9	496	12.3	4.2
82	Vidani	1042	12.7	955	10.4	-2.3	1358	13.4	3.0
83	Dudhebavi	327	9.2	353	9.2	0.0	365	8.5	-0.7
84	Tirakwadi	120	11.0	127	12.1	1.1	106	9.2	-2.9
85	Bhadali-kh	163	18.2	106	15.0	-3.2	107	13.7	-1.3
86	Sonawadi-kh	84	10.6	111	11.8	1.2	146	13.6	1.8

87	Dhuldeo	211	6.6	743	16.0	9.4	447	15.1	-0.9
88	Somathali	200	6.2	403	10.5	4.3	272	6.9	-3.6
89	Algudevadi	329	16.3	383	16.6	0.3	204	8.6	-8.0
90	Sangavi	835	18.6	241	4.5	-14.1	383	6.4	1.9
91	Songaon	-194	-14.	75	5.2	19.5	97	5.4	0.2
92	Saskal	133	9.4	143	9.6	0.2	161	9.8	0.23
93	Dhumalwadi	111	12.6	58	5.3	-7.3	31	2.5	-2.8
94	Bhadali-bk	79	13.4	161	15.7	2.3	90	7.3	-8.4
95	Sonawadi -bk	57	5.3	99	7.9	2.6	105	8.3	0.4
96	Padegaon	409	9.7	555		-9.7	582		
97	Koregaon	64	7.5	126	12.3	4.8	126	11.6	-0.7
98	Tambave	312	12.0	239	10.1	-1.9	232	9.1	-1.0
99	Salpe	154	9.3	202	10.8	1.5	161	7.7	-3.1
100	Koparde	NA	NA	4	5.1	5.1	8	10.8	5.7
101	Chambharwadi	64	13.9	103	17.1	3.2	61	9.4	-7.7
102	Hingangaon	203	6.5	315	7.9	1.4	448	10.3	2.4
103	Sherechwadi	47	5.9	63	6.7	0.8	110	8.7	2.0
104	Adarki-bk	148	6.4	156	5.8	-0.6	276	10.2	4.4
105	Adarki-kh	197	9.7	157	7.4	-2.3	230	9.7	2.3
106	Aradgaon	82	7.3	95	7.9	0.6	60	5.2	-2.7
107	Chavanwadi	30	2.4	92	6.9	4.5	122	7.8	0.9
108	Kapadgaon	138	10.5	195	12.9	2.4	156	8.6	-4.3
109	Mirewadi	43	8.4	69	10.6	2.2	70	9.6	-1.0
110	Kusur	26	2.8	52	4.9	2.1	63	5.2	0.3
111	Malevadi	77	11.3	50	6.9	-4.4	136	16.5	9.6
112	Shindemal	50	7.5	46	6.6	-0.9	49	6.2	-0.4
113	Saswad	141	4.9	289	8.2	3.3	261	2.7	-5.5
114	Takubaichiwad	18	2.6	85	16.1	13.5	32	5.3	-10.8
115	Kalaj	117	7.7	83	4.8	-2.9	241	11.6	6.8
116	Khamgaon	168	6.6	358	2.8	-3.8	340	8.2	5.4
117	Murum	43	4.4	97	7.3	2.9	53	3.5	-3.8
118	Tadavale	78	5.7	82	5.4	-0.3	102	6.3	0.9
119	Vitthalvadi	25	3.0	36	4.0	1.0	42	3.9	-0.1
120	Taradgaon	599	10.2	97	11.4	1.2	888	12.1	0.7
121	Rawadi-kh	34	4.1	27	2.9	-1.2	15	1.3	-1.6
122	Rawdi-bk	68	4.9	58	4.1	-0.8	130	8.3	4.2
123	Dombalwadi	40	6.7	37	5.2	-1.5	23	2.3	-2.9
124	Kapasi	100	8.5	118	8.6	0.1	130	9.6	1.0
124	Alajapur	37	2.8	33	2.3	-0.5	45	2.7	0.4
126	Ghadagevadi	105	9.2	129	9.4	0.2	87	5.8	-3.6
127	Mulikwadi	139	12.2	125	11.6	-0.6	129	10.4	-1.2
128	Bibi	186	8.8	122	5.3	-3.5	180	8.0	3.3

Appendix-J
Phaltan Tahsil
Occupational Structure 1991 to 2011 and Volume of Change
Total Main workers

