AN ANALYSIS OF AGRO SERVICE CENTRES AND IT'S IMPACT ON AGRICULTURAL DEVELOPMENT: A STUDY OF SATARA DISTRICT (M.S.)

A MINOR RESEARCH PROJECT

UGC
University Grants Commission

SUBMITTED TO

UNIVERSITY GRANTS COMMISSION

(WESTERN REGIONAL OFFICE, PUNE)

BY

SMT. SONAR MANUJA BHASKAR

PRINCIPAL INVESTIGATOR
ASSISTANT PROFESSOR,
DEPARTMENT OF GEOGRAPHY

RAYAT SHIKSHAN SANSTHA'S

ARTS & COMMERECE COLLEGE, PUSEGAON.

TAL – KHATAV, DIST. – SATARA,

MAHARASHTRA.

AN ANALYSIS OF AGRO SERVICE CENTRES AND IT'S IMPACT ON AGRICULTURAL DEVELOPMENT: A STUDY OF SATARA DISTRICT (M.S.)

A MINOR RESEARCH PROJECT

Submitted to

UNIVERSITY GRANTS COMMISSION
(WESTERN REGIONAL OFFICE, PUNE)

By

SMT. SONAR MANUJA BHASKAR
Principal Investigator
Assistant Professor,
Department of Geography,

Rayat Shikshan Sanstha's
ARTS & COMMERECE COLLEGE, PUSEGAON.
Tal – Khatav, Dist. – Satara.
Maharashtra.

DECLARATION

I hereby declare that the Minor Research Project entitled "An Analysis of Agro Service Centres and It's Impact on Agricultural Development: A Study of Satara District (M.S.)" completed and written by me, has not formed earlier the basis for the award of any degree or similar title of this or any other university of examining body.

Further, I declare that I have not violated any of the provisions under Copyright and Piracy / Cyber / IPR Act amended from time to time.

Place: Pusegaon

Date: 3 /12/2021

M. B. Sonar

Principal Investigator

ARTS & COMMERCE COLLEGE PUSEGAON

Principal
Art's & Commerce College,
Pusegaon, Tal. Khatav, Dist. Satara

ACKNOWLEDGEMENTS

Gratitude cannot be seen or expressed; it can be felt deep in heart and it beyond description. Althought 'thanks' are poor expression of debt of gratitude one feel, yet there is no way to express it.

I am grateful to the University Grants Commission for supporting finance for the minor research work.

I own my gratitude to the several Government officials and authorities of various institutes for their assistance in providing the data, information and other relevant materials.

I wish to extend thanks to Principal Dr. K. H. Shinde Saheb, Prof. Dr. R. P. Bhosale Sir, Principal Dr. S. M. Kamble Saheb, Principal Dr. K. B. Jagdale Saheb, Prof. Dr. S. D. Shinde Sir, Prof. Dr. S. R. Kshirsagar Sir, Prof. S. R. Kharat Sir, Prof. S. A. Mali and Mr. B. Sawant for their valuable guidance and kind co-operation during the research work.

My sincere thanks are also due to all teaching and non-teaching staff of the College for their help.

I am grateful to authorities of College library, District Statistical Department, Agricultural Department of Satara District, for providing necessary data and information.

I am thankful to Dr. Pravin Talekar for his cartographic work as well as Mauli Computers for neat and prompt typing and printing of this minor research project.

It is my great pleasure to record a sense of gratitude to my Husband and Children for their support and encouragement.

Last but not least I am thankful to all my friends and well wishers.

- M. B. Sonar.

CONTENT

LIST OF TABLES

LIST OF FIGURE

CHAPTER – I

INTRODUCTION

CHAPTER - I

INTRODUCTION

CHAPTER - I
INTRODUCTION

1.1 INTRODUCTION:

India is the agrarian country. Agriculture is the main occupation of major population of India. Agriculture is the backbone of Indian economy seventy percent people of the population engaged in the agricultural activity and allied work to it. Agriculture is the main occupation of the rural area. In India economic and industrial development depends on agriculture.

Physical, social, institutional and technological factors are changeable in nature. It is true that there should be a change in agriculture with change in time for its progress and development. In this regard Agro Service Centres are playing very vital role in the agricultural development. The agricultural production depends on the agricultural implements, machinery and other essential inputs like hybrid varieties of seeds, chemicals like insecticides, fungicides, pesticides and weedicide etc. chemicals fertilizers, manures and technical know-how. Agro Service Centres are providing different agricultural inputs to achieve agricultural development.

Agro Service Centres are an innovative idea and interesting experiment which holds the great promises to increase agricultural production through more use of fertilizer and wise use of other agricultural inputs.

The Agro Service Centres located in the region performing a function to make remarkable change in agriculture. It provides not only various inputs but also better services to farmers. Farmers can achieve success in agriculture which would help to improve the national economy

of the country. Now- a - days Agro Service Centres have become an important infrastructure in the development of agriculture and rural welfare. Agro Service Centres also help to solve the problem of migration of educated people from rural areas to urban areas. Agro Service Centres are providing different facilities to the farmers. It can play very dominant role in accelerating the pace of agricultural yield. The expansion of activities of Agro Service Centres would also provide greater employment to the rural people.

The Agro Service Centres can help to educate and to make awareness among the farmers about now techniques, new arrivals, new hybrid varieties with typical characteristics, new different advanced techniques. It realized that by introducing such facilities by the Agro Service Centres in rural areas the educated persons can also be retained in rural areas. Besides this to generate the employment opportunities made available to the unemployed from the countryside. Therefore it is very essential that to consider role of Agro Service Centres in the process of development of agriculture.

1.2 SELECTION OF THE PROBLEM:

The researcher undertakes the study of the Agro Service Centres in Satara District. This selection is based on following consideration.

i. Area selected for present research is more dominant in agriculture mostly Krishna, Koyana river basin of the Satara district.

ii. Karad, Satara, Wai, Koregaon and Phaltan tahsils of the district have significant area under cash crops like sugarcane, ginger soyabeen, wheat and rice. This is influenced by adoption of modern technology in the same region.

iii. Farmers are diverted from their traditional methods of agriculture to modern advanced techniques for increasing agricultural production in it.

iv. The major port of the Satara District with black cotton soil and alluvial soil which promotes the agricultural production.

v. The Western part of Satara District i.e. Mahabaleshwar, Jawali and Patan talulka receive more rainfall where as eastern part of study region i.e. Phaltan, Man and Khatav talukas receive comparatively less rainfall throughout year.

vi. Significant increase in this area under cash crops has increased due to in facilities of irrigation and modern implements.

vii. Agro Service Centres in the study region are not distributed evenly which effects in the agricultural development in the study region.

Therefore it is necessary to assess the spatial distribution and its impact on agricultural development in the Satara District.

1.3 OBJECTIVES:

The selected objectives for the research are as fallows.

1) To study the geographical profile of the study area.
2) To assess the spatial distribution of Agro Service Centres in the study area.
3) To classify Agro Service Centres on the basis of their functions.
4) To find out hierarchy of Agro Service Centres in the study region.
5) To understand the correlation between Agro Service Centres and physical and economical factors.
6) To know the level of Agricultural Development in the study region.

7) To investigate the difficulties of Agro Service Centres and to suggest solutions for it.

1.4 STUDY AREA:

Satara District is one of the economically, culturally and historically prosperous districts in the state of Maharashtra. It lies on the southern part of the state on Deccan plateau. Major portion of Satara district is in Krishna river basin and remaining in the Bhima river basin. The longitudinal and latitudinal extent of Satara district is 73^0 33' to 74^0 54' east and 17^0 5' to 18^0 11' north respectively. It is comprised by 11 tahsils like Satara, Koregaon, Wai, Khandala, Medha (Jawali) , Phaltan, Man (Dahiwadi), Khatav (Vaduj), Mahabaleshwar, Karad and Patan. The length of study region in east to west direction is about 144 km. and in north to south direction is about 120 km. Administratively it is boarded by Pune district on the whole of the northern side, by the Solapur district on the east, by the Sangli district on the south-east, by the Ratnagiri district on the west, which is only over a length of 44 km. The Raigarh district is boarded on the north-west side.

The Satara district is a part of Deccan ballistic plateau with an average height of 600 above mean sea level. Sahyadri and Mahadeo are two main systems of hill ranges are laying in the district. These two hill ranges covered by several local hills.

The drainage pattern influenced on agriculture and economic activities therefore it is necessary to study drainage pattern to bring out changes in the agricultural characteristics. The variation in relief division of the study region has influenced on the drainage pattern. There are several rivers like Krishna, Koyna, Venna, Vasana, Kudali, Tarali,

Urmodi, Yerala, Nira, Manganga and many other smaller tributaries drain the district.

The climate of the study region is monsoon type, which plays a major role and influences on agriculture. In fact, the climate of region is considered as one of the important geographical factor, which influences on the cropping pattern. The maximum and minimum average temperatures recorded as 37.60 c and 19.50c respectively. The annual temperature range is 18.10 c the rainfall is significant climatic element that influences the agricultural economy of the study region. The average annual rainfall is 1475 mm. The rainfall received mainly during June to September in the study region. It is decreases from west to east part of study area.

According to census 2011 district includes 1719 inhabited villages. The study region has 3,003,741 population and out of total population 1,510,842 males and 1,492,899 females. In the Satara district 2433373 populations is lived in rural area whereas 570378 populations is lived in urban area.

1.5 DATABASE:

The investigation of the Agro Service Centres and agricultural development is based on collection, tabulation analysis and interpretation of data for the spatial analysis, existing conditions and various perspectives of Agro Service Centres of Satara district. The data has been collected from; both primary and secondary data.

1.7.1 Primary Data:

Primary data is collected through direct contacts and discussion with class I and class II officers of tahsils offices, Zilla Parishad Office and agriculture offices of Satara district, the information about Agro

Service Centres of the study area has been collected through interviews and schedule.

1.7.2 Secondary Data:

Secondary data required for the present work has collected from different published and unpublished material like reports and abstract, census handbook, gazetteers, research journals and books related with agro cultures, Agriculture bulletins, and socio-economic abstract.

The data collected through different sources has been processed and presented with various cartographic techniques such as maps, graphs and diagrams etc.

1.6 METHODOLOGY:

The data collected through various methods like field work and personal interviews. The analysis and interpretation of the data incorporate both empirical and testicular approaches. The appropriate cartographic techniques have been implemented to support the analysis.

Following methods used for the analysis of agro service centres and its impact on agricultural development.

Density of Agro Service Centres

$$\text{Density of A. C. S.} =. \frac{\text{No. of A. C. S}}{Area\ in\ Sq. Kms}$$

Population Dependency on Agro Service Centres

$$\text{Population Dependency on A. C. S.} =. \frac{\text{Total Population}}{\text{No. of A. C. S}}$$

Agricultural Density of Agro Service Centres

$$\text{Agricultural Density of A. C. S.} =. \frac{\text{No. of A. C. S}}{Area\ Under\ Agriculture}$$

Dependency of Agricultural Area on A.S.C.

$$\text{Agricultural Density of A. C. S.} = \frac{Area\ Under\ Agriculture}{\text{No. of A. C. S}}$$

Degree of Concentration of A.S.C.

The calculation of degree of concentration location quotation was calculated for each tehsils in the study region.

Centrality of Agro Service Centres:

$$C = \frac{t}{T} X\ 100$$

Where, **'C'** is centrality index

't' is centrality value of agro service centre

'T' is the total centrality of all agro service centres in the region.

HIERARCHY OF AGRO SERVICE CENTRES:

Peter Davis's (1975) method is used to determine the hierarchy of agro service centres.

Agro Service Centers and Its Corelationships to Physical and Economic Factors

The Karl Pearson's rank correlation coefficient method is used for analysis of data.

$$\text{Karl Pearson's Rank correlation coefficient (rs)} = 1 - \frac{6 \sum (R1-R2)^2}{n^3 - n}$$

Where,

rs - Rank correlation coefficient
R1 – Ranks given to first variables
R2 - Ranks given to second variables
N – Number of Observations

Levels of Agricultural Development

For calculation overall levels of agricultural development and it's even, distribution the data of all variables indicators have been transformed into Z score techniques. The formula is

$$\text{Z-Score (Zi)} = \frac{Xi - X}{S.D.}$$

Where,

Zi - Z-Score For i' th observation

Xi - Original Value of i' th observation

X - Mean value of X' variables

S.D. - Standard Deviation of X' variable

1.7 REVIEW OF LITERATURE:

The present research work investigated by referring different kind of literature. There is very little published material particularly regarding to the Agro Service Centres. The geography of service activities has been an important area of interest in geographical research and teaching.

The studies in this field have been made by the Indian geographer recently. A brief account of some important work is given here.

The most remarkable pioneering work in this field has been done by Singh (1955, 1956) and Prakash Rao (1958). Jaiswal,(1962) has

examined Morphological and functional aspect of rural services centres. Guja (1967), identifies the rural service centres of Hugali district of Karnataka state by means of three criteria.

The study regarding to the spatial organization of service centres have been done by Tiwari(1980) Wanmali (1983). In their study of service centres of rural India has been analyzed the impact of Government policies on the service provision.

Service provision and agro based industries, Geographical studies of the location and use of service facilities mainly related to central place theory have been emphasized by Deshmukh (1985), Didde (1884) and Mulik (1989).

Agro Service Centres in respect of Spatial organization, Centrality and hierarchy and spheres of influence have been studied by Pawar and Gharpure (1985, 1987, 1988). All details regarding to market facilities have been studied by Dixit (1988) the importance of Agro Service Centres in the study region has also been emphasized by Pawar (1989). The some studies have been made with special emphasis on Agro Service Centres in the western Maharashtra by Agricultural economist, Agronomist, Agricultural engineers, pertaining to their relevant aspects.

The basic requirements, objectives and working of Agro Service Centres have been studied by Krishna and Chouhan (1975). The role of agro service centre in rural development has been studied by Wagh (1975). Agro service centre and agricultural modernization have been studied by Throat (1977) whereas the study regarding to agro service centre and communication of agricultural technology was carried out by Jadhav (1977).

The innovative and interesting experiments of Agro Service Centres have been studied by Narkhede (1977). The evaluative study of

Agro Service Centre in Punjab carried out by the government of Punjab (1980). Development of Agro Service Centre, which provides the essential technical services, supply of inputs and serve as guide to the farmer has been studied by Zachariah (1971).

An attempt to study the extent and distribution of soviet agricultural services including regional and local services for plant crop protection and fertilizers, distribution of machinery, Spare parts and other forms of inputs, repair stations transport services was made by Doroffeva (1979). The change in structure of agricultural production service in Poland have been studied by Misiua(1979), services in (Zecholobvak agriculture include those connected with use of chemicals, special services such as agro chemical enterprises, commercial production service for purchasing agriculturall products and supplying agricultural requisites have been studied by Bartunek and Pytel(1979).

Spatial analysis of Agro Service Centres in development of agriculture In Bhusawal taluka one of the geographical analysis studied by Ingale (1995). A spatial perspectives on Agro Service Centres in Karad taluka, geographical analysis (2009) studied by Shinde S.A. In her studies, functional classification, spatial distribution, land use pattern, cropping and irrigation patterns and other aspects are studied.

The geographical studies on impact of irrigation are several in India and abroad. It is an interdisciplinary subject being studied by Geographer, Economist irrigation Engineers and Agronomist Contor, (1967) in his book A world of Geography of irrigation (1967) has highlighted the history and present condition of irrigated agriculture in the world.

Michel, in his book Irrigation theory and Practices (1983) has covered all the areas of irrigation related to agriculture. An attempt has

been made by Fakuda (1962) to study the Irrigation and drainage of the world.

The method of irrigation and water management are studied by M. Shafi (1987) and Atkinan (1979). India's water wealth, its Problems facts and basic principles are highlighted by Rao (1975). Impact of irrigation, studies of Canal, well and tank irrigation in Karnataka was attempted by economist such as Karni M.V. Mishra G.P. and Vivekananda.

Kamble, N. D., Abdul Ali, C.Charles Nalson, Nageshwar Rao and V. M. Gadgil (1948) studied the economic effects of irrigation. The regional account of irrigation is studied by Jasbir Singh (1977) and Pawar (1981) and Gurjark. K (1987) some aspect of irrigation have been highlighted by David friman (1952) The negative effect of irrigation have also been studied by many scholars such as Chowdhary and Reddy (1987) Patil P.B.(1988) Bowonder B. and Ravi 1984, Aggarwal R. R. (1957) and Dhawan L. L. (1964). The regional account of irrigation is studied by Jasbir Singh, Pawar C.T. (1977).

Agricultural geography (1984) is studied by M. G. Jadhav. The Inter district variation in agriculture efficiency studied by Sapre S. G. and Deshpande V. Irrigation and its impact on cultivated area of Satara district (2009) is studied by Wagh A.S. in his study irrigation pattern, cropping pattern, production of major crops and productivity of crops measures are investigated.