Sr. No.	Name of the Villages	1991	%	2001	%	Volume Change	2011	%	Volume Change
1	Waghoshi	266	40.7	126	18.8	-21.8	391	56.0	37.1
2	Vadgaon	228	36.3	157	23.4	-12.9	427	61.4	37.9
3	Korhale	207	23.3	282	50.0	26.6	314	49.6	-0.3
4	Wakhari	695	32.4	1004	45.9	13.4	1060	42.4	-3.5
5	Wathar-nim	1147	38.1	1120	32.0	-6.0	1461	36.9	4.8
6	Dhaval	889	34.0	1262	46.8	12.7	1396	44.3	-2.4
7	Pirachiwadi	195	46.4	171	39.4	-7.0	270	62.6	23.2
8	Sherewadi	365	42.1	406	44.7	2.5	613	59.0	14.2
9	Surawadi	893	39.9	990	34.2	-5.7	1947	52.1	17.9
10	Kharadevadi	112	14.3	251	20.5	6.2	588	48.3	27.7
11	Ghadgemala	NA	NA	199	28.8	28.8	334	44.7	15.9
12	Nandal	848	35.0	894	38.6	3.6	1483	51.9	13.3
13	Jinti	1550	40.6	1509	36.1	-4.5	1693	42.5	6.4
14	Phartadvadi	912	36.2	704	27.3	-8.9	1120	39.7	12.3
15	Bhilkati	306	42.9	389	47.8	4.9	326	38.7	-9.0
16	Nimbore	635	34.9	708	33.6	-1.3	912	37.9	4.3
17	Dhavlevadi	227	33.1	270	34.0	0.8	346	42.7	8.7
18	Kashidvadi	166	38.7	224	46.7	7.9	312	55.5	8.7
19	Vadjal	263	43.6	264	33.5	-10.1	534	58.6	25.0
20	Dalvadi	522	49.6	622	51.6	2.0	645	44.3	-7.2
21	Upalave	1092	50.4	1289	49.6	-0.7	1382	51.5	1.8
22	Sawantvadi	NA	NA	NA	NA	NA	NA	NA	NA
23	Daryachivadi	NA	NA	NA	NA	NA	NA	NA	NA
24	Jadhavnagar	NA	NA	NA	NA	NA	NA	NA	NA
25	Malvadi	425	41.2	572	48.6	7.4	1009	59.1	10.4
26	Khadaki	112	29.9	160	30.6	0.7	152	27.9	-2.6
27	Mirgaon	693	50.5	580	33.5	-17.0	825	41.0	7.5
28	Tathvada	366	35.1	640	41.8	6.6	742	44.1	2.3
29	Manevadi	NA	NA	211	45.4	45.4	247	49.0	3.5
30	Zadakwadi	90	23.2	245	53.2	30.0	47	8.7	-44.5
31	Hol	1221	47.9	1205	51.6	3.6	814	37.4	-14.1
32	Sakharwadi	3126	32.5	3207	31.7	-0.7	3553	37.1	5.3
33	Veloshi	253	54.4	254	41.0	-13.3	426	55.4	14.4
34	Tardaf	681	46.2	729	45.7	-0.4	926	54.6	8.9
35	Miryachiwadi	724	70.3	664	54.8	-15.5	1143	93.0	38.2
36	Pharadvadi	727	50.8	874	46.4	-4.3	924	41.1	-5.2
37	Thakurki	933	47.8	777	30.3	-17.4	1164	38.4	8.1
38	Tawadi	443	45.8	666	56.6	10.8	609	51.5	-5.1
39	Barad	2165	51.6	2162	57.2	5.6	2061	46.9	-4.6
40	Shereshindeva	150	43.7	331	42.4	-1.3	545	51.3	8.8
41	Nimbalak	1712	44.8	2356	54.7	9.8	2080	49.6	-5.0
42	Mathachivadi	1368	44.8	1451	44.8	0.0	1430	43.1	-1.7
43	Pimparad	1280	47.2	1416	41.5	-5.7	1651	44.7	3.1
44	Takalwade	661	44.3	851	54.1	9.7	785	50.0	-4.1
45	Vadale	677	38.0	612	32.3	-5.7	1110	47.1	14.8
46	Mirde	485	43.1	474	38.3	-4.8	1043	51.1	12.7
47	Naikbomvadi	316	42.3	162	28.0	-14.2	285	39.4	11.4
48	Rajale	1680	48.7	1896	44.5	-4.2	2112	45.1	0.6
49	Sathe	887	42.0	1068	45.2	3.1	1067	45.1	-0.0
50	Sarde	1181	35.8	1074	28.2	-7.5	1769	41.2	12.9

51	Gokhali	1654	47.3	1831	49.5	2.1	1624	42.8	-6.6
52	Khatkevasti	822	39.8	773	33.5	-6.2	1404	51.3	17.7
53	Vajegaon	NA	NA	NA	NA	NA	271	34.6	34.6
54	Kurawali bk	774	46.2	1126	121	74.8	546	49.8	-71.2
55	Dattanagar	NA	NA	NA	NA	NA	775	52.6	NA
56	Andhrud	706	42.4	920	47.2	4.7	1040	49.2	1.9
57	Javali	716	42.0	743	36.6	-5.4	1129	45.7	9.1
58	Rajuri	1350	47.0	1913	50.3	3.3	1025	36.7	-13.5
59	Bhavaninagar	NA	NA	NA	NA	NA	565	34.0	34.0
60	Asu	1922	38.5	2317	44.8	6.3	2367	40.2	-4.6
61	Dhavalevadi	318	53.4	309	49.8	-3.6	292	45.7	-4.0
62	Shindenagar	770	47.3	559	43.4	-3.9	456	41.5	-1.8
63	Pawarvadi	1370	47.1	1247	41.1	-6.0	1025	33.7	-7.4
64	Hanamantwadi	849	45.6	811	42.6	-2.9	846	42.9	0.3
65	Jadhavwadi	350	33.6	587	52.6	19.0	360	33.5	-19.1
66	Gunaware	2476	41.7	2655	43.7	1.9	3071	46.5	2.7
67	Munjawadi	1375	39.7	2111	51.8	12.0	2009	48.6	-3.1
68	Girvi	1656	40.1	2075	43.0	2.9	2281	45.1	2.0
69	Bodakewadi	196	32.6	315	53.3	20.7	317	58.1	4.7
70	Kurawali-kh	367	34.0	751	46.3	12.3	749	39.6	-6.7
71	Mandavkhadak	268	40.0	445	50.1	10.1	478	52.2	2.0
72	Nirgudi	960	38.9	792	29.3	-9.6	1468	49.8	20.5
73	Vinchurni	225	34.0	286	39.3	5.3	394	44.5	5.1
74	Khunte	940	38.6	557	22.1	-16.4	947	34.7	12.5
75	Shindevadi	672	41.3	895	40.3	-0.9	1133	48.0	7.6
76	Chaudharwadi	1105	38.1	1467	44.4	6.3	1639	43.0	-1.4
77	Jadhavwadi	232	35.9	519	31.5	-4.3	1138	49.0	17.5
78	Kolki	1061	32.9	1736	31.8	-1.0	2651	30.5	268.6
79	Zirapwadi	555	32.8	861	43.7	10.8	911	41.6	-2.0
80	Kambleshwar	566	36.7	974	50.4	13.7	1096	51.1	0.7
81	Sastewadi	1259	39.9	1365	36.6	-3.2	1865	46.4	9.8
82	Vidani	3493	42.6	3599	39.4	-3.1	4907	47.0	7.5
83	Dudhebavi	1640	46.2	1415	36.9	-9.3	1862	43.4	6.5
84	Tirakwadi	441	40.6	470	44.8	4.2	543	47.4	2.6
85	Bhadali-kh	408	45.5	454	64.4	18.9	475	60.9	-3.5
86	Sonawadi-kh	325	40.8	294	31.2	-9.6	605	56.7	25.4
87	Dhuldeo	1782	55.4	2188	47.1	-8.3	1081	36.6	-10.4
88	Somathali	1416	43.5	1861	48.8	5.3	1748	44.8	-4.0
89	Algudevadi	852	42.1	910	39.5	-2.6	888	37.4	-2.0
90	Sangavi	1666	37.2	2373	45.2	8.0	2826	47.7	2.5
91	Songaon	600	44.2	586	40.7	-3.5	985	55.1	14.4
92	Saskal	550	39.0	644	43.3	4.3	748	45.8	2.4
93	Dhumalwadi	341	38.7	530	49.0	10.3	539	44.4	-4.6
94	Bhadali-bk	244	41.5	326	31.9	-9.5	349	28.6	-3.3
95	Sonawadi -bk	285	26.7	496	40.0	13.3	596	40.8	0.8
96	Padegaon	1896	45.0	2301	45.3	0.3	2341	46.5	1.1
97	Koregaon	388	45.3	503	49.2	3.8	505	46.8	-2.3
98	Tambave	751	28.9	1121	47.6	18.7	1111	43.6	-3.9
99	Salpe	497	30.1	568	30.6	0.5	677	32.5	1.8
100	Koparde	40	51.2	28	35.9	-15.3	36	48.6	12.7
101	Chambharwadi	286	62.0	208	34.7	-27.3	342	53.1	18.3
102	Hingangaon	1237	39.6	1726	43.8	4.2	2440	56.2	12.4
103	Sherechwadi	280	35.1	406	43.5	8.3	689	54.8	11.2
104	Adarki-bk	790	34.0	864	32.2	-1.7	1180	43.6	11.3
105	Adarki-kh	833	40.9	810	38.1	-2.8	1081	45.7	7.6

106	Aradgaon	450	40.3	469	39.0	-1.2	511	44.4	5.3
107	Chavanwadi	526	41.3	598	45.1	3.8	909	58.3	13.1
108	Kapadgaon	588	44.8	740	49.0	4.2	768	42.6	-6.4
109	Mirewadi	344	67.5	351	54.0	-13.5	360	49.7	-4.2
110	Kusur	502	54.6	514	49.2	-5.4	650	54.6	5.3
111	Malevadi	346	50.7	393	54.9	4.2	409	49.8	-5.0
112	Shindemal	232	34.7	229	33.1	-1.5	405	51.6	18.4
113	Saswad	1250	43.4	1703	48.7	5.2	1580	44.8	-3.9
114	Takubaichiwad	340	49.6	273	51.8	2.1	180	30.0	-21.7
115	Kalaj	504	33.2	582	34.0	0.8	946	45.7	11.6
116	Khamgaon	932	36.4	983	28.7	-7.7	1459	35.5	6.7
117	Murum	282	29.1	577	43.7	14.6	661	43.8	0.1
118	Tadavale	428	31.3	602	40.2	8.8	640	40.0	-0.2
119	Vitthalvadi	231	27.8	209	23.6	-4.1	566	53.3	29.6
120	Taradgaon	1914	32.4	2863	41.0	8.6	3015	41.0	0.0
121	Rawadi-kh	246	29.5	500	55.0	25.5	351	30.5	-24.5
122	Rawdi-bk	454	32.5	603	43.0	10.5	610	39.4	-3.6
123	Dombalwadi	211	35.1	285	40.5	5.4	494	50.5	10.0
124	Kapasi	572	48.6	493	36.6	-12.0	805	53.7	17.0
124	Alajapur	423	31.8	459	32.7	0.9	773	47.6	14.9
126	Ghadagevadi	477	41.9	440	32.2	-9.6	486	32.5	0.2
127	Mulikwadi	436	38.3	379	35.4	-2.8	727	59.0	23.5
128	Bibi	769	36.2	934	40.6	4.3	1048	46.6	6.0