Gomatee Singh, Syed Was Ashraf (2012) studied the Spatial Variation in Level of Agricultural Development in Bulandshahr District of Western U.P'. (India) with help of Z-score and its composite index for level of agricultural development.

1.8 CHAPTER OUTLINE:

The chapter outline of the research is as follows,

First chapter includes Introduction, selection of the problem, objectives, review of literature, study region, sources of data, methodology and chapter outline

Chapter 2nd entitles **"The Study Region"** associated with physical setup, climatic condition and demographic profile of the study region.

Chapter 3rd **"Distribution and Functional Classification of Agro Service Centres"** related with Spatial Distribution of Agro Service Centres, Degree of Concentration of Agro Service Centres and Functional Classification of Agro Service Centres.

Chapter 4th deals with **"Centrality and Hierarchy of Agro Service Centres"** it covers Centrality of Agro Service Centres and Hierarchy of Agro Service Centres and Agro Service Centres: Relationships.

Chapter 5th entitled **"Level of Agricultural Development"** deals with Agro Service Centres and level of agricultural development in the study region.

Chapter 6th deals with **"Conclusion and Suggestions."**

REFERENCES:

1. Agricultural development office, Agriculture department, Satara Zilla Parishad Satara.
2. Deshmukh Ram, (2005), "Fundamental Statistics" Vidya Prakashan, Nagpur.
3. Fefellow V.P.,(1979), "Organization of agro chemical services, world agricultural economics and rural Sociology" Abstract volume-21 pp.69.
4. Gharpure V. T., (1989), "Spatial Organization and Hierarchical ordering of Agro Service Centres in Panchaganga basin of Kolhapur district": Indian Journal of regional science, Vol.23 No.2 pp. 23.
5. Gharpure V. T., (2005), "A role of Agro Service Centres in agriculture development" first edition. Raj publishing house, Jaipur (Rajasthan). Hussain M., (1979), "Agriculture geography" Inter India Publication, 105, Anandnagar Delhi.
6. Ingle K.D.(1995), "A role of Agro Service Centres in agriculture development" in Bhusaval taluka. A Geographical Analysis unpublished M.Phil. Dissertation, submitted to North Maharashtra, University, Jalgaon.
7. Jadhav D.R (1979) A role of Agro Service Centres in communication of Agricultural technology, AGRESCO, MP Krishi Vidyapeeth.
8. Jadhav M. G., (1986), "Sugarcane Cultivation a Regional Survey". Himalaya Publishing house, Bombay.
9. Kumbhar K.S.(1991), "Spatial Analysis of Agro Service Centres in Dule District" Unpublished M.phil. Dissertation, University of Pune.

10. Narkhede N. N., (1977),"Agro Service Centres- A promise to increase agriculture production by taking modern agriculture technology village farmers", MASCA Souvenir.

11. Sapre S.G., and Deshpande V., (1964), "Interdistrict variation in agricultural efficiency in Maharashtra state" Indian Journal of Economics.

12. Shinde S.A. (2009), "A spatial perspectives on Agro Service Centres in Karad taluka" –A geographical Analysis, Unpublished M,Phil dissertation submitted to TMV. Pune.pp. 1 to 10.

13. Singh J, Dhillon S, (1984),"Water resources in India -A Geographical perspectives", Geographical Review of India Vol.48.49

14. Socio-Economic Abstract of Satara District (2015-16)

15. Wagh A. S.,(2009),"Irrigation and its impact on cultivated area –A case study of Satara district" (1984-85 to 2004-05), Unpublished M.Phil, dissertation submitted to T. M. V. Pune.

16. Wagh L. N.(1977), "Role of agro services centres in rural development" Souvenir National Entrepreneur convention.

CHAPTER - II

THE STUDY REGION

CHAPTER - II

THE STUDY REGION

2.1 INTRODUCTION

2.2 LOCATION

2.3 PHYSICAL SETTING

2.4 DRAINAGE PATTERNS

2.5 CLIMATE

2.6 SOIL

2.7 FOREST

2.8 LAND USE PATTERN

2.9 TRANSPORT NETWORK

2.10 POPULATION CHARACTERISTICS

REFERENCES

CHAPTER - II

THE STUDY REGION

2.1 INTRODUCTION:

Geographical setting of any region is highly affects on distribution and development of agriculture which directly affected on the distribution and functions of agro service centers as well as play vital role in socio-economic transformation of population.

Distribution and pattern of agriculture and agro service centers is depended on the many physical factors such as physiography, climatic condition, drainage pattern, and soil types as well as economic factors like agriculture landuse and economy of farmer therefore to understand distribution and pattern of agro service centers, there is need to assess physical as well as socio-economic determinants of the study region.

As per earlier discussion this chapter deals with the physical as well as socio-economic determinants where detail descriptions about the geography of the district mainly focuses on the location, physical setting, drainage pattern, climate condition, soil, landuse pattern, population characteristics and transport network of the study region etc.

2.2 LOCATION:

The study region is one of the district of Maharashtra states. The district has slight circular shape and it is located in the Nira and Krishna basin. The Satara district is located between 17^0 5' to 18^0 11' north latitudes and 73^0 33' to 74^0 54' east longitudes and occupies an area of 10484.89 sq. km. The study region lies in southern Maharashtra and administratively divided into 11 tehsils, which is Phaltan, Man, Khatav, Koregaon, Satara, Karad, Patan, Jaoli, Mahableshwar, Wai and

Khandala. For administrative purpose the district is divided in to four sub- divisions Koregaon, Satara, Phaltan and Wai.

The length of study region in east to west direction is about 144 km. and in north to south direction is about 120 km. Administratively it is boarded

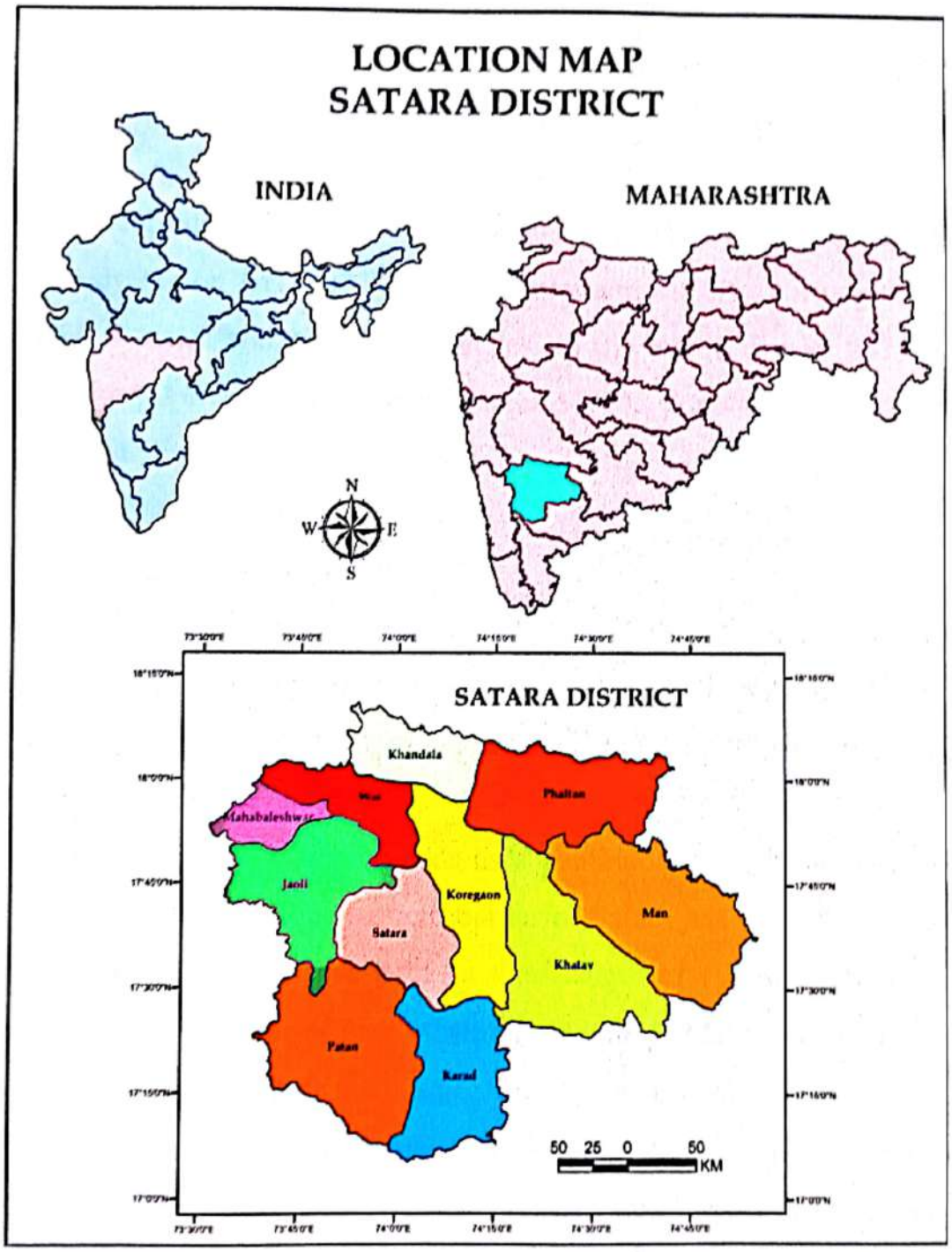

Fig. No. 2.1

by Pune district on the whole of the northern side, by the Solapur district on the east, by the Sangli district on the south-east, by the Ratnagiri district on the west, which is only over a length of 44 km. The Raigarh district is boarded on the north-west side. Although the boundaries of the district are mainly administrative along several lines these coincide with physical features. The study region extends between the Sahydrian spurs on the west and the Mahadeo range on the east.

According to census 2011 district includes 1719 inhabited villages. The study region has 3,003,741 population and out of total population 1,510,842 males and 1,492,899 females. In the Satara district 2433373 populations is lived in rural area whereas 570378 populations is lived in urban area.

2.3 PHYSICAL SETTING:

The Satara district is a part of Deccan ballistic plateau with an average height of 600 above mean sea level. Sahyadri and Mahadeo are two main systems of hill ranges are laying in the district. These two hill ranges covered by several local hills.

The Sahyadri, which extends as a continuous wall in north-south direction, forms the entire western border of Satara has limited width of 15 to 20 km. Besides these it has a total length of 196 km. There are several hill station i.e. Mahableshwar (1436 mt.), Makarandgad (1229 mt.), Yevateshwar (1340 mt.), and Pratapgad (1074 mt.). There are some saddles in the range, provide the location for ghat routes. Along these ghats Kumbharli pass, Ambinali pass, Tivara pass, Mala pass, Par pass etc. In this passes Kumbharli pass (Koynanagar to Chiplun) and

Ambinali pass (Mahablashwar to Poladpur) allow major routes from the plateau to Konkan.

There are five spurs pass east and south-east from the Sahyadri named Kamalgad, Vairatgad, Hatgegad-Arle, Bamnoli-Gherategad and Bhaivargad-Kandur from north to south direction. The last two ranges are large with the exceptions of hills in Mahableshwar and Koyana valley. All other hills are low, barren, and rugged. Mahableshwar (1436 mt.) is the highest peak point in the district. Besides these there are many small saddles in Mahadeo range i.e. Khambatki, Adarki and Tathwada etc. The Khambatki is an important in this range which is traversed by national highway No.4.

In the study region the Mahadeo range is another important range, which is runs eastward and south-east direction. It has three sub-ranges. The first sub-range 'Chandan Vandan' covers nearly half of area of study region and lies in the west. Remaining two ranges covers 50 % of the study region named Vardangarh and Mahimangarh and lies towards east.

There are several hill forts in the study region. In Wai Manderdev, Pachgani, Vairatgad, Vandan are important. One of them Pachgani is a health resort. There are two hills in Jaoli Makrandgad and Vasota. The Mahableshwar having two major hills named Mahableshwar and Pratapgad. One of them Mahableshwar is health resort, and another Partapgad is fort built by Shivaji Maharaj. The seven major hills in Satara named Ajimtara, Yavteshwar, Sajjangad, Petova, Ghatai, Pateshwar and Shulpani. The Koregaon consists five major hills are Harneshwar, Chavaneshwar, Jaranda, Nandgiri and Chandan. In the Patan five major hills are Chandli, Dategad, Gunvangad, Bhairavgad and Jangali-Jaigad. The tahsil Karad covers four major hills named Agashiv, Pal,

Khokada, Shikhar- Shingnapur, Ththawada, Jire-Patha, Kanher and Mahimangad. Khatav tahsil having four major hills named Solaknath, Bhapshah, Vardhangad and Bhushangad is important. The study region, on the basis of altitude above mean sea level, can be divided into three relief divisions.

A) Hilly Ranges:

This physiographic division includes area with the altitude of 900 to 1200 mt. and above. The hilly ranges cover 44.11 percent of the entire area of the district. The average gradient in this relief division varies from 30 to 50 meters per kilometer. The major portion of the hilly ranges comes in the western part of the study region from the tehsil Mahableshwar to Patan. This zone consists of scarps of Sahyadri and steep ballistic walls. A large area of this division is under thick forest cover. This area presents the picture of intense erosion and ruggedness of landscape. Due to the hilly topography proportion of area under cultivation is small. Economically this is varying poor area as compared to the foot hills and plain area.

Table No.2.1

SATARA DISTRICT: AERIAL EXTENT OF RELIEF DIVISION

(In Percent)

Sr. No.	Tehsils	Hilly Region	Foot Hills	Plains
1	Mahableshwar	100	--	--
2	Jaoli	62.44	30.46	09.10
3	Wai	51.37	33.18	15.45
4	Patan	50.72	37.17	22.11
5	Satara	45.21	31.24	23.55
6	Khandala	34.76	30.50	33.74
7	Khatav	32.02	36.12	31.86
8	Man	30.96	35.37	53.67
9	Phaltan	30.20	25.45	44.45
10	Koregaon	27.17	32.86	39.97
11	Karad	21.36	28.03	50.16
	Total	**44.11**	**29.12**	**26.73**

Source: Director, Ground water survey and Development Agency, Government of Maharashtra 2011.

B) Foot Hills:

The area having height between 600 to 900 meters comes under this division includes the central and eastern part of the study region. This division covers 29.12 percent area of the district. The average gradient in this relief division varies from 10 to 30 meters per kilometer. There are several hill ranges run to the east and south-east direction from the main ranges of Sahyadri and Mahadeo. The surface is dotted with the scattered hills.

Except Mahableshwar tahsil, this relief division covers relatively uniform area in all parts of the district shown by most of the area in this category is covered by the scrub, grasses and deciduous forests. In this division agriculture is poor due to the infertile soils.

C) Plain Region:

The plain region covers major portion of the river valleys draining the land towards north east and south east. This physical division includes an altitude below 600 meters which shares 26.77 percent of the total area of the district. The average gradient of this relief division varies from 1 to 10 meters per kilometer. The soils are medium deep black soil. Besides these it is agriculturally developed area.

Table No. 2.1 shows that tehsil wise area extent of this relief division, table shows that the plain area is much less than the other relief division, as it is covers only 26.77 percent of the total area in the district. The areal variation of the plain shows considerable differences in the tahsils.