Appendix - K
Phaltan Tahsil
Population 1991 To 2011

Sr. No.	Name of the Villages	Population 1991	Density Sq.k.m.	Population 2001	Density Sq.k.m.	Population 2011	Density Sq. k.m.
1	Waghoshi	653	104	667	106	698	111
2	Vadgaon	627	137	669	146	695	152
3	Korhale	887	160	564	102	633	114
4	Wakhari	2139	138	2186	141	2500	161
5	Wathar-nim	3005	140	3490	163	3954	184
6	Dhaval	2609	252	2695	261	3146	304
7	Pirachiwadi	420	184	434	190	431	189
8	Sherewadi	866	151	908	158	1039	181
9	Surawadi	2235	214	2891	277	3731	357
10	Kharadevadi	780	181	1220	284	1217	283
11	Ghadgemala	NA	NA	690	200	746	217
12	Nandal	2422	138	2313	131	2854	162
13	Jinti	3814	317	4175	347	3976	330
14	Phartadvadi	2513	525	2570	536	2815	588
15	Bhilkati	713	307	813	350	841	362
16	Nimbore	1817	223	2105	259	2403	295
17	Dhavlevadi	684	124	793	144	809	147
18	Kashidvadi	428	130	479	146	562	171
19	Vadjal	602	231	786	302	911	350
20	Dalvadi	1052	125	1205	143	1455	173
21	Upalave	2166	161	2594	193	2683	199
22	Sawantvadi	NA	NA	NA	NA	NA	NA

23	Daryachivadi	NA	NA	NA	NA	NA	NA
24	Jadhavnagar	NA	NA	NA	NA	1074	315
25	Malvadi	1030	74	1175	85	1707	124
26	Khadaki	374	60	522	83	543	87
27	Mirgaon	1371	137	1729	172	2008	200
28	Tathvada	1040	49	1529	73	1679	80
29	Manevadi	474	130	464	127	504	138
30	Zadakwadi	387	93	460	111	537	130
31	Hol	2545	330	2334	302	2174	282
32	Sakharwadi	9613	1244	10091	1306	9570	1238
33	Veloshi	465	105	619	140	768	173
34	Tardaf	1473	131	1593	142	1694	151
35	Miryachiwadi	1029	190	1211	224	1228	227
36	Pharadvadi	1431	290	1880	381	2243	455
37	Thakurki	1952	202	2560	265	3025	313
38	Tawadi	967	205	1175	250	1181	251
39	Barad	4196	183	4560	199	4387	192
40	Shereshindevadi	343	47	780	109	1062	148
41	Nimbalak	3818	306	4307	346	4187	336
42	Mathachivadi	3048	329	3233	349	3312	358
43	Pimparad	2708	208	3408	262	3692	284
44	Takalwade	1489	262	1571	277	1569	276
45	Vadale	1778	98	1894	104	2356	130
46	Mirde	1124	63	1236	70	2041	116
47	Naikbomvadi	747	90	578	69	722	87
48	Rajale	3445	252	4258	311	4675	342
49	Sathe	2108	203	2362	228	2363	228
50	Sarde	3299	356	3799	410	4288	463
51	Gokhali	3492	415	3699	440	3789	451
52	Khatakevasti	2063	410	2301	457	2735	544
53	Vajegaon	NA	NA	550	972	783	1384
54	Kurawali-bk	1675	168	930	93	1095	110
55	Dattanagar	NA	NA	NA	NA	1471	114
56	Andhrud	1662	140	1947	164	2114	178
57	Javali	1703	77	2030	92	2470	112
58	Rajuri	2869	309	3798	410	2786	300
59	Bhavaninagar	NA	NA	1442	162	1660	187
60	Asu	4991	303	5161	314	5876	357
61	Dhavalevadi	595	134	620	140	638	144
62	Shindenagar	1625	238	1288	189	1097	161
63	Pawarvadi	2905	475	3030	496	3037	497
64	Hanamantwadi	1860	313	1901	320	1969	331
65	Jadhavwadi	1041	344	1115	369	1074	355
66	Gunaware	5928	312	6074	320	6605	348
67	Munjawadi	3459	233	4074	274	4129	278
68	Girvi	4125	189	4815	221	5050	232
69	Bodakewadi	600	45	590	44	545	41
70	Kurawali-kh	1078	107	1620	162	1890	189
71	Mandavkhadak	669	120	887	159	915	164
72	Nirgudi	2466	443	2702	486	2944	529
73	Vinchurni	660	71	726	78	885	95
74	Khunte	2434	315	2513	326	2726	353
75	Shindevadi	1625	346	2216	472	2357	502
76	Chaudharwadi	2896	303	3299	345	3812	399
77	Jadhavwadi	646	84	1645	216	2319	305
78	Kolki	3221	395	5446	668	882	108
79	Zirapwadi	1688	237	1968	277	2185	307
80	Kambleshwar	1542	161	1929	201	2141	223

81	Sastewadi	3153	276	3722	325	4012	351
82	Vidani	8193	374	9123	417	10439	477
83	Dudhebavi	3548	161	3833	174	4288	195
84	Tirakwadi	1086	226	1048	218	1144	238
85	Bhadali-kh	896	105	704	83	780	92
86	Sonawadi -kh	795	154	940	183	1066	207
87	Dhuldeo	3213	791	4643	1143	2950	726
88	Somathali	3251	314	3808	368	3896	377
89	Algudevadi	2023	412	2304	470	2371	483
90	Sangavi	4478	254	5246	297	5915	335
91	Songaon	1356	191	1439	203	1787	252
92	Saskal	1408	178	1484	188	1632	207
93	Dhumalwadi	880	51	1080	62	1213	70
94	Bhadali-bk	588	224	1020	389	1220	466
95	Sonawadi -bk	1066	285	1238	331	1458	389
96	Padegaon	4213	293	5070	353	5034	350
97	Koregaon	855	167	1022	199	1077	210
98	Tambave	2593	349	2352	317	2544	343
99	Salpe	1649	124	1854	139	2082	156
100	Koparde	NA	NA	78	28	74	27
101	Chambharwadi	461	182	599	236	644	254
102	Hingangaon	3124	128	3940	161	4341	178
103	Sherechiwadi	796	118	932	138	1256	186
104	Adarki-bk	2318	178	2676	205	2704	207
105	Adarki-kh	2032	134	2121	140	2361	156
106	Aradgaon	1116	146	1200	157	1151	151
107	Chavanwadi	1272	242	1324	252	1558	297
108	Kapadgaon	1311	152	1508	175	1802	210
109	Mirewadi	509	141	650	180	724	201
110	Kusur	918	330	1043	375	1189	428
111	Malevadi	682	493	715	517	820	593
112	Shindemal	668	301	690	311	784	353
113	Saswad	2876	129	3493	156	3523	158
114	Takubaichiwadi	685	303	527	233	599	265
115	Kalaj	1514	140	1707	158	2066	192
116	Khamgaon	2556	290	3422	388	4108	466
117	Murum	968	168	1319	229	1507	262
118	Tadavale	1364	235	1497	258	1600	275
119	Vitthalvadi	831	383	884	407	1062	490
120	Taradgaon	5901	259	6972	306	7337	322
121	Rawadi-kh	834	132	908	144	1150	182
122	Rawadi-bk	1397	199	1400	199	1548	220
123	Dombalwadi	601	231	703	270	977	375
124	Kapasi	1176	141	1346	161	1499	180
124	Alajapur	1330	121	1403	128	1621	148
126	Ghadagevadi	1138	170	1364	204	1493	224
127	Mulikwadi	1138	125	1070	117	1232	135
128	Bibi	2120	165	2298	178	2246	174
129	Phaltan	44367	1390	50800	1592	60116	1633
	Total	273451		314410		342667	

Appendix - L
Phaltan Tahsil
Crop Combination Region

Sr. No.	Name of the Villages	Jowar	Bajara	Sugarcane	II Crop
1	Waghoshi		1		
2	Vadgaon	1			
3	Korhale	1			
4	Wakhari	1			
5	Wathar-nim	1			
6	Dhaval	1			
7	Pirachiwadi		1		
8	Sherewadi	1			
9	Surawadi			1	
10	Kharadevadi				2
11	Ghadgemala	1			
12	Nandal		1		
13	Jinti				2
14	Phartadvadi			1	
15	Bhilkati			1	
16	Nimbore				2
17	Dhavlevadi	1			
18	Kashidvadi	1			
19	Vadjal			1	
20	Dalvadi	1			
21	Upalave	1			
22	Sawantvadi		1		
23	Daryachivad	1			
24	Jadhavnagar	1			
25	Malvadi	1			
26	Khadaki	1			
27	Mirgaon	1			
28	Tathvada	1			
29	Manevadi	1			
30	Zadakwadi	1			
31	Hol				2
32	Sakharwadi			1	
33	Veloshi	1			
34	Tardaf	1			
35	Miryachiwadi	1			
36	Pharadvadi	1			
37	Thakurki	1			
38	Tawadi	1			
39	Barad	1			
40	Shereshindevadi			1	
41	Nimbalak			1	
42	Mathachivadi			1	
43	Pimparad			1	
44	Takalwade			1	
45	Vadale	1			