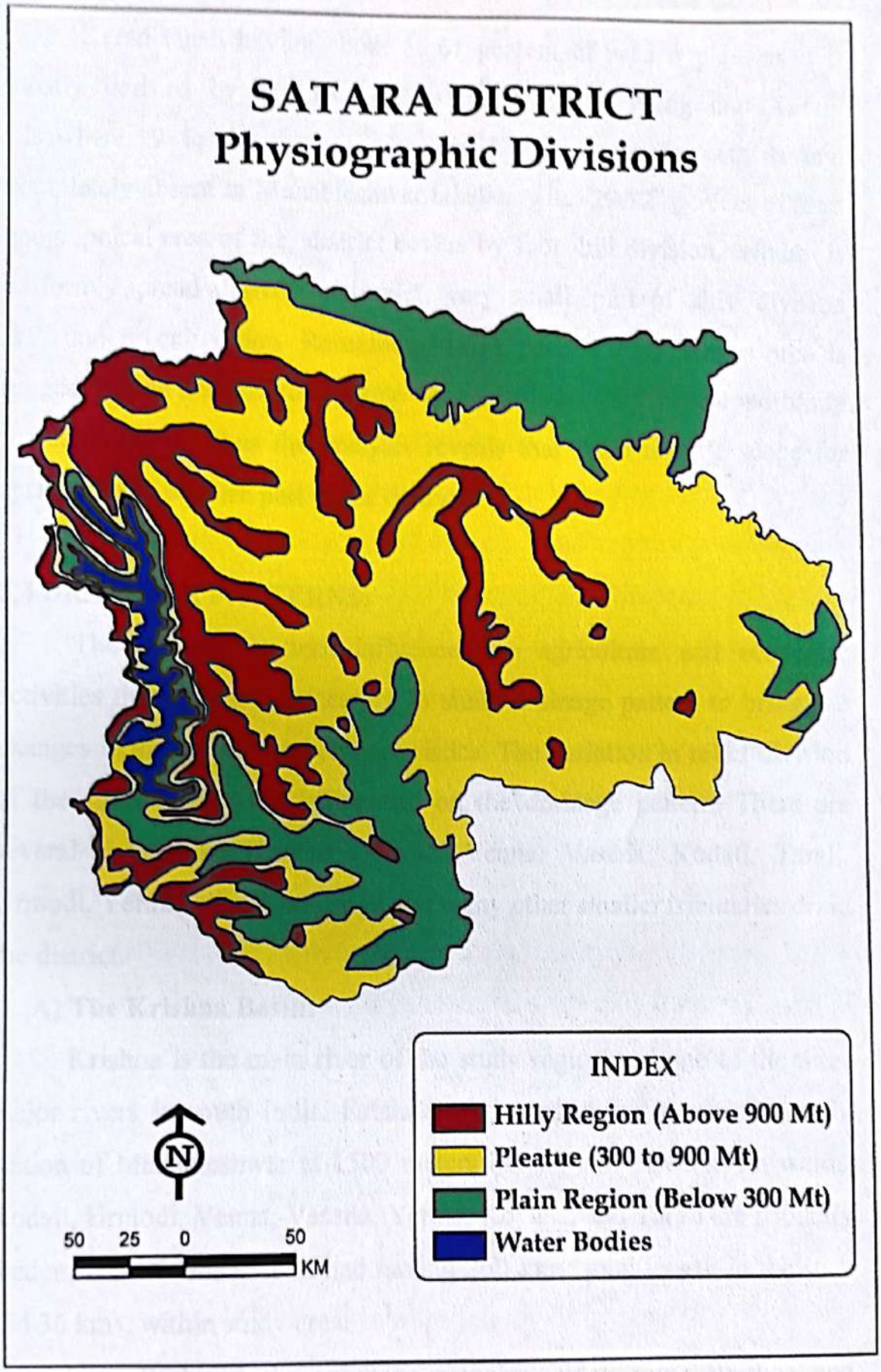
SATARA DISTRICT
Physiographic Divisions
INDEX
Hilly Region (Above 900 Mt)
Pleatue (300 to 900 Mt)
Plain Region (Below 300 Mt)
Water Bodies
N
50 25 0 50
KM

Fig. No. 2.2

Karad tahsil having about 50.61 percent of area is plain as it is mostly derived by the rivers Krishna, Koyana, Wang and Tarali. Elsewhere, 9 to 44 percent area are having remaining tahsils and completely absent in Mahableshwar tahsils. The 29.12 percent of total geographical area of the district covers by foot hill division, which is uniformly spread all over the district, very small part of this division is under cultivation. Remaining 44.11 percent hilly ranges area is rugged, barren and has steep slope which provides vary little opportunity for cultivations. Thus the analysis reveals that there is little scope for agriculture in western part of the district.

2.4 DRAINAGE PATTERNS:

The drainage pattern influenced on agriculture and economic activities therefore it is necessary to study drainage pattern to bring out changes in the agricultural characteristics. The variation in relief division of the study region has influenced on the drainage pattern. There are several rivers like Krishna, Koyna, Venna, Vasana, Kudali, Tarali, Urmodi, Yerala, Nira, Manganga and many other smaller tributaries drain the district.

A) The Krishna Basin:

Krishna is the main river of the study region and one of the three major rivers in south India. Krishna originated at just north of the hill station of Mahableshwar at 1500 meters height, and flows south wards. Kudali, Urmodi, Venna, Vasana, Yerala, Koyana, and Tarali are tributary feeders. The Krishna River had having 260 kms. total length in the state and 36 kms. within study area.

Near Pachwad the tributary namely Kudali joins Krishna and Venna joins near Mahuli Sangam. Although in the rainy season they are

very thin. Recently a dam near Venunagar has been constructed on the river Venna to check the floods and store the water to form reservoir which supports agriculture in the western part of the Satara district. River Urmodi receives Krishna near Vanegaon. A small dam has been constructed across river Urmodi near Kas village. The water of Kas is supplied to Satara city for drinking purpose. Near Umbraj, river Urmodi joins to krishna.

Koyana river is the largest tributary of Krishna, which joins near Karad city. Shiv-Sagar dam constructed on the Koyana River, keeps huge water storage in the narrow valley, which has helped to irrigate the land in southern Satara as well as Sangli district. Thus Koyana river becomes the life line of western Maharashtra because it also generates the hydro-electricity. Besides this Vasana and Yerala rivers is small feeder of the Krishna River from eastern part of the Satara district.

The fertile soil, assured water supply, favorable climate and innovative sprit of famers have encouraged the sugar cultivation in the Krishna basin, which is the base of the region's economy.

B) The Bhima Basin:

In the drainage system of the Satara district is shared by Bhima river system. Nira and Manganga rivers are the two chief tributary of Bhima River, draining northern and eastern part of study region.

Nira river raises in the Sahyadri ranges near Bhor in Pune district. Nira runs eastward to form the boundary between Pune and Satara districts. The Nira River has acquired great economic importance due to Vir and Bhatghar dam, from which Nira right and left bank canals supply water to Phaltan and Khandala tahsils of the study region.

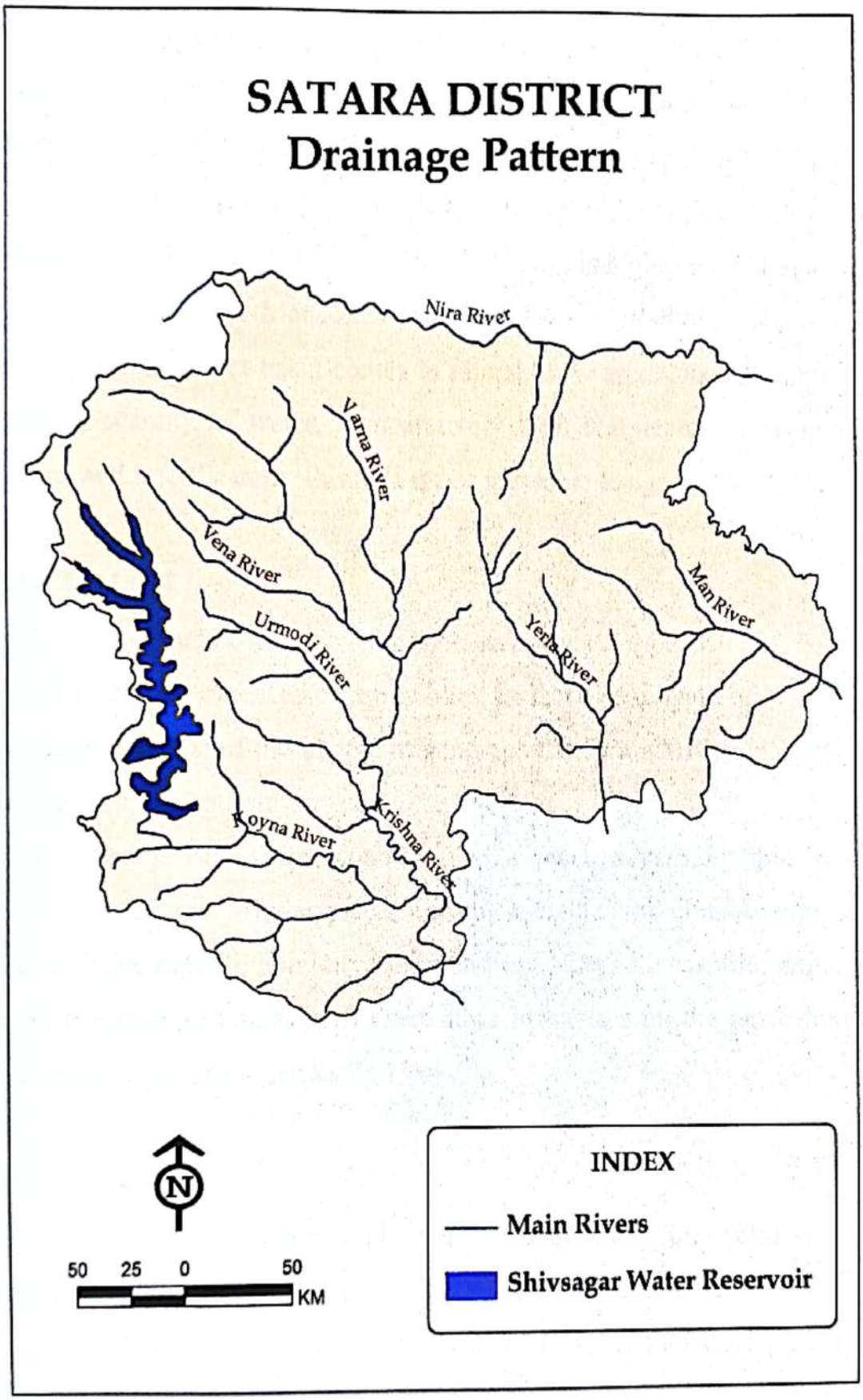
SATARA DISTRICT
Drainage Pattern
Nira River
Varna River
Vena River
Urmodi River
Yerla River
Man River
Koyna River
Krishna River
N
50 25 0 50
KM
INDEX
Main Rivers
Shivsagar Water Reservoir

Fig. No. 2.3

Manganga river originated in Seetabai hill near Kulkajai village in Man tahsil. The study region has length of 56 kms of Manganga. In the study region of Man tehsil Manganga runs in south-east direction touching the villages Kulkjai, Malavadi, Andli, Bidal, Dahiwadi, Gondawale bk. and Mhaswad. The river bank is highly eroded and bed is sandy. The river Manganga joins to Bhima at Sarkoli village near Phandrpur. The river basin comes in rain shadow area. Due to scanty of rainfall, scarcity of water, comparatively high temperature in summer season and infertile soils, this area is not favorable to agriculture.

2.5 CLIMATE:

The climate of the study region is monsoon type, which plays a major role and influences on agriculture. In fact, the climate of region is considered as one of the important geographical factor, which influences on the cropping pattern.

Average of weather conditions at a place over along period is called the climate of the place, various elements of climate such as temperature, rainfall, humidity, and wind influences human life. Among them temperature and rainfall exert more influences on the agricultural activities. (Sawant and Athavale 1994)

A) Seasons:

On the basis of temperature, relative humidity and rainfall the region may be divided into three seasons i.e. hot weather season from March to May; rainy season from June to October and cold weather season from November to February.

Hot Season:

In the study region March to May is hot season. Temperature starts to rise from March and reaches to the highest in May as it is the highest month in the region. During the hot season higher temperature recorded in the east than the west. The mean maximum temperature recorded at Mhaswad 37.2^{0}C in the month of May. The daily range of temperature is high all over the district. During the hot season, wind directions vary but westerly winds are more common in the afternoon. The thunderstorms, which are usually occurs with heavy rainfall or hails and high speed winds.

Rainy Season:

In the study region June to October is rainy season. In the second week of June the south-west monsoon arrives in the study region. Month July and August are the rainiest month, and during this period rainfall is widely distributed. The temperature is lower than cool season. The mean daily temperature in July recorded at Mahableshwar is 17.6^0 C, at Karad 26.5^0 C and 29.7^0 C at Mhaswad respectively. From the end of month September climatic condition are changing, temperature starts to rise, wind direction is mainly from north-east and east, and days are quite warm. During this period rainfall distribution is quite variable and ranges between 5000 mm in the west and 300 mm in the east.

Cold Season:

November to February is cold season in the study region. The temperature starts to come down from the month of November. The month December and January recorded coldest months of the year. The daily range of temperature is highest during the cool season. Mean minimum temperature recorded 14.9^0 C at Mhaswad, 16.3^0 C at Karad and 12.7^0 C at Mahableshwar in the month of January respectively. Early

in the morning, fog is the common climatic phenomena of this cool season. The sunshine is bright with the clear sky and from north east direction wind occurs in this season.

B) Temperature:

In the study area temperature data is collected from few stations i.e. Mahableshwar, Karad and Mhaswad. Table No. 2.2 shows some salient features of temperature in the study region.

Table No.2.2

SATARA DISTRICT: AVERAGE ANNUAL RAINFALL AND TEMPERATURE

Sr. No.	Tehsils	Average Annual Rainfall in mm.	Average Annual Temperature in 0C	
			Maximum ^{0}C	Minimum ^{0}C
1	Mahableshwar	6126.4	31.5	12.7
2	Jaoli	1712.2	34.7	13.9
3	Wai	734.6	35.4	14.1
4	Patan	1882.5	35.1	14.0
5	Satara	1132.1	35.3	14.2
6	Khandala	503.8	36.2	15.3
7	Khatav	512.2	36.5	15.4
8	Man	496.2	37.2	14.9
9	Phaltan	557.1	36.9	14.8
10	Koregaon	714.7	35.5	15.1
11	Karad	713.1	33.5	16.3
	District Average	**1371.3**	**35.25**	**14.60**

Source: Socio-Economic Review and District Statistical Abstract of Satara District (2014-2015)

C) Rainfall:

Rainfall is an important element, which are directly influences on the drainage pattern and in turn of agricultural activity. Amount of rainfall influences human life to a considerable extent. From the point of view of human life, it is not only the amount of rainfall that matters but its distribution over the year is quite significant. If rainfall is well distributed over the year, it helps agricultural as well as it helps raise ground water level.

Average Annual Rainfall:

Distribution of monsoon in the district is unequal from part to part and ranges between 500 mm. to 6000 mm. The western mountains tehsils including Mahableshwar, Patan, Wai, and Jaoli receives 2500 mm. to 6000 mm. rainfall, which can be called heavy rainfall zone. The isohyets run in north-south direction and vary close in north western part of the region. In this zone, the rainfall decreases rapidly from western part towards the eastern side.

The central plain zone, including tehsils of Satara, Karad and western part of Koregaon have been lies in moderate rainfall zone, which receives 1000 mm. to 2500 mm. precipitation. In this zone rainfall decreases towards west to east.

The north eastern part of the study region including Phaltan, Khandala, Man, Khatav and eastern part of Koregaon tahsil receives 500 to 1000 mm. rainfalls, and lies in the eastern low rainfall zone. Eastern part of the study region is drought prone area, which lies in the rain shadow area, where as most eastern part of Man, Khatav, and Phaltan tahsil receives rainfall below 500 mm. There is drought prone area and always shortage of drinking water.

SATARA DISTRICT
Rainfall Distribution

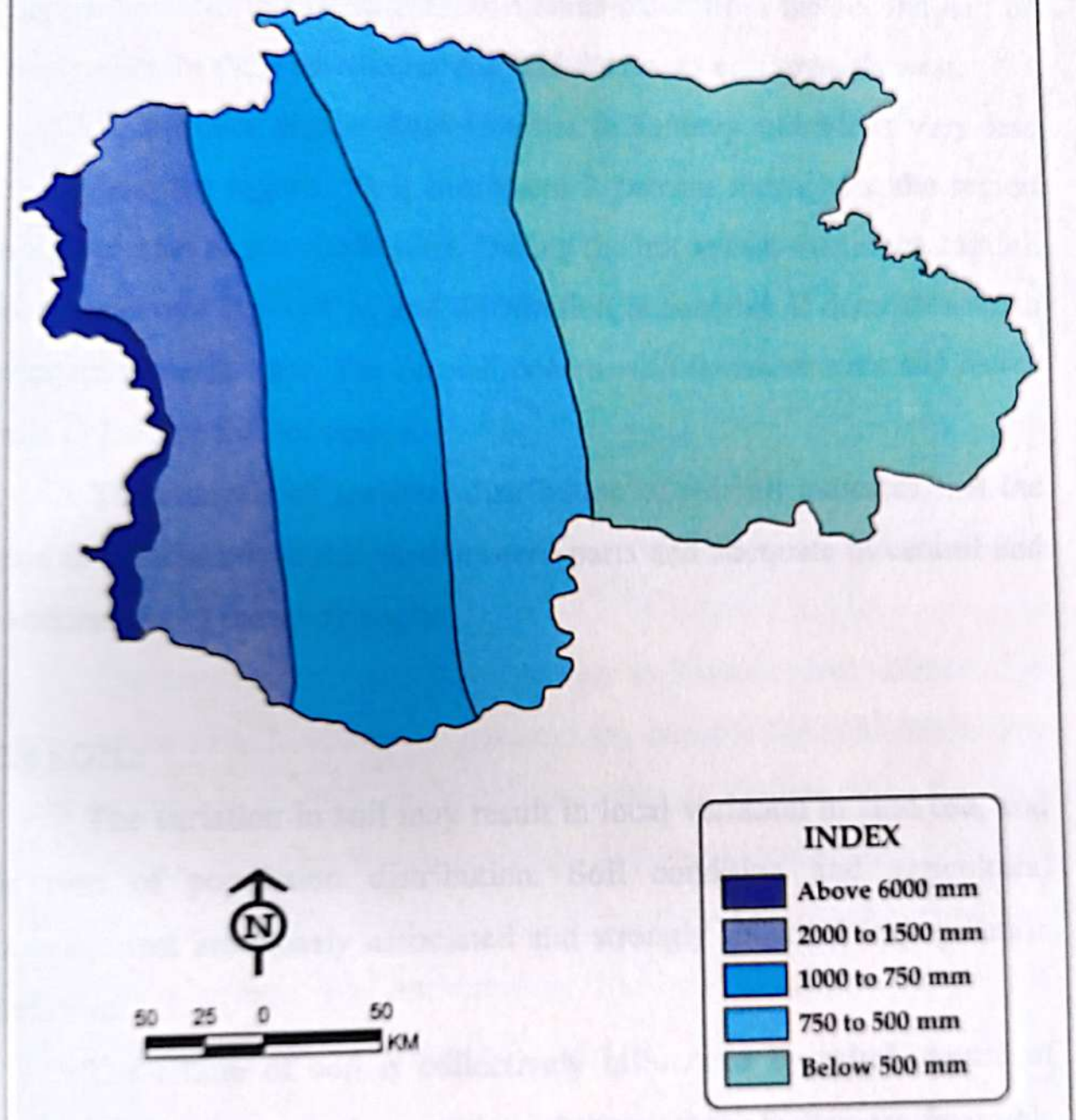

Fig. No. 2.4

Seasonal Distribution of Rainfall:

In the study region, seasonality is an important characteristic of the rainfall. However, 70 to 90 percent of the mean annual rainfall of the region is received during south west monsoon periods from June to September. North eastern monsoon takes place from the second half of September. In these periods rainfall had decreases east towards west.