46	Mirde		1		
47	Naikbomvadi		1		
48	Rajale			1	
49	Sathe			1	
50	Sarde			1	
51	Gokhali			1	
52	Khatkevasti			1	
53	Vajegaon			1	
54	Kurawali bk		1		
55	Dattanagar			1	
56	Andhrud	1			
57	Javali	1			
58	Rajuri			1	
59	Bhavaninagar			1	
60	Asu			1	
61	Dhavalevadi			1	
62	Shindenagar	1			
63	Pawarvadi			1	
64	Hanamantwadi			1	
65	Jadhavwadi			1	
66	Gunaware			1	
67	Munjawadi			1	
68	Girvi		1		
69	Bodakewadi	1			
70	Kurawali-kh				2
71	Mandavkhadak				2
72	Nirgudi	1			
73	Vinchurni	1			
74	Khunte			1	
75	Shindevadi			1	
76	Chaudharwadi			1	
77	Jadhavwadi	1			
78	Kolki				2
79	Zirapwadi	1			
80	Kambleshwar			1	
81	Sastewadi			1	
82	Vidani			1	
83	Dudhebavi	1			
84	Tirakwadi		1		
85	Bhadali-kh		1		
86	Sonawadi-kh		1		
87	Dhuldeo			1	
88	Somathali			1	
89	Algudevadi			1	
90	Sangavi			1	
91	Songaon			1	
92	Saskal		1		
93	Dhumalwadi		1		
94	Bhadali-bk	1			
95	Sonawadi-bk		1		
96	Padegaon			1	

97	Koregaon		1		
98	Tambave	1			
99	Salpe		1		
100	Koparde		1		
101	Chambharwadi		1		
102	Hingangaon	1			
103	Sherechiwadi	1			
104	Adarki-bk		1		
105	Adarki-kh		1		
106	Aradgaon		1		
107	Chavanwadi		1		
108	Kapadgaon		1		
109	Mirewadi		1		
110	Kusur		1		
111	Malevadi				2
112	Shindemal		1		
113	Saswad	1			
114	Takubaichiwadi	1			
115	Kalaj	1			
116	Khamgaon			1	
117	Murum			1	
118	Tadavale			1	
119	Vitthalvadi			1	
120	Taradgaon	1			
121	Rawadi-kh			1	
122	Rawdi-bk				2
123	Dombalwadi			1	
124	Kapasi	1			
124	Alajapur	1			
126	Ghadagevadi	1			
127	Mulikwadi	1			
128	Bibi	1			

Crop Diversification

Sr. No.	Name of the village	Value	N.S.A.		High	Moderate	Low
1	Waghoshi	0.71	140	**M**		140	
2	Vadgaon	0.63	241	**M**		241	
3	Korhale	0.65	180.27	**M**		180.27	
4	Vakhari	0.66	949	**M**		949	
5	Wathar-nim	0.74	1500	**M**		1500	
6	Dhaval	0.66	532	**M**		532	
7	Pirachiwadi	0.65	182.59	**M**		182.59	
8	Sherewadi	0.71	350	**M**		350	
9	Surawadi	0.78	700	**M**		700	
10	Kharadevadi	0.85	305	**H**	305		
11	Ghadgemala	0.78	250	**M**		250	
12	Nandal	0.61	1101	**M**		1101	
13	Jinti	0.81	735	**H**	735		
14	Phartadvadi	0.74	346	**M**		346	
15	Bhilkati	0.81	108	**H**	108		

16	Nimbore	0.87	522	**H**	522		
17	Dhavlevadi	0.69	319.31	**M**		319.31	
18	Kashidvadi	0.69	207	**M**		207	
19	Vadjal	0.85	124	**H**	124		
20	Dalvadi	0.52	142	**L**			142
21	Upalave	0.75	392	**M**		392	
22	Sawantvadi	0.77	272.52	**M**		272.52	
23	Daryachivadi	0.83	410.3	**H**	410.3		
24	Jadhavnagar	0.80	270	**M**		270	
25	Malvadi	0.65	464	**M**		464	
26	Khadaki	0.72	178	**M**		178	
27	Mirgaon	0.67	726	**M**		726	
28	Tathvada	0.56	301.87	**L**			301.87
29	Manevadi	0.59	201	**L**			201
30	Zadakwadi	0.58	287	**L**			287
31	Hol	0.67	351	**M**		351	
32	Sakharwadi	0.68	466	**M**		466	
33	Veloshi	0.60	110	**L**			110
34	Tardaf	0.62	710	**M**		710	
35	Miryachiwad	0.65	350	**M**		350	
36	Pharadvadi	0.64	253	**M**		253	
37	Thakurki	0.66	695	**M**		695	
38	Tawadi	0.63	323	**M**		323	
39	Barad	0.77	1721	**M**		1721	
40	Shereshindev	0.80	477	**M**		477	
41	Nimbalak	0.61	989	**M**		989	
42	Mathachivadi	0.57	650	**L**			650
43	Pimparad	0.68	550	**M**		550	
44	Takalwade	0.71	256	**M**		256	
45	Vadale	0.58	1446.64	**L**			1446.64
46	Mirde	0.60	780	**L**			780
47	Naikbomvadi	0.61	425	**M**		425	
48	Rajale	0.75	764.33	**M**		764.33	
49	Sathe	0.72	802	**M**		802	
50	Sarde	0.73	670	**M**		670	
51	Gokhali	0.64	645	**M**		645	
52	Khatkevasti	0.71	341	**M**		341	
53	Vajegaon	0.82	54.28	**H**	54.28		
54	Kurawalibk	0.77	638	**M**		638	
55	Dattanagar	0.83	893	**H**	893		
56	Andhrud	0.73	619.95	**M**		619.95	
57	Javali	0.77	1051	**M**		1051	
58	Rajuri	0.58	548	**L**			548
59	Bhavaninagar	0.68	631	**M**		631	
60	Asu	0.72	1262	**M**		1262	
61	Dhavalevadi	0.79	361.6	**M**		361.6	
62	Shindenagar	0.76	532.81	**M**		532.81	
63	Pawarvadi	0.48	491.18	**L**			491.18
64	Hanamantwa	0.54	502.18	**L**			502.18
65	Jadhavwadi	0.75	217.71	**M**		217.71	
66	Gunaware	0.55	1264	**L**			1264
67	Munjawadi	0.57	921	**L**			921
68	Girvi	0.71	1652.58	**M**		1652.58	
69	Bodakewadi	0.86	356	**H**	356		
70	Kurawali-kh	0.56	326	**L**			326
71	Mandavkhad	0.70	71.1	**M**		71.1	
72	Nirgudi	0.74	329	**M**		329	
73	Vinchurni	0.61	292	**M**		292	

74	Khunte	0.73	545	**M**		545	
75	Shindevadi	0.66	324	**M**		324	
76	chaur	0.66	791	**M**		791	
77	Jadhavwadi	0.77	595.98	**M**		595.98	
78	Kolki	0.79	615	**M**		615	
79	Zirapwadi	0.62	590.33	**M**		590.33	
80	Kamblesw	0.75	749	**M**		749	
81	Sastewadi	0.80	918.15	**M**		918.15	
82	Vidani	0.83	1367	**H**	1367		
83	Dudhebavi	0.85	1536.02	**H**	1536.02		
84	Tirakwadi	0.85	350	**H**	350		
85	Bhadali-kh	0.87	398	**H**	398		
86	Snawadi	0.85	205	**H**	205		
87	Dhuldeo	0.79	274	**M**		274	
88	Somathali	0.70	687.1	**M**		687.1	
89	Algudevadi	0.76	229	**M**		229	
90	Sangavi	0.77	1175.5	**M**		1175.5	
91	Songaon	0.76	387.43	**M**		387.43	
92	Saskal	0.79	336	**M**		336	
93	Dhumalwadi	0.77	171	**M**		171	
94	Bhadali-bk	0.84	198	**H**	198		
95	Sonawadi -bk	0.81	251	**H**	251		
96	Padegaon	0.73	866.52	**M**		866.52	
97	Koregaon	0.73	353	**M**		353	
98	Tambave	0.70	562.44	**M**		562.44	
99	Salpe	0.64	334.46	**M**		334.46	
100	Koparde	0.71	130	**M**		130	
101	Chambharwa	0.73	162.25	**M**		162.25	
102	Hingangaon	0.74	1764.64	**M**		1764.64	
103	Sherechiwadi	0.70	336	**M**		336	
104	Adarki-bk	0.60	871	**M**		871	
105	Adarki-kh	0.58	749	**L**			749
106	Aradgaon	0.58	464.98	**L**			464.98
107	Chavanwadi	0.57	423.72	**L**			423.72
108	Kapadgaon	0.63	648	**M**		648	
109	Mirewadi	0.78	183	**M**		183	
110	Kusur	0.83	141	**H**	141		
111	Malevadi	0.69	123.95	**M**		123.95	
112	Shindemal	0.72	201.6	**M**		201.6	
113	Saswad	0.51	1795.4	**L**			1795.4
114	Takubaichiw	0.64	203.73	**M**		203.73	
115	Kalaj	0.62	767	**M**		767	
116	Khamgaon	0.75	498.5	**M**		498.5	
117	Murum	0.73	317.98	**M**		317.98	
118	Tadavale	0.71	336.77	**M**		336.77	
119	Vitthalvadi	0.80	151.58	**M**		151.58	
120	Taradgaon	0.72	1658	**M**		1658	
121	Rawadi-kh	0.82	253	**H**	253		
122	Rawdi-bk	0.85	500.02	**H**	500.02		
123	Dombalwadi	0.85	133	**H**	133		
124	Kapasi	0.67	632	**M**		632	
125	Alajapur	0.69	542	**M**		542	
126	Ghadagevadi	0.66	375	**M**		375	
127	Mulikwadi	0.72	409	**M**		409	
128	Bibi	0.71	513.6	**M**		513.6	
	Total		**69321.87**		**8839.62**	**49078.28**	**11403.97**

H= High Diversification, M= Moderate Diversification, L= Low Diversification.