In the cool season from October to January rainfall is vary less throughout the region. It is maximum 2 percent throughout the region and decreases east towards west. During the hot season maximum rainfall over 8 percent is received and distribution is unequal. It decreases north western towards west. The rainfall occurs with thunderstorms and heavy rain or hails in the hot season.

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

2.6 SOIL:

The variation in soil may result in local variation in land use, and in turn of population distribution. Soil condition and agricultural development are closely associated and strongly reflected in population densities.

The nature of soil is collectively influenced by relief, nature of parent rocks, climate and vegetation wherever these factors are favorable soils have been formed and agricultural has flourished. The higher fertility of soils is good for agricultural activities of the regions. The variation in soil color, texture, fertility may result in local variation land use, and in turn of agricultural activities.

A) Coarse Shallow Soils:

The coarse shallow soils occur mainly in the hill ranges, especially offshoots of the Shaydari and southern flanks of Mahavdeo ranges. This group of soil is shallow and mostly covered by the forest in Mahableshwar, Jaoli, Patan and western part of Satara tahsil. The coarse shallow soils also covered central and eastern part of the study region. In the Man, Khatav, and eastern part of the Phaltan tahsil the soil is extremely poor and shallow.

B) Laterite Soils:

This group of soils covers Mahableshwar, Patan, Jaoli and western part of Satara tahsil. The colours of laterite soils are red to brownish, due to presence of excessive iron oxide, shallow in depth. These soils are acidic and low in phosphoric content. The laterite soils are locally known as Tambadi Mati. These soils have different depths and are classified as deep and medium laterite soils.

The deep laterite soils largely occur in Koyana river valleys. The deep laterite soils have rich texture and are suitable for cultivation. The upper reaches of all the right bank tributaries of Krishna have the deep laterite soils. These soils zone is mainly under rice production.

This zone of soils largely occurs in the river valley and plateau top, and covers large area. The medium deep laterite soils have less depth and course in structure. This is suitable for agriculture.

C) Black Soils:

The regional distribution of black soils occurs in central, northern and eastern part of the study region. The black soils have different colours from

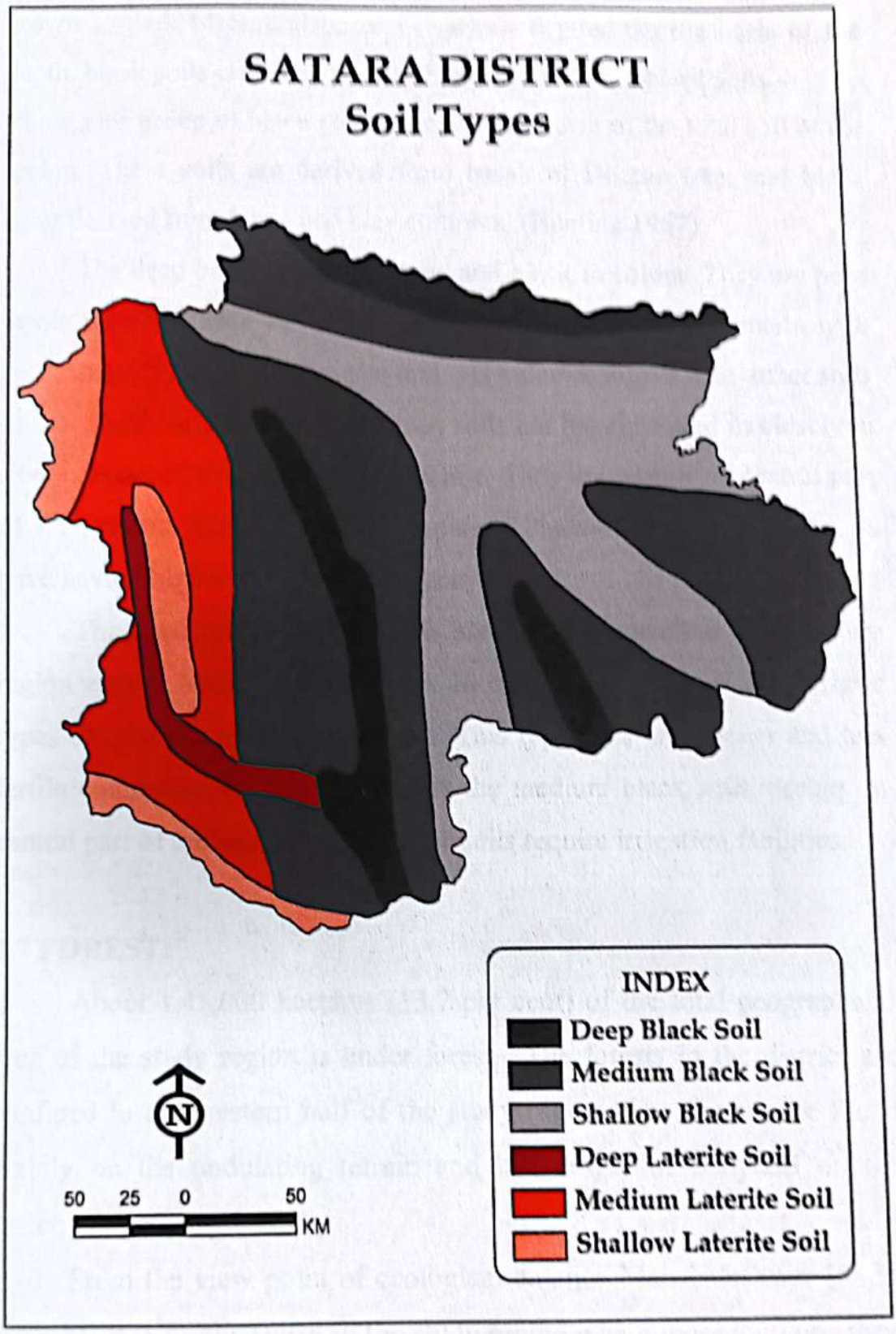
SATARA DISTRICT
Soil Types
INDEX
Deep Black Soil
Medium Black Soil
Shallow Black Soil
Deep Laterite Soil
Medium Laterite Soil
Shallow Laterite Soil
N
50 25 0 50
KM

Fig. No. 2.5

brown to dark black and occur in various depths. On the basis of the depth, black soils classified as deep black and medium black soils.

This group of black soils covered 76 percent of the total soil of the region. These soils are derived from basalt of Deccan trap, and black color derived from humus and clay complex. (Hunting 1967)

The deep black soils are clayey and black in colour. They are poor in nitrogen but rich in phosphate and potash, and also contain high percentage of calcium carbonate and pH value is higher than other soils of the study region. The deep black soils are mostly found in closely to river courses of Krishna and Nira valley. They are mainly in central part of Wai, Satara, Karad and northern part of Phaltan tahsil. The deep soils have having high water holding capacity.

The zone medium black soils are found everywhere in the study region except Mahableshwar tahsil. In the Patan and Jaoli tahsil these types of soils occurs in less amount. This type soils are thinner and less fertile comparing to deep black soils the medium black soils occupy in central part of the study region. These soils require irrigation facilities.

2.7 FOREST:

About 1,45,000 hectares (13.7 per cent) of the total geographical area of the study region is under forest. The forests in the district are confined to the western half of the study region. The forests are found mainly on the undulating terrain and hill ranges of Sahyadri on the eastern slopes.

From the view point of ecological balance Mahabaleshwar (58.59 per cent) is the only Tehsil in the study region where more than one third of the total geographical area is under forest.

Broadly speaking there are following there types of forests in the study region. Evergreen forests are confined to the Sahyadri range. The plantation or semi-evergreen forests are on the slopes of off-shoots of Sahyadri hills which run east wards. And bush sprinkled (thorny) forests are on the hills to the east of river Krishna.

Table No. 2.3

THE SATARA DISTRICT: LAND UNDER FOREST

Sr.No.	Name of the Tehsil	Forest Area	
		In '00' hectares	In per cent
1	Satara	85	9.34
2	Wai	128	20.78
3	Khandala	65	11.97
4	Koregaon	108	11.70
5	Phaltan	89	7.56
6	Man	130	8.63
7	Khatav	71	5.20
8	Karad	99	9.50
9	Patan	300	21.36
10	Jaoli	242	27.85
11	M'shwar	133	58.59
	Satara District	1450	13.70

Source: Socio-Economic Review and District Statistical Abstract, Satara (2014-15)

Low forest covered (Less than 10 per cent of the total geographical area) is found in five Tehsils viz. Satara, Phaltan, Man, Khatav and Karad.

2.8 LAND USE PATTERN:

Table 2.4 shows the picture of land utilization in the Satara district in 2014 - 15. In the Satara district 145 thousand hectares of land is under

forest, which accounts for 13.00 per cent of the total geographical area of the study region.. But as regards to areal distribution only Mahabaleshwar Tehsil has more than 35 per cent of the total geographical are under forest while all the Tehsils have forest cover ranges from 3.00 per cent to 22.77 per cent.

Uncultivable land including cultivable waste land and barren land cover 11.48 per cent of the total area of the study region. But this is higher than the study region's average figure(12.56 per cent) in Satara (14.76), Man (21.53) and Patan (18.11)Tehsils.

Uncultivated land including land put to non agricultural use, permanent pasture, grazing and tree crops account for 10.05 per cent of the total area of the study region. Percentage of such land is more in Satara (16.42), khandala(18.63), Koregaon(16.10), Phaltank (11.75), man (16.65), Patan (11.12).

Follow include two types of land viz. other follow (for 2 to 5 years) and current follow (one year). The percentage of area under follow in the study region is 4.58. The largest per centage of the land under this categories is in Mahabaleshwar Tehsil (18.50).

The net sown area covers 50.98 per cent of the total study region's area. Comparatively Khandala (61.3), Phaltan(69.4), Khatav (78.8), Karad(70.51) have higher net sown area. While Mahabaleshwar Tehsil has the lowest net sown area. (5.73 per cent).

13.87 per cent of the total cultivated area of the study region is sown more than one. The per centage of area sown more than one is the highest in Satara Tehsil(35.1), followed by Wai (25.56), Koregaon (18.79), Patan, (16.14).

Table No. 2.4

THE SATARA DISTRICT: GENERAL LAND USE

Sr. No.	Land use Types	Forest Area	
		In '00' hectares	In percentage
1	Total Geographical Area	10484	100
2	Forest	1450	13.83
3	Barren and area not available for cultivation	905	8.63
4	Land put to non-agricultural uses	285	2.72
5	Cultivable Wastes	412	3.93
6	Permanent Pasture and other grazing land	717	6.84
7	Miscellaneous tree crops and groves	51	0.49
8	Other follow	333	3.18
9	Current follow	147	1.40
10	Net area sown	6184	58.98

Source: Socio-Economic Review and District Statistical Abstract, Satara (2014 - 15).

2.9 TRANSPORT NETWORK:

Transportation activities are closely linked with industrialization and urbanization. Hence, developments of transportation facilities play a significant role in agricultural development.

Transportation facilities increase mobility, expand trade and commerce, and minimize the difficulties of movement. With the development of the modern transport system, urban growth is concentrating in large cities and towns. (Chakrawarthy 2006)

The study region has relatively good network of transport by roads and railways. The total length of the study region is 10451.14 kms. having an average density of 99.61 kms. of road length per 100 sq. kms. Most of the villages having population above 500 are linked by the roads in the study region.

Table No.2.5

SATARA DISTRICT: TYPES AND LENGTH OF ROADS

Sr. No.	Types of Roads	Length in Kms.	Avg. Density/100 Sq. Km.
1	National Highway	131.00	01.25
2	State Highway	996.67	09.50
3	Major District Roads	2249.98	21.44
4	Other District Roads	1838.03	17.52
5	Village Roads	4683.18	44.64
6	Other Roads	552.28	5.26
	District Total	**10451.14**	**99.61**

Source: Socio-Economic Review and District Statistical Abstract of Satara District (2014-15)

The national highway No. 4 (Pune- Bangalore) passes through the study region having a length of 124 kms. Besides this Mahableshwar – Pandharpur, Pune – Mahableshwar - Mahad, Satara –Mahableshwar – Mahad, Phaltan – Miraj and interstate Vijapur – Chiplun highway passes through the study region, and they accounts for the total length of 996 kms. The major district roads connect the tahsils and other important places of the study region.

Pune – Bangalore broad gauge railway line passes through the study region from north to south about 124 kms. On this railway line from north to south Lonand, Wather, Satara, Koregaon, Rahimatpur, Masoor, Karad are the important railway stations.

In general, western highland zone have seasonal roads are the major means of transportation because of rugged topography, but in the central and eastern part many village roads are constructed by Zilla Parishad, which are linked to settlement.

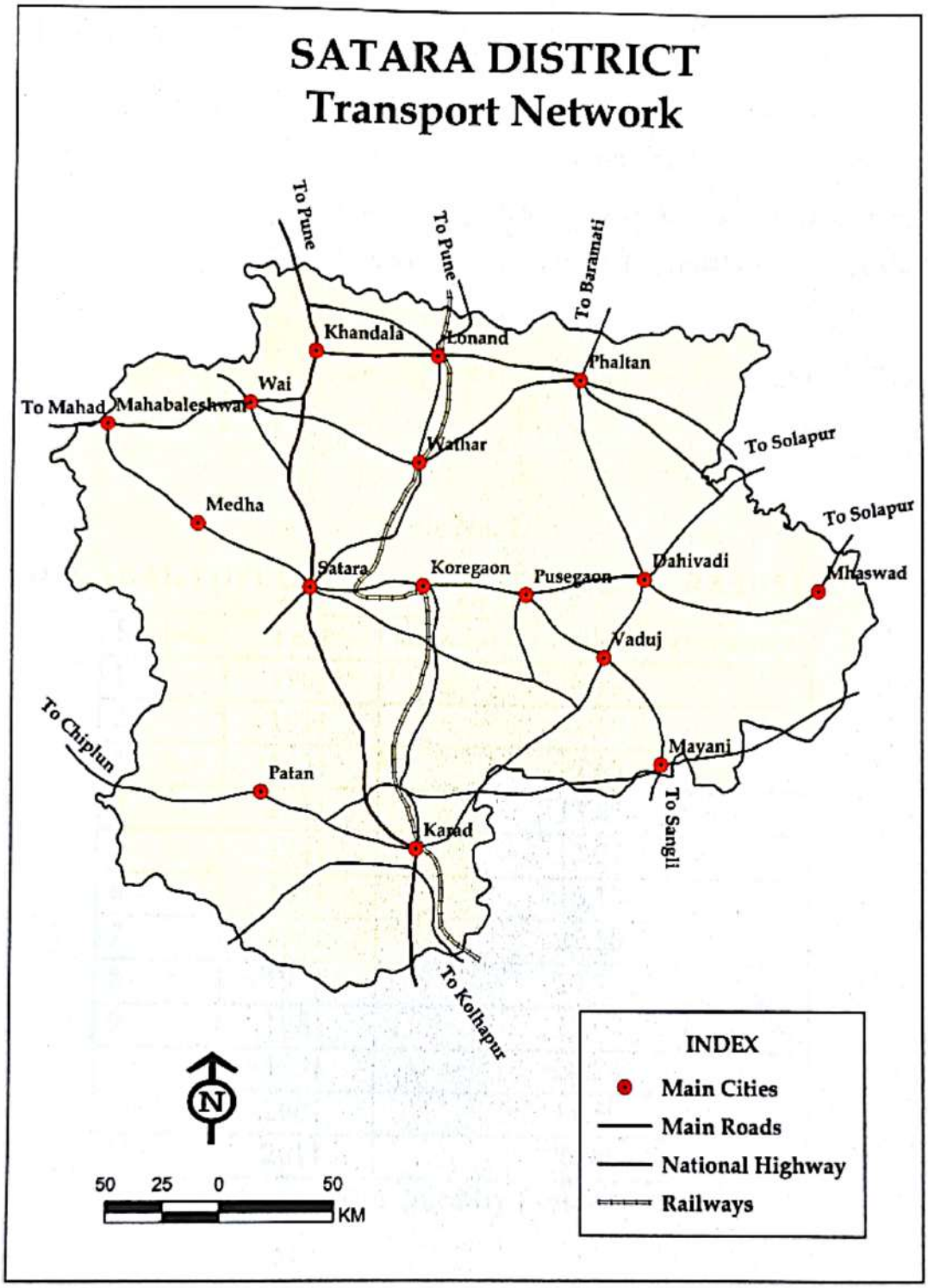
SATARA DISTRICT
Transport Network
To Pune
To Pune
To Baramati
Khandala
Lonand
Phaltan
Wai
To Mahad
Mahabaleshwar
Wathar
To Solapur
Medha
To Solapur
Satara
Koregaon
Pusegaon
Dahivadi
Mhaswad
Vaduj
To Chiplun
Mayani
Patan
To Sangli
Karad
To Kolhapur
N
50 25 0 50
KM
INDEX
Main Cities
Main Roads
National Highway
Railways

Fig. No. 2.6

2.10 POPULATION CHARACTERISTICS:

The study of the population structure in the region is essential to assess the development of agriculture in the region. The agriculture activity requires skilled labour, large number of skilled labour can be utilised in this activity. Therefore here attempt has made to assess the population characteristics by consider population growth, rural – urban population, density of population, sex ratio and occupational structure of population in the study region.

Table No. 2.6

DECADAL POPULATION GROWTH IN SATARA DISTRICT

Sr. No.	Year	Decadal Growth in Percentage
1	1901	---
2	1911	-1.69
3	1921	-5.85
4	1931	13.81
5	1941	13.21
6	1951	16.17
7	1961	21.50
8	1971	20.79
9	1981	18.02
10	1991	20.24
11	2001	14.59
12	2011	6.94

Source: Complied By Researcher

Table 2.6 reveals that there is natural growth in population, since 1931 to 2011 but in the year 1911 and 1921 showing negative population growth that is -1.69 and -5.85 respectively. The highest population growth is observed in 1961 by 21.50 percent from 1951. In the year 1961,

1971 and 1991 population growth is more than 20 percent from the previous year.

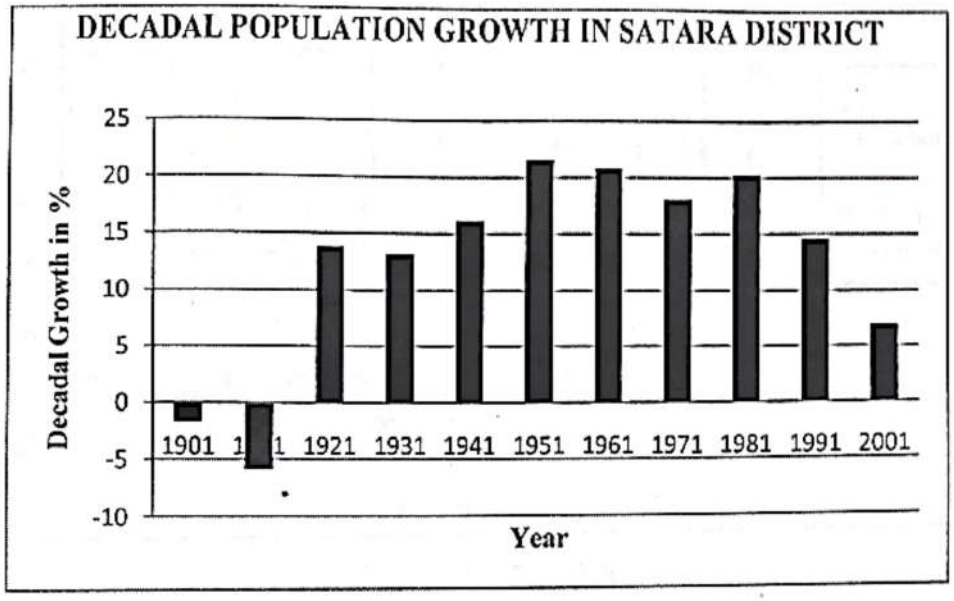

Fig. No. 2.7

Table No. 2.7

SATARA DISTRICT: TEHSIL WISE RURAL- URBAN POPULATION (2011)

Tehsils	Total Population	Rural Population	Percentage	Urban Population	Percentage
Mahabaleshwar	72830	44543	61.16	28287	38.84
Wai	200269	163453	81.62	36816	18.38
Khandala	137418	118695	86.38	18723	13.62
Phaltan	342667	282495	82.44	60172	17.56
Man	225634	201514	89.31	24120	10.69
Khatav	275274	275274	100	0	0.00
Koregaon	257510	215187	83.56	42323	16.44
Satara	502049	289825	57.73	212224	42.27
Jaoli	106506	101828	95.61	4678	4.39
Patan	299509	285730	95.40	13779	4.60
Karad	584085	454829	77.87	129256	22.13
Satara District	**3003751**	**2433373**	**81.01**	**570378**	**18.99**

Source: District Census Handbook of Satara District 2011

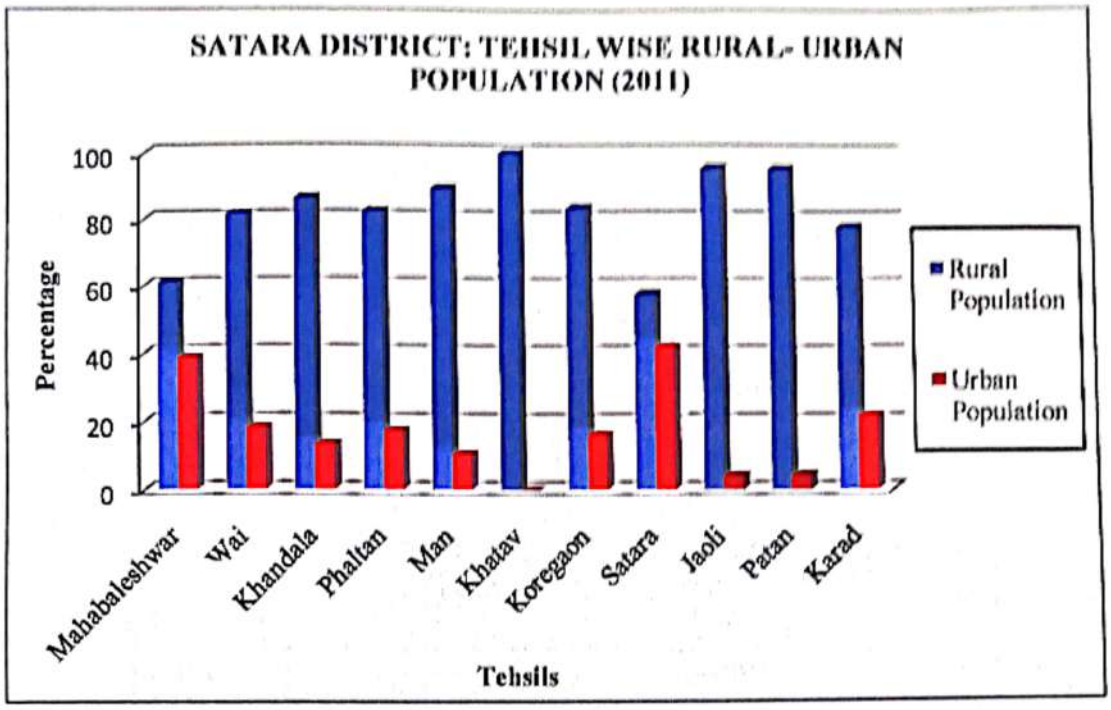

Fig. No. 2.8

Above table no. 2.7 shows tehsil wise rural and urban population of the district in year 2011. It is observed that 18.99 percent population is urban and 81.01 percent population is rural population. In the Satara district Satara tehsil has 42.27 percent urban population which is highest and followed by Mahabaleshwar tehsil with 38.84 percent.

Jaoli and Patan tehsil contain very low urban population which is 4.39 and 4.60 percent respectively because this tehsils are located in the hilly region of the study region. In the Satara district Khatav tehsil is not has urban population because of no any urban centre is located in this tehsil.

Table No. 2.8

SATARA DISTRICT: TEHSIL WISE DENSITY OF POPULATION (2011)

Tehsils	Density of Total Population
Mahabaleshwar	111
Wai	280
Khandala	264
Phaltan	274
Man	146
Khatav	189
Koregaon	270
Satara	548
Jaoli	180
Patan	203
Karad	510
Satara District	**268**

Source: District Census Handbook of Satara District 2011.

The table 2.8 reveals that the tehsil wise distribution of density in the study in 2011. Satara tehsil has highest population density with 548 persons per sq. km. which is followed by Karad tehsil with 510 persons per sq. km. Satara and Karad tehsils has high population concentration because many urban centers are present in this tehsils with high employment opportunity therefore population are concentrate in this two tehsils.

Mahabaleshwar tehsil has lowest population density with 111 persons per sq. km. Man, Jaoli and Khatav tehsils also has low population density as compare to other tehsils because Man and Khatav tehsils are located in the drought prone region of the study region whereas Mahabaleshwar and Jaoli tehsils are located in the hilly region of the district.


SATARA DISTRICT
Population Density - 2011
(Persons per Sq. Km.)
Khandala
Wai
Phaltan
Mahabaleshwar
Jaoli
Koregaon
Satara
Man
Khatav
Patan
Karad
N
50 25 0 50
KM
INDEX
High
Moderate
Low

Fig. No. 2.9

Table No. 2.9

SATARA DISTRICT: TEHSIL WISE SEX RATIO OF TOTAL POPULATION (2011)

Tehsils	Sex Ratio
Mahabaleshwar	937
Wai	1005
Khandala	947
Phaltan	944
Man	976
Khatav	1012
Koregaon	999
Satara	976
Jaoli	1068
Patan	1065
Karad	972
Satara District	**988**

Source: District Census Handbook of Satara District 2011.

Sex ratio is calculated as number of Women's to per thousand males in particular area and time.

In the Satara district total sex ratio is 988 in 2011. In the spatial distribution of sex ratio Jaoli ,Patan, Khatav and Wai tehsils has high sex ratio, here women's are more than 1000 male population whereas remaining tehsils has low sex ratio with women's are less than 1000 male population.

In the study region Jaoli tehsil has 1068 women's per 1000 male population which is highest while Mahabaleshwar tehsil has 937 women's per 1000 male population which is lowest in the district. It is clearly indicates that high sex ratio is observed in the hilly as well as drought prone region of the study region whereas low sex ratio is observed in the urban region of the study region.

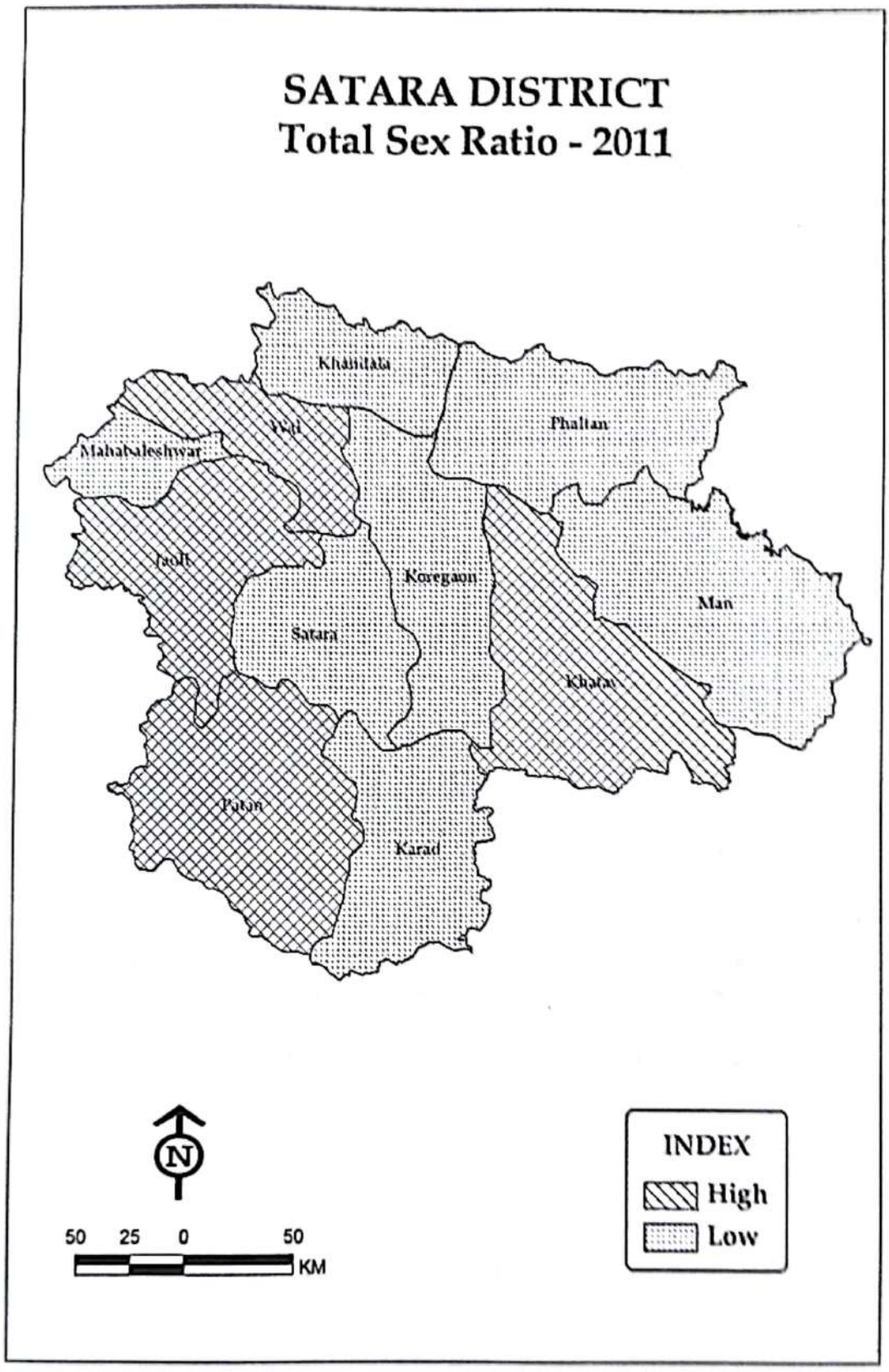
SATARA DISTRICT
Total Sex Ratio - 2011
Khandala
Wai
Phaltan
Mahabaleshwar
Jaoli
Koregaon
Man
Satara
Khatav
Patan
Karad
N
50 25 0 50
KM
INDEX
High
Low

Fig. No. 2.10

OCCUPATIONAL STRUCTURE OF POPULATION:

The census of India (1971) defined "occupation as the name of the function, which a person performs by engaging himself in some gainful activity". It indicates the earner's nature of work.

The term occupation structure is often used in a broader sense. It indicates a unitary relationship of three occupational component of the working population as primary, secondary and tertiary activity.

Table 2.10

SATARA DISTRICT: TEHSIL WISE OCCUPATIONAL STRUCTURE (2011)

Tehsils	Primary	Secondary	Tertiary
Mahabaleshwar	44.26	52.98	2.76
Wai	64.38	33.67	1.96
Khandala	63.09	34.06	2.85
Phaltan	70.47	27.35	2.18
Man	81.62	16.81	1.58
Khatav	77.98	19.88	2.14
Koregaon	70.48	26.49	3.03
Satara	39.50	57.11	3.39
Jaoli	69.89	27.43	2.68
Patan	78.21	19.66	2.12
Karad	57.56	39.53	2.91
Satara District	**64.63**	**32.82**	**2.55**

Source: District Census Handbook of Satara District 2011.

According to census, population is divided into nine livelihood classes and grouped into three sectors. The primary sector includes cultivators, agricultural labourers and livestock, forestry, mining and quarrying.