APPENDIX-M
QUESTIONNAIRE-I
VILLAGE INFORMATION

1. Name of the Village-
2. Tahsil- District-
3. Distance from Tahsil –
4. Population (2011) - Males- Females-
5. Number of households-
6. General Land use in hectares –

Sr. No.	Land use Categories	2011
1	Total village area	
2	Net sown area	
3	Land not available for cultivation	
4	Cultivable waste	
5	Fallow land	
6	Forest	

7. No. of Farmers - No. of Land Holdings –

8. No. of Agriculture Labours –

9. No. of Main Workers -

10. No. of Other Workers –

11. Area Under Major crops (in hectares) –

Sr. No.	Crops	Area	Sr. No.	Crops	Area
1			6		
2			7		
3			8		
4			9		
5			10		

12. Irrigation Details –

Sr. No.	Type	Area in Kharip	Sr. No.	Type	Area in Rabi
1			1		
2			2		

13. No. of Wells in the Village –

14. No. of Bore Wells in the Village –

15. No. of Lift Irrigation in the Village –

16. No. of Wells in the Village –

17. Major Implements used –

18. Major Inputs –

19. Use of Pesticides –

20. Other Facilities in Villages –

Sr. No.	Facilities	Numbers
1	Weekly market	
2	School	
3	Drinking water	
4	Agro-service centre	
5	Transport and communication	
6	Electricity	
7	Hospital	

21. Group Discussion with Villagers and Official on Following Points

1. Agricultural Practices –

2. Irrigation –

3. Soil Type –

4. Water Table –

5. Dairy and Poultry-

6. Govt. Schemes –

7. Crop Production –

8. Other Problems Faced By Farmers –

QUESTIONNAIRE-II
FARMERS INVENTORY

1. Name of the Village – Tahsil - District –

2. Name of the head of the family –

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 of Land Holding –

A. Total Land Owned by family – (Total): (Hectares)

B. Irrigated Area- Hectares

C. UN Irrigated - Hectares

5. Cropping details of the last year (2011-12)

Sr. No	Crops	Area	Use of the fertilizers	Production	House consumed	Sold
1						
2						
3						
4						

6. Name of the Agriculture Equipment's –

7. Livestock –

8. Source of irrigation –

Sr. No.	Type	Perennial Area	Seasonal Area
1	Well		
2	Canal		
3	Lift		
4	Other		

9. Agriculture Problems –

Sr. No.	Field	Problem	Solution
1	Soil		
2	Crops		
3	Irrigation		
4	Labour		
5	Employment		
6	Migration		
7	Market		
8	Transportation		
9	Govt. schemes		
10	Dairy		
11	Other		

10. Other income sources –

Sr. No.	Sources	Monthly /Yearly income(Re.)
1	Agriculture	
2	Service	
3	Dairy	
4	Poultry	
5	Self-Employment	

PHOTOGRAPS

PHOTO 1: GRAMPACHAYAT OFFICE, BARAD

PHOTO 2: PRIMARY HEALTH CENTRE, BARAD

PHOTO 3: SEEDS CENTRES, BARAD

PHOTO 4: BAJARA CULTIVATION, BARAD

PHOTO 5: VEGETABLES CULTIVATION, BARAD

PHOTO 6: VEGETABLES CULTIVATION,

PHOTO 7: WELL IRRIGATION, SASAKAL

PHOTO 8: COLLECTING INFORMATION ABOUT FARMERS, SASAKAL

PHOTO 9: POMOGRANATES FIELD, SASAKAL

PHOTO 10: MAIZE HARVESTING, SASAKAL

PHOTO 11: VISIT TO SASAKAL VILLAGE

PHOTO 12: GRAMPANCHAYAT OFFICE,

PHOTO 13: VEGETABLES CULTIVATION,

PHOTO 14: GRAM AND SUGARCANE

PHOTO 15: ONION AND MAIZE CULTIVATION,

PHOTO 16: WELL IRRIGATION, DHAVAL

PHOTO 17: POMEGRANATE CULTIVATION,

PHOTO 18: PULSES CULTIVATION, DHAVAL

PHOTO 19: MAIZE CULTIVATION, DHAVAL

PHOTO 20: POMEGRANATECULTIVATION, DHAVAL

PHOTO 21: CONNECTED ROAD WITH

PHOTO 22: CENTRAL SUGARCANE RESEARCH CENTRE, PADEGAON

PHOTO 23: JOWAR CULTIVATION.

PHOTO 24: WHEAT CULTIVATION. PADEGAON

PHOTO 25: SUGARCANE CULTIVATION, PADEGAON

PHOTO 26: MAIZE CULTIVATION, PADEGAON

PHOTO 27: FODDER CROP *(GHAS)* CULTIVATION, PADEGAON

PHOTO 28: NEW PHALTAN SUGAR WORKS,

PHOTO 29: VISIT TO SHRIRAM SAHAKARI

PHOTO 30: SHRIRAM S.SAKHAR KARKHANA.

PHOTO 31: MARKET YARD, PHALTAN

PHOTO 32: THE BANGANGA RIVER BED

PHOTO 33: THE BANGANGA DAM

PHOTO 34: VEER DAM, VEER

PHOTO 35: THE NIRA RIGHT BANK CANAL