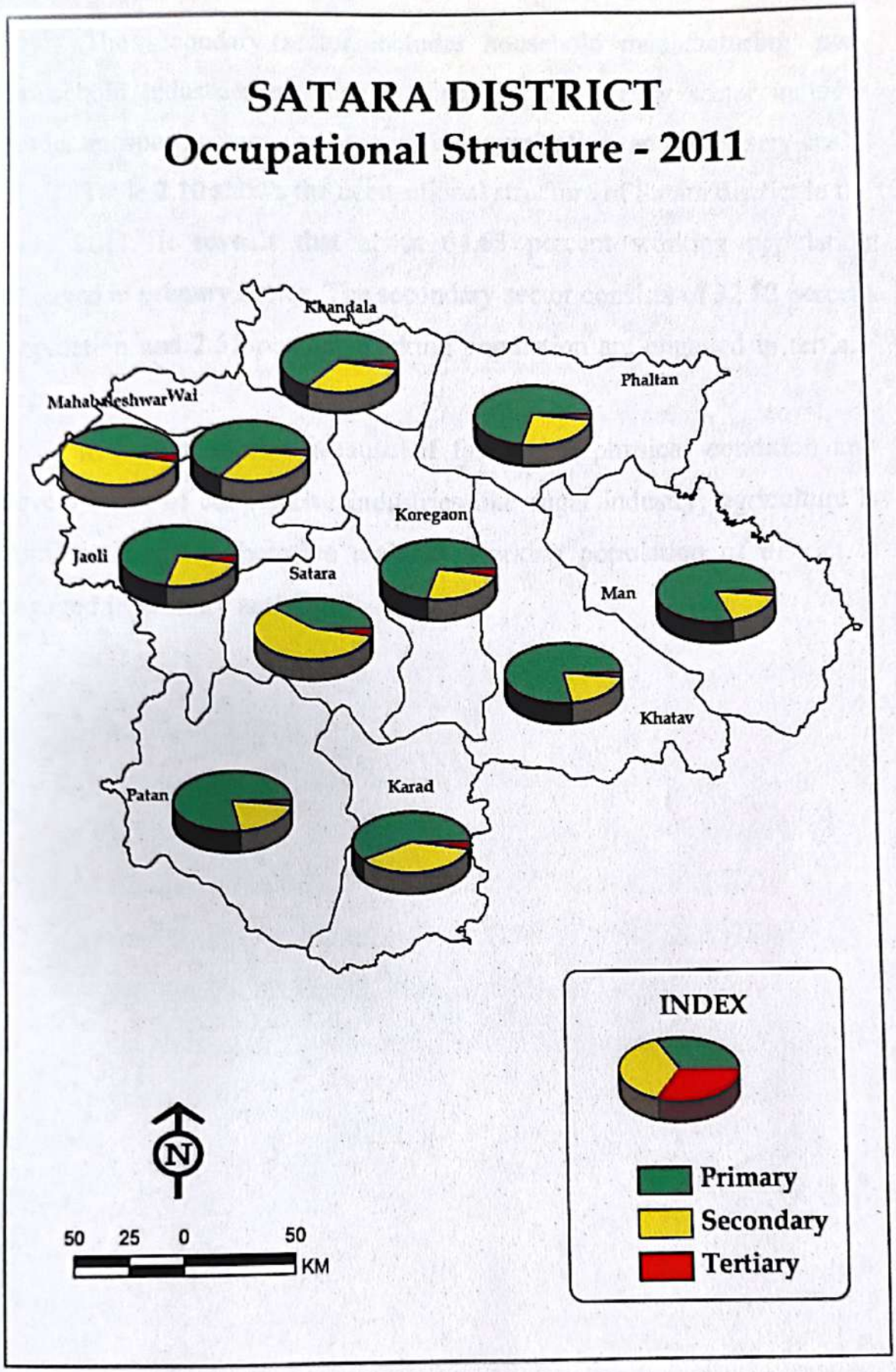
SATARA DISTRICT
Occupational Structure - 2011
Khandala
Phaltan
Mahabaleshwar
Wai
Koregaon
Jaoli
Satara
Man
Khatav
Patan
Karad
INDEX
Primary
Secondary
Tertiary
N
50 25 0 50
KM

Fig. No. 2.11

The secondary sector includes household manufacturing, non-household industries and construction and the tertiary sector includes trade, transport, commerce, storage, communication, and other services.

Table 2.10 shows the occupational structure of Satara district in the year 2011. It reveals that about 64.63 percent working population engaged in primary sector. The secondary sector consists of 32.82 percent population and 2.55 percent working population are engaged in tertiary sector.

In Satara district because of favourable physical condition and development of cooperative industries like sugar industry, agriculture is dominant activity therefore majority working population of district is engaged in primary activity.

REFERENCES:

1. Chakrawarthy K. (2006): 'Geography of Population', Mohit Publications, New Delhi, Pp. 116-117.
2. Chandana R. C. (2006): 'Geography of Population, Concepts, Determinants and Pattern', Kalyani Publishers, New Delhi, Pp. 4950.
3. District Census Hand book of Satara District – 2011.
4. Ghosh B. N. (1985): 'Fundamentals of Population Geography', Sterling Publishers Private Ltd, New Delhi, Pp.25.
5. I. C. A. R. (1989): 'Hand Book of Agricultural', I. C. A. R. New Delhi, Pp. 11-20.
6. Maharashtra State Gazetteer, Satara District- 2001.
7. Mate, G.R., (1968), "Asa Ghadala Satara Jillha" Maharashtramitra Mudranalaya, Satara.
8. Nevase, S.V., (2009), "Spatio-Temporal Analysis of SC and ST Population in Satara District" (1991-2001),Unpublished M.Phil.Dissertaton Submitted to TMV Pune. pp10 to 25.
9. Sawant S. B. and Athawale A. S. (1994): 'Population Geography', Mehta Publishing House, Pune, Pp. 25-26.
10. Socio economic review and District Statistical abstract of Satara District 2014-15.

CHAPTER - III

DISTRIBUTION AND FUNCTIONAL CLASSIFICATION OF AGRO SERVICE CENTRES

CHAPTER - III

DISTRIBUTION AND FUNCTIONAL CLASSIFICATION OF AGRO SERVICE CENTRES

3.1 INTRODUCTION

3.2 SPATIAL DISTRIBUTION OF AGRO SERVICE CENTRES

3.2.1 Area and distribution of Agro Service Centres

3.2.2 Population and Distribution of Agro Service Centres

3.2.3 Agricultural area and Distribution of Agro Service Centres

3.3 AGRICULTURAL AREA DEPENDS ON AGRO SERVICE CENTRES

3.4 DEGREE OF CONCENTRATION OF AGRO SERVICE CENTRES

3.5 FUNCTIONAL CLASSIFICATION OF AGRO SERVICE CENTRES

REFERENCES

CHAPTER - III

DISTRIBUTION AND FUNCTIONAL CLASSIFICATION OF AGRO SERVICE CENTRES

3.1. INTRODUCTION:

In Indian economy agriculture occupies strategic position. It is main source of livelihood for 70 percent Indian population. The prosperity of the India is largely depends on agriculture and development of agricultural depending on the growth and development of Agro Service Centres.

As per government decision 500 Agro Service Centres established in the economy of the country and this was right stop for the progress. The scheme indented to provide employment in the rural area as well as to accelerate the process of modernization in the villages. It is particularly aimed at providing help to the small farmers and the relatively backward areas. Agro Service Centres playing very significant role in and providing all the required facilities to the farmers. Within a short span Agro Service Centres become an important infrastructure in the process of development of agriculture and rural welfare.

Agro Service Centres are an innovative idea and interesting experiment which holds the great promises to increase agricultural production through more use of fertilizer and wise use of other agricultural inputs.

3.2 SPATIAL DISTRIBUTION OF AGRO SERVICE CENTRES:

A spatial distribution is the arrangement of a phenomenon across the Earth's surface and a graphical display of such an arrangement is an important tool in geographical statistics also spatial distribution defines as

a spatial distribution is the study of the relationship between objects in physical space.

In the Satara district distribution of Agro Service Centres is uneven. The study region composed with 11 tehsils and each tehsil has different number in agro service centres which is shows in the table no.3.1.

Table No.3.1

DISTRIBUTION OF AGRO SERVICE CENTRES IN SATARA DISTRICT

Sr. No.	Tehsil	No. of A.S.C.
1	Mahabaleshwar	82
2	Wai	158
3	Khandala	192
4	Phaltan	487
5	Man	284
6	Khatav	309
7	Koregaon	310
8	Satara	375
9	Jaoli	109
10	Patan	218
11	Karad	562
12	**Total**	**3086**

Source: Socio-economic Abstract of Satara District 2015

In the study region total 3086 agro service centres are working, in this Karad and Phaltan tehsils has highest numbers of agro service centres because this tehsils is under the influence of Krishna - Koyana basin

which plays a vital role in agriculture. Agricultural land used for the crops like Wheat, Rice, Sugarcane and other crops.

In the eastern part of Satara district consists the Man and Khatav tehsil where 284 and 309 agro service centres located respectively. In the western part Patan is leading tehsil i.e. (218) in Agro Service Centres. The more concentration of Agro Service Centres is located the in central part of the study region i.e. Karad (502), Satara (375), Koregaon (310) and Khandala (192) Agro Service Centres. The hilly region of the district has very low numbers in agro service centres where Mahabaleshwar (82), Jaoli (109) and Wai (158) tehsils are located.

Total 3086 Agro Service Centres providing facilities to the farmers of district farmers are getting satisfied by purchasing all necessary inputs like fertilizer, weedicides, fungicides and insecticides along with guidance and consultancy service through agro care centres.

3.2.1 Area and Distribution of Agro Service Centres:

Area and distribution of agro service centres refers to ratio between number of agro service centres and Area in Sq. Km. simply it is density of agro service centres per sq. km. area. In the Satara district total 3086 agro service centres are located over 10610.16 sq. km. area where district average density of agro service centres is 0.31.

Table No.3.2 shows the tehsil wise density of Agro Service Centres in Satara district. The Karad (0.54) and Phaltan (0.41) tehsils has highest density of Agro Service Centres due to fertile plain region and developed agriculture activity. Moderate density of Agro Service Centres is found in the Mahabaleshwar, Wai, Khandala, Khatav and Koregaon tehsils where as Jaoli (0.13), Patan (0.16) and Man (0.19) tehsils has lowest density of Agro Service Centre because these tehsils located in hilly region of the

district therefore in this region agriculture activity is subsistence agriculture level.

Table No.3.2

DENSITY OF AGRO SERVICE CENTRES IN SATARA DISTRICT

Sr. No.	Tehsil	No. of A.S.C.	Area in Sq. km.	Density of A.S.C.
1	Mahabaleshwar	82	221.9	0.37
2	Wai	158	619.09	0.26
3	Khandala	192	536.08	0.36
4	Phaltan	487	1190.29	0.41
5	Man	284	1507.87	0.19
6	Khatav	309	1364.57	0.23
7	Koregaon	310	948.4	0.33
8	Satara	375	907.26	0.41
9	Jaoli	109	868.95	0.13
10	Patan	218	1403.64	0.16
11	Karad	562	1042.11	0.54
12	**District Avg.**	**3086**	**10610.16**	**0.31**

Source: Socio-economic Abstract of Satara District 2015

In the study region five tehsils i.e. Mahabaleshwar, Khandala, Phaltan, Satara and Karad are located above the district average density of Agro Service Centres and reaming Wai, Man, Khatav, Koregaon, Jaoli and Patan tehsils are located below the district average.

3.2.2 Population and Distribution of Agro Service Centres:

Population and distribution of agro service centres refers to ratio between number of agro service centres and 10000 persons. Simply it is number of agro service centres per 10000 persons. In the Satara district total 3003741 persons are depends on 3086 agro service centres where district average 10000 persons depends on 11 agro service centres.


SATARA DISTRICT
DENSITY OF AGRO SERVICE CENTRES
Khandala
Wai
Mahabaleshwar
Phaltan
Jaoli
Koregaon
Satara
Man
Khatav
Patan
Karad
N
50 25 0 50
KM
INDEX
High
Moderate
Low

Fig. No. 3.1

Table No.3.3

POPULATION DEPENDENCY ON AGRO SERVICE CENTRES IN SATARA DISTRICT

Sr. No.	Tehsil	No. of ASC	Total Population	A.S.C./10000 Population
1	Mahabaleshwar	82	72830	11
2	Wai	158	200269	8
3	Khandala	192	137418	14
4	Phaltan	487	342667	14
5	Man	284	225634	13
6	Khatav	309	275274	11
7	Koregaon	310	257500	12
8	Satara	375	502049	7
9	Jaoli	109	106506	10
10	Patan	218	299509	7
11	Karad	562	584085	10
12	**District Avg.**	**3086**	**3003741**	**11**

Source: Socio-economic Abstract of Satara District 2015

Table No.3.3 shows the tehsil wise distribution of population and Agro Service Centres in Satara district where dependency of 10000 population per Agro Service Centres is Calculated. The Khandala and Phaltan (14) tehsils has highest Agro Service Centres per 10000 population where as Satara and Patan (7) tehsils has lowest Agro Service Centres per 10000 population. Moderate dependency of Agro Service Centres is found in the Mahabaleshwar, Khatav, Koregaon, Jaoli and Karad tehsils.

In the study region five tehsils i.e. Satara, Patan, Wai, Jaoli and Karad are located below the district average in terms of population

Fig. No. 3.2

Centres and roaming Khandala, Phaltan, Man and Koregaon tehsils are located above the district average.

3.2.3 Agricultural Area and Distribution of Agro Service Centres:

Agricultural area and distribution of agro service centres refers to ratio between number of agro service centres and agricultural area in Sq. Km. simply it is agricultural density of agro service centres per sq. km. area. In the Satara district total 3086 agro service centres are located over 6857.39 sq. km. agricultural area where district average agricultural density of agro service centres is 2.22.

Table No.3.4

AGRICULTURAL DENSITY OF AGRO SERVICE CENTRES IN SATARA DISTRICT

Sr. No.	Tehsil	No. Of ASC	Area Under Agriculture	Agricultural Density
1	Mahabaleshwar	82	64.68	0.79
2	Wai	158	501.12	3.17
3	Khandala	192	409.03	2.13
4	Phaltan	487	644.19	1.32
5	Man	284	558.51	1.97
6	Khatav	309	834.28	2.70
7	Koregaon	310	688.17	2.22
8	Satara	375	821.58	2.19
9	Jaoli	109	453.55	4.16
10	Patan	218	929.5	4.26
11	Karad	562	952.78	1.70
12	**District Avg.**	**3086**	**6857.39**	**2.22**

Source: Socio-economic Abstract of Satara District 2015


SATARA DISTRICT
AGRICULTURAL DENSITY OF
AGRO SERVICE CENTRES
Khandala
Wai
Phaltan
Mahabaleshwar
Jaoli
Koregaon
Man
Satara
Khatav
Patan
Karad
INDEX
High
Moderate
Low
N
50 25 0 50
KM

Fig. No. 3.3

Table No.3.4 illustrates the tehsil wise distribution of Agricultural area and Agro Service Centres in Satara district where density of Agro Service Centres on agricultural area is calculated.

The Patan (4.26) tehsil has highest agricultural density of Agro Service Centres where as Mahabaleshwar (0.79) tehsil has lowest agricultural density of Agro Service Centres in the study region.

The High agricultural density of Agro Service Centres is observed in Patan, Jaoli and Wai tehsils and moderate agricultural density of Agro Service Centres is found in the Khatav, Koregaon, Satara, Man, Karad and Khandala tehsils where as low agricultutal density is observed in Mahabaleshwar and Phaltan.

In the study region Mahabaleshwar, Phaltan, Karad, Khandala, Man and Satara are located below the district average of agricultural density and reaming Wai, Khatav, Koregaon, Jaoli and Patan tehsils are located above the district average.

3.3 AGRICULTURAL AREA DEPENDS ON AGRO SERVICE CENTRES:

Dependency of Agricultural Area on agro service centres is refers to agricultural area in Sq. Km. depends on one agro service centre. In the Satara district total 3086 agro service centres are located over 6857.39 sq. km. agricultural area where district average 0.45 sq. km. agricultural area is depends on one agro service centres.

Table No.3.4 shows the tehsil wise dependency of agricultural area per Agro Service Centres in Satara district where dependency of per Agro Service Centres on agricultural area is calculated.

Table No.3.5

DEPENDENCY OF AGRICULTURAL AREA ON A.S.C. IN SATARA DISTRICT

Sr. No.	Tehsil	No. of ASC	Area Under Agriculture	Agri Area depends on ASC in Sq Km
1	Mahabaleshwar	82	64.68	1.27
2	Wai	158	501.12	0.32
3	Khandala	192	409.03	0.47
4	Phaltan	487	644.19	0.76
5	Man	284	558.51	0.51
6	Khatav	309	834.28	0.37
7	Koregaon	310	688.17	0.45
8	Satara	375	821.58	0.46
9	Jaoli	109	453.55	0.24
10	Patan	218	929.5	0.23
11	Karad	562	952.78	0.59
12	**District Avg.**	**3086**	**6857.39**	**0.45**

Source: Socio-economic Abstract of Satara District 2015

In the study region Mahabaleshwar tehsil (1.27) has highest agricultural dependency of per Agro Service Centres because in this tehsil agricultural area is very low where as Patan (0.23) tehsil has lowest agricultural dependency of per Agro Service Centres in the study region.

The High agricultural dependency per Agro Service Centres is observed in Mahabaleshwar and Phaltan tehsils and moderate agricultural dependency per Agro Service Centres is found in the Wai, Khandala, Man, Khatav, Koregaon, Satara and Karad tehsils where as low

agricultural dependency is observed in Jaoli and Patan tehsils because majority area of this tehsils are hilly and covered by forest.

Fig. No. 3.4

In the study region Wai, Khatav, Koregaon, Jaoli and Patan are located below the district average of agricultural dependency per agro service centre and reaming Mahabaleshwar, Khandala, Phaltan, Man, Satara and Karad tehsils are located above the district average dependency.

3.4 DEGREE OF CONCENTRATION OF AGRO SERVICE CENTRES:

In general, a close distribution is considered to be a concentration and a wide distribution as dispersion. It is easy to distinguish them if they are found in extreme cases, however, it is rather difficult to differentiate in marginal cases (Reddy, 1970). The concentration of agro service centres is demarcated by a simple procedure, where a distribution in a region contains a number of discrete concentrations. They can be grouped together if they are related to each other. They are considered to be related if the distance of separation between the continuous concentration across their settlements is less than the observed distance.

In the Satara distirct for the calculation of degree of concentration location quotation was calculated for each tehsils in the study region and on the basis of calculated L. Q. values tahsils are classified in to four different groups of degree of concentration i.e. Very high (above 1.51 L.Q. value), High (1.1 to 1.5 L.Q. value), Moderate (0.51 to 1.0 L.Q. value) and Low (below 0.5 L.Q. value).

Table No.3.6

DEGREE OF CONCENTRATION OF A.S.C. IN SATARA DISTRICT

Sr. No.	Tehsil	No. of ASC	%	Area	%	L.Q.	Degree of Concentration
1	Mahabaleshwar	82	2.66	221.9	2.09	1.27	High
2	Wai	158	5.12	619.09	5.83	0.88	Moderate
3	Khandala	192	6.22	536.08	5.05	1.23	High
4	Phaltan	487	15.78	1190.29	11.22	1.41	High
5	Man	284	9.20	1507.87	14.21	0.65	Moderate
6	Khatav	309	10.01	1364.57	12.86	0.78	Moderate
7	Koregaon	310	10.05	948.4	8.94	1.12	High
8	Satara	375	12.15	907.26	8.55	1.42	High
9	Jaoli	109	3.53	868.95	8.19	0.43	Low
10	Patan	218	7.06	1403.64	13.23	0.50	Low
11	Karad	562	18.21	1042.11	9.82	1.85	Very High
12	**District Avg.**	3086	100	10610	100	1.03	High

Source: Compiled by Researcher

In the study region Karad tehsil has very high degree of concentration of Agro Service Centres with 1.85 L.Q. value where as Jaoli and Patan tehsils has low degree of concentration with 0.43 and 0.50 L.Q. value respectively.

In the high degree of concentration class tehsils such as Mahabaleshwar (1.27), Khandala (1.23), Phaltan (1.41), Koregaon (1.12) and Satara (1.42) are located because these all tahsils fertile soil and irrigation facility is developed therefore well developed agriculture needs maximum numbers of Agro Service Centres and by this there are numbers Agro Service Centres are located which reflects on their concentration.

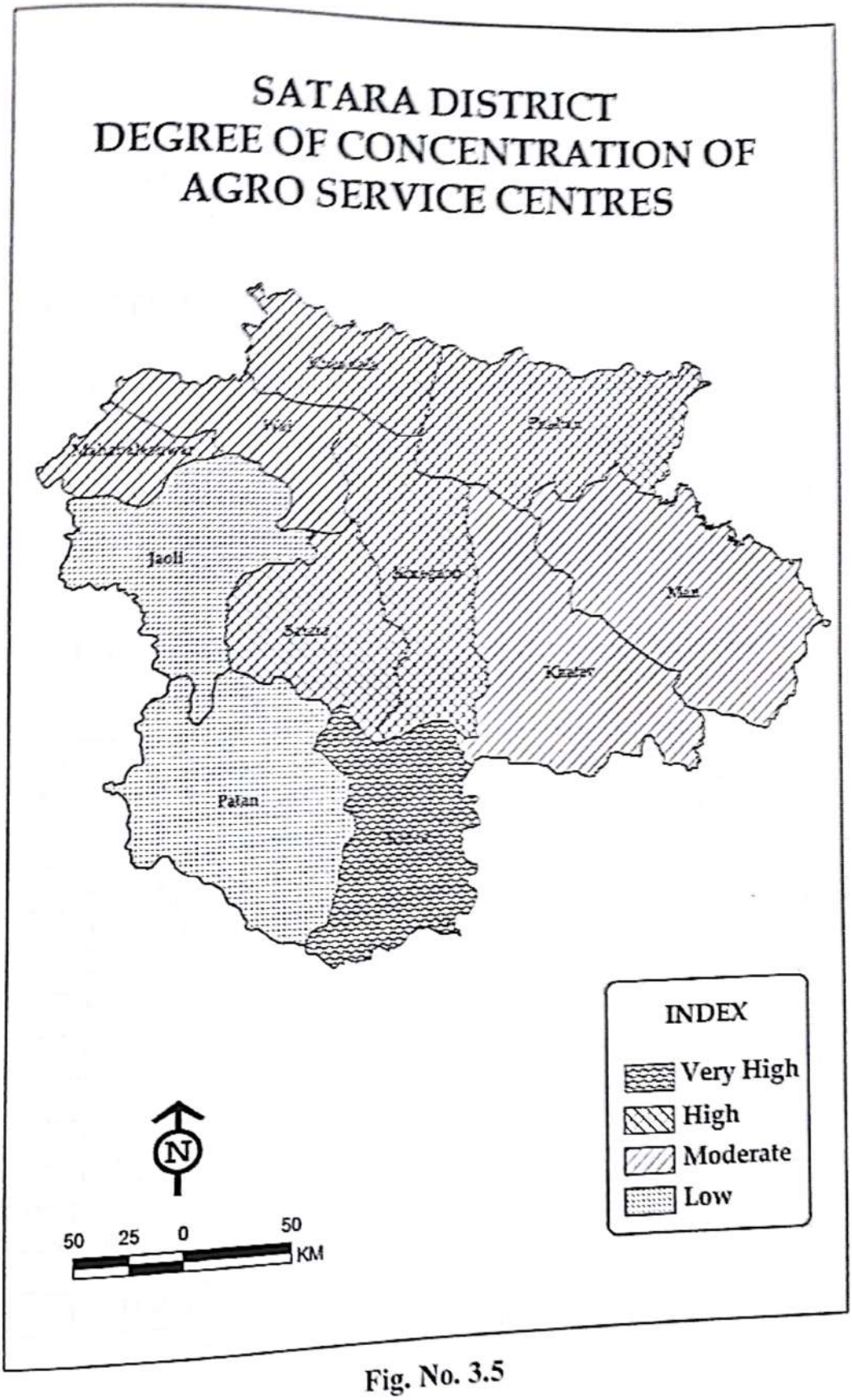
SATARA DISTRICT
DEGREE OF CONCENTRATION OF
AGRO SERVICE CENTRES
Jaoli
Patan
Man
Khatav
INDEX
Very High
High
Moderate
Low
N
50 25 0 50
KM

Fig. No. 3.5

Eastern dry region belongs to Man and Khatav tahsils where moderate degree of concentration of Agro Service Centres is observed and in view of entire district falls under high degree of concentration of Agro Service Centres.

3.5 FUNCTIONAL CLASSIFICATION OF ASCs:

Fertilizers, seeds and insecticides distribution services important function of any agro service centre in the study region. The distribution of Agro Service Centres in the study region has been shown in table and figure.

Table No.3.7

FUNCTIONAL CLASSIFICATION OF A.S.C. IN SATARA DISTRICT

Sr. No.	Tehsil	No. of ASC	Fertilizers	Seeds	Pesticides
1	Mahabaleshwar	82	28	34	20
2	Wai	158	77	41	40
3	Khandala	192	77	70	45
4	Phaltan	487	204	163	120
5	Man	284	104	103	77
6	Khatav	309	124	109	76
7	Koregaon	310	123	115	72
8	Satara	375	148	132	95
9	Jaoli	109	47	39	23
10	Patan	218	92	85	41
11	Karad	562	230	185	147
12	**District Avg.**	3086	1254	1076	756

Source: Socio-economic Abstract of Satara District 2015

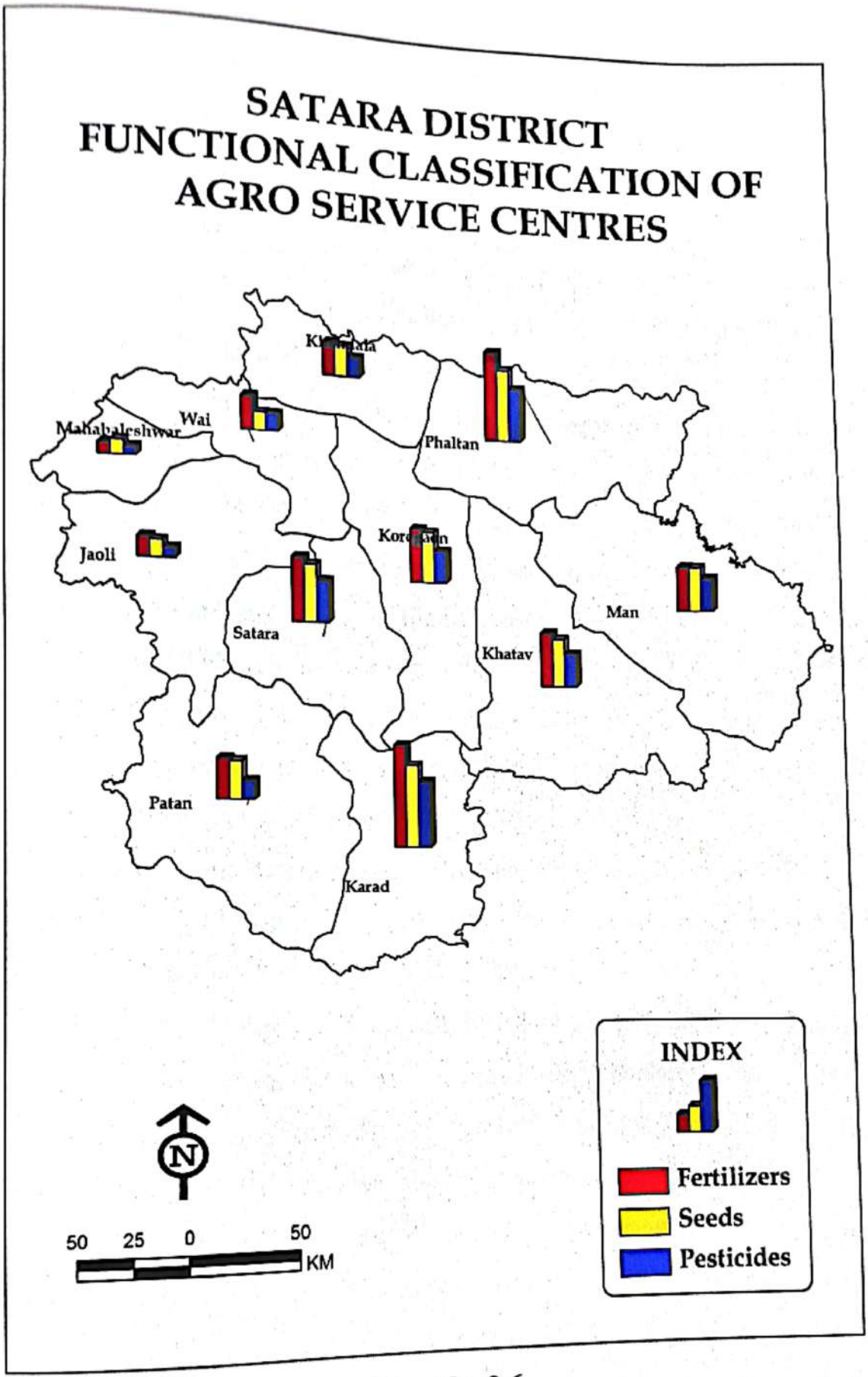
SATARA DISTRICT
FUNCTIONAL CLASSIFICATION OF
AGRO SERVICE CENTRES
Wai
Phaltan
Jaoli
Satara
Man
Khatav
Patan
Karad
N
50 25 0 50
KM
INDEX
Fertilizers
Seeds
Pesticides

Fig. No. 3.6

Out of 3086 Agro Service Centres 1254 fertilizer distribution centres are there in the study area. High concentration (above 100) is observed in the Satara, (148), Karad (230), Koregaon (123), Phaltan (204), Man (104) and Khatav (124) tehsils because of high fertile soil as well as developed irrigation facilities responsible for agricultural development so this develop agriculture requires large numbers of agro service centres in the study region.

Medium concentration (50 - 100) of fertilizer distribution centres are located in the Patan (92) Khandala (77) wai (77) and lower concentration (below 50) is observed in Jawali (47) and Mahabaleshwar (28) in the study region which is due to in accessible undulating surface, dry cultivations and poor status of the farmers.

In total 1076 Agro service centre has seeds distribution facilities all over the district high concentration (above 100) of seeds distribution centres are observed in Satara (132), Karad (185), Koregaon (115) Phaltan (163) Man (103), Khatav (109) tehsil.

Medium concentration of agro service centre is observed in Patan (85) Khandala (70) while low concentration of Agro service centre is observed in Jawali (39), Wai (41) and Mahabaleshwar (34).

Out of 3086 agro service centre 756 Agro Service Centres has insecticide distributions facilities in centres. High concentration (above 100) of insecticide distributions facilities is observed in Karad (147) and Phaltan (120) tehsils whereas medium concentration of insecticide distribution facilities is located in Satara (95), Koregaon (72), Man (77), Khatav (76) while low concentration of insecticides distribution are observed in remaining tehsils of the Satara districts.

REFERENCES:

1. Bracey, H.E. (1953): "Towns as Rural Service Centres" An Index of Centrality with special reference to somerset, Tran, Inst, of Br, Geographer.
2. Deshmukh, P.W. (1985) : "The Location of service Activities, A study of Central Places in Upper Krishna valley". Ajab Pustakalaya, Kolhapur.
3. District Census Hand book of Satara District – 2011.
4. Ingle K.D.(1995), "A role of Agro Service Centres in agriculture development" in Bhusaval taluka. A Geographical Analysis unpublished M.Phil. Dissertation, submitted to North Maharashtra, University, Jalgaon.
5. Jadhav D.R (1979) A role of Agro Service Centres in communication of Agricultural technology, AGRESCO, MP Krishi Vidyapeeth.
6. Pawar, C.T. and Gharpure, V.T. (1985): "Delineation of sphere of influence of Agro Service Centres in the Panchaganga Basin (Mah)", Journal ofShivaji University, vol.XXII, pp. 155-161.
7. Sharma, P.S. (1973): "Agricultural Regionalization in India", New Heights, Delhi
8. Socio economic review and District Statistical abstract of Satara District 2014-15.

CHAPTER - IV

CENTRALITY AND HIERARCHY OF AGRO SERVICE CENTRES

CHAPTER - IV
CENTRALITY AND HIERARCHY OF AGRO SERVICE CENTRES

4.1 INTRODUCTION

4.2 CENTRALITY OF AGRO SERVICE CENTRES

A) Methods of Measuring Centrality

B) Choice of Method for Determining Centrality

C) Regional Analysis

4.3 HIERARCHY OF AGRO SERVICE CENTRES

A) Choice of Method for Determining Hierarchy

B) Regional Analysis

4.4 AGRO SERVICE CENTRES : RELATIONSHIPS

REFERENCES

CHAPTER - IV
CENTRALITY AND HIERARCHY OF AGRO SERVICE CENTRES

4.1 INTRODUCTION:

In the preceding chapter an attempt has been made to analyze the distribution and functional classification of agro service centres. The present chapter deals with the centrality and hierarchy of agro service centres in the study region. It consists of two parts: Part I deal with the centrality and the hierarchy of agro service centres.

The Part second highlights spatial distribution of agro service centers and their relationship with physical and economical factors. These physical and economical factors are correlated with the agro service centers in the Satara district such as altitude, soil types, agricultural workers, net sown area, and farm implements. The total scenario of distribution of agro service centers is the out of cumulative effect of all these factors. The environmental factors are also affecting on different categories. In this chapter also an attempt has been made to study the centrality of agro service centres in the Satara district.

4.2 CENTRALITY OF AGRO SERVICE CENTRES:

Centrality is a measure of importance of a place in terms of its functional capacity to serve the needs of people in the surrounding area. This is expressed qualitatively, such as low and high centrality, as well as quantitatively by centrality scores which are derived by converting the functional base of a place into scores on the basis of frequency and importance of functions, that are found in the place. The centrality, however, depends only upon the central functions. These functions have a certain range beyond the limits of the surrounding region. Christaller

(1933) considers central places as the places which provide central goods and services to its hinter-land. According to him, the centrality of a place is that component of its functional magnitude which is required for the population of its hinter-land.

In the early stages of human civilization the settlements were very small in shape and size. With the development in technology and increase in population the rural settlements became multifunctional. Later on each settlement got some functional importance in the region. But the physical setting of settlements differs as the geographical factors affect the growth rate of various settlements. The term 'Central place' is used in a relative sense. Every place has certain importance more or less in accordance with its possession of certain functions or services not merely for its internal population, but also for surrounding areas (Singh, 1977). A central place theoretically enjoys centrality in a given area or region with respect to a variety of functions or services for its contiguous surrounding areas. The permanent settlements have certain functions or activities, which provide the socio-economic needs of neighboring settlements.

A) Methods of Measuring Centrality:

Centrality of a place can be measured in several ways by taking into account a single function or all the functions available at the place. The single function index has been used by several authors. The number of telephones installed was used by Christaller (1933) in his original work. Bus service frequency of each central place has been used as a measure of centrality by Smaile (1944). The reliability of a single indicator to determine centrality has often been criticized. Single function index may give misleading results if the indicator selected does not represent the level of economic development of the region.

Berry and Garrison (1958) have considered all central functions for quantifying the centrality of a place. Retail trade is a very important function which has been given more attention to by several authors, while others have given more importance to professional and other services.

Davis (1967) has pointed out that if all the retail establishments are included for measuring centrality, the problem of equivalence is very important. In the absence of such a weightage a large jweller is likely to be equated with a small grocery shop. Hence, due weightage should be given to such establishment in respect of floor space and turnover. This problem can be resolved to some extent by classifying them as shops of convenience good.

Smailes (1944) used banks, shops, offices, schools, hospitals and cinemas as indicators of centrality. He distinguished five well defined classes of centres. Abiodun (1967) used multivariate analysis for the functional classification of Nigerian central places.

8) Choice of Method for Determining Centrality:

For the present study the centrality of agro service centres has been calculated by using location quotient of Davis (1967). At the same time Gedlund's (1956) method of centrality based on population engaged in trade and commerce has also been used for comparing the results.

Davis (1967) has used this method for South Wales. In this method a score for any single unit of function is calculated by following formula:

$$C = \frac{t}{T} \times 100$$

Where, "C" is centrality index
"t" is centrality value of agro service centre
"T" is the total centrality of all agro service centres in the region.

With the help of this method centrality scores for all the functions have been calculated. The sum of individual centrality scores of all functions at any urban place gives composite locational index.

The spatial distribution of centrality scores calculated by this method is given in Table 4.2 and shown in Fig. 4.1.

Table No. 4.1

A LIST OF CENTRAL FUNCTIONS AND SERVICES SELECTED FOR DETERMINING CENTRALITY

Sr. No.	Central Function / Services
1	Agricultural Credit Society
2	Fertilizers Distribution Facility
3	Pesticides Distribution Facility
4	Seeds Distribution Facility
5	Hired Implement Facility
6	Repairs Facility
7	Agricultural Implements
8	Extension Services
9	Veterinary Dispensaries
10	Banking Facility
11	Marketing Facility i) Weekly Markets ii) Sub-Market Yard iii) Market Yard

C) Regional Analysis:

The composite scores of centrality obtained by Davis (1967) method clearly indicates the high difference between the lower and

all the centrality scores have been put under square root and sizable values have been obtained and mapped according to their rank (Fig. 4.1).

Table No. 4.2

CENTRALITY INDEX OF AGRO SERVICE CENTRES IN SATARA DISTRICT

Sr. No.	Tehsil	No. of A.S.C.	L.Q.
1	Mahabaleshwar	82	1.27
2	Wai	158	0.88
3	Khandala	192	1.23
4	Phaltan	487	1.41
5	Man	284	0.65
6	Khatav	309	0.78
7	Koregaon	310	1.12
8	Satara	375	1.42
9	Jaoli	109	0.43
10	Patan	218	0.53
11	Karad	562	1.85
		District Avg.	**1.03**

Source: Compiled by Researcher

Table No. 4.3

CENTRALITY SCORES OF AGRO SERVICE CENTRES CALCULATED BY DAVIS METHOD

Sr. No.	Centrality Groups	Name of Tehsil with Centrality Score	Centrality
1	Above 1.5	Karad (1.85)	Very High
2	1 to 1.5	Satara (1.42), Phaltan (1.41), Mahabaleshwar (1.27), Khandala (1.23), Koregaon (1.12)	High
3	0.75 to 1	Wai (0.88), Khatav (0.78)	Moderate
4	Below 0.75	Man (0.65), Patan (0.53), Jaoli (0.43)	Low

Source: Compiled by Researcher

The highest centrality value is obtained for Karad tehsil (1.85) and its centrality is very high in the study region. Karad tehsil is followed by Satara tehsil (1.42), Phaltan tehsil (1.41), Mahabaleshwar tehsil (1.27), Khandala tehsil (1.23) and Koregaon (1.12) which has high centrality in the Satara district. Wai (0.88) and Khatav (0.78) tehsils has moderate centrality while Man (0.65), Patan (0.53) and Jaoli (0.43) tehsils has low centrality.

It is observed that the places having high centrality are located in the central part of the district in Krishna and Koyna river basin where highest area is found under agriculture. The moderate and low centrality is observed in the hilly tehsils as well as rain shadow region of the district. In hilly region due to undulating surface agricultural land is very limited and in rain shadow region has very minimum rainfall as well as seasonal rivers therefore irrigation facilities are limited which directly


SATARA DISTRICT
CENTRALITY OF AGRO SERVICE CENTRES
Khandala
Wai
Mahabaleshwar
Phaltan
Jaoli
Koregaon
Satara
Man
Khatav
Patan
Karad
INDEX
Very High
High
Moderate
Low
N
50 25 0 50
KM

Fig. No. 4.1

affected on the agricultural activities in the region which result least number of agro service centres in these both region of the Satara district.

The analysis reveals that Agro service centres located in urban areas have high centrality which provides more services to the peasants. On the contrary the agro service centres located in rural areas are more in number having low centrality. They provide only minimum facilities to the farmers.

4.3 HIERARCHY OF AGRO SERVICE CENTRES:

The hierarchical class system is a very important part of the spatial model of agro service centres and is useful in the regional planning. Berry and Garrison (1958) have given good explanation of the central hierarchy. They have pointed out that, there are, three types of class orders in the hierarchy of central place (Hamlet, village and town). These centres differ from one type to another than they differ within a type.

There are various methods of calculating hierarchy. Out of them two basic methods are important. In the first one, the calculated values of centrality are plotted against the population of agro service centres and any breaks visible in the distribution can define the hierarchy between the places.

The other one (Berry and Garrison, 1958) in which they have explained that the rural service centres belong to one or another class and each class has its specific central functions. They have used exponential relationship to determine population threshold for individual function.

Preston (1975) has tried to give new method to find out the hierarchy of central places. He has used the technique of moving average. The cumulative average of differences when plotted on a graph shows

more than one slopes. These different groups of agro service centres of different order.

A) Choice of Method for Determining Hierarchy:

For the present investigation Peter Davis's (1975) method has been used to determine the hierarchy of agro service centres.

Class limits on an interval, which vary in some regular ways, are the most difficult to calculate. The present method involves the use of successive terms in a geometrical progression as class boundaries. The method involves for steps:

1. Find the log value of the lowest value in the distribution and substract it from the log value of the highest in the distribution.
2. The result is divided by the required classes.
3. Starting with log value of the lowest value make a list by adding to it progressively result of step two till the log value of highest figure is reached. The number of items in this list should be one more than the number of classes used.
4. Find the anti log of each log value and use it in a class interval.

By adding constant value four class intervals are obtained. They are as follows:

Class I – Less than 2

Class II – 2.1 to 4

Class III – 4.1 to 6

Class IV – Above 6.1

Considering the above class interval all agro service centres have been classified into four classes of hierarchic order (Table 4.4).

Table 4.4

CLASS WISE DISTRIBUTION OF AGRO SERVICE CENTRES

Class	No. of agro service centres
IV	144
III	477
II	884
I	1580

Source: Compiled by Researcher

The class wise distribution of agro service centres in Satara district is shown in the table 4.4. In the study region 1580 agro service centres has lower class i.e. class – I and this centres are located in the rural areas. Class – II and class – III agro service centres are 884 and 477 respectively basically they are located in the fringe area of the urban centres. Out of total only 144 agro service centres has higher class. These are located in the urban areas of the district such as Satara, Karad and Phaltan etc.

TAHSIL WISE DISTRIBUTION OF AGRO SERVICE CENTRES IN HIERARCHICAL CLASS ORDER

Sr. No.	Tehsil	No. of A.S.C.	IV	III	II	I
1	Mahabaleshwar	82	2	12	25	43
2	Wai	158	7	23	47	81
3	Khandala	192	6	29	61	96
4	Phaltan	487	21	77	146	243
5	Man	284	11	34	97	142
6	Khatav	309	13	46	36	214
7	Koregaon	310	16	47	93	155
8	Satara	375	24	76	113	163
9	Jaoli	109	5	16	33	55
10	Patan	218	11	33	65	109
11	Karad	562	28	84	169	281

Source: Compiled by Researcher

A) Regional Analysis:

The regional analysis of hierarchical distribution of agro service centres reveals that higher order agro service centres are located in the central part of the district. It is evident that lower order agro service centres are found in all the tahsils of the study region with highest in number as compare to other classes this is due to the study region has high percentage of hilly region as well as rural region as compare to urban and fertile plain region. Lower order agro service centres of class I and class II have a higher frequency of distribution in the region.

The maximum highest order agro service centres are located in Karad, Satara and Phaltan tehsils with 28, 24 and 21 agro service centres respectively. Whereas, Jaoli, Patan, Mahabaleshwar and Wai all these

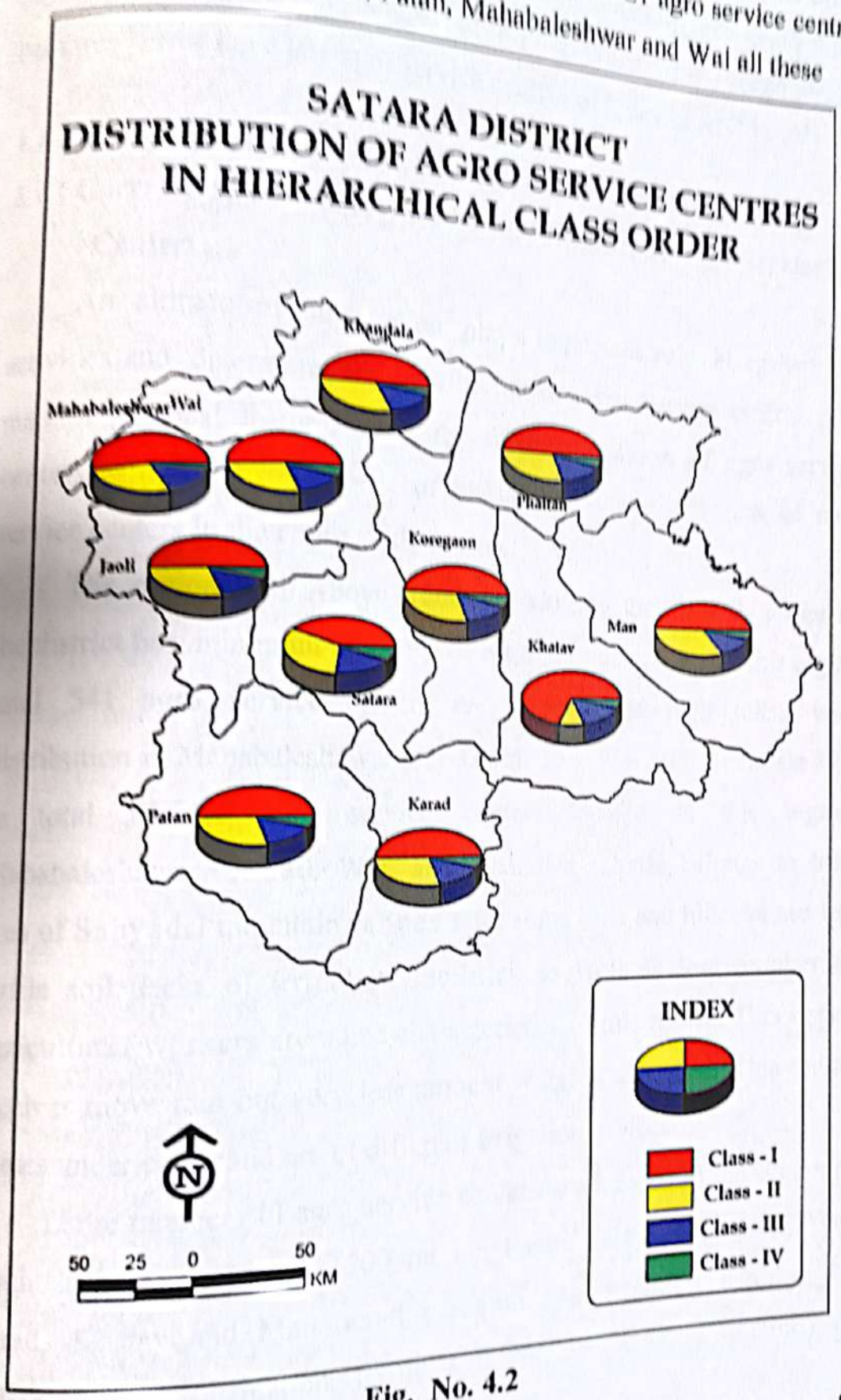

Fig. No. 4.2

[illegible]

4.4 AGRO SERVICE CENTERS RELATIONSHIP

4.4.1 Correlation between Altitude and Number of Agro Service Centers:

An altitude of any region plays important role in agricultural activities and determines the distribution of Agro Service centers. The map of physical features used for super imposition of agro service centers which shows impact of altitude on the distribution of agro service centers in the entire study region.

The region with Above 1200 mt altitude that is hilly region of the district has minimum numbers of agro service centers. In this region total 541 agro service centers are located and their tahsil wise distribution is Mahabaleshawar 83, Jawali 158, Wai 100, Khandala 192. In total 17.51% agro service centers located in this region. Mahabaleshawar, Jawali, Wai, and Khandala tahsils belongs to hilly area of Sahyadri mountain ranges with some hills and hillocks are less fertile soil, lacks of irrigation facilities as well as less number of agricultural workers are some characteristics of this region. This region receives move rain but very less amount water is absorbed. This region comes under command are of different irrigation project.

Large numbers of agro service centers are located in the region of height in between 500 to 1200 mt i.e. Patan, Satara, Koregaon, Wai, Karad, Khatav and Man. as this region has irrigation facilities by different sources irrigation, fertile soil, leveled land, availability of

distance and conducive climatic and physiographic conditions. Some part of this region is also in drought conditions even there large numbers of agro service centers i.e. 47.27% are located in this region.

Agro Service centres recorded in the areas of height below 300 i.e. part of Khandala, Phaltan, Karad and Phaltan tahsils. In this only Karad (18.21%) and Phaltan tahsils recorded (15.78%) highest Agro Service centre in the district as per the record and this due to plain topography, alluvial soil medium black soil of Krishna Koyana basin. Sugar factories are located in this area total 10 sugar factories are located in this area.

4.4.2 Correlation between soil types and number of Agro Service Centres

Soil types also affecting the distribution of Agro Service centres in the Satara district. In the study region four types of soils are found these are shallow black soil, medium deep black soil, deep black soil, shallow laterite soil, medium deep laterite soil and deep laterite soil. The impact of soil type is observed indirectly in the distribution of Agro Service centres, which showing correlation between soil type and Agro Service centres. It is observed that the western part of satara district comprised by shallow, medium and deep laterite soil mostly in Jawli, Patan and Mahabalershwar tahsils. Some part of Satara tahsil also the belong to laterite soil along with western margin of Khatav taluka, central part of Man and major part of Phaltan tahsil also has laterite soil even though Phaltan recorded second ranking Agro Service centres.

Deep, medium and shallow black soil are distributed in north marginal part of Satara district along with Krishna river basin, south eastern part of Khatav and Man tahsils, Karad, Satara, Koregaon, Wai tahsils has large number of agro servicer centres. In the areas of laterite

soil less number of Agro Service centres i.e. in Jawali, Mahabaleshwar tahsils of the district.

4.4.3 Correlation between agricultural workers and number of Agro Service centres:

Agricultural workers affecting the distribution of Agro Service centres in the study area. In the satara district highest number of agricultural workers found in Karad tahsil, followed by Phaltan tahsil which rank second in Satara district.

On the other hand, minimum number of Agro Service centres is found in Jawali and Mahabaleshwar tahsils. Along with this Khandala, Wai, Man, Satara and Patan has moderate number of Agricultural workers.

In Karad and Phaltan tahsils has highest number of agricultural labours because of developed agricultural due to high irrigation facilities, fertile soil, transport and communication facilities.

Table No.4.6

SATARA DISTRICT - NUMBER OF AGRICULTURAL WORKERS

Sr. No.	Tahsils	No. of ASC'S	No. of Agricultural Worker			
			Main	Marginal	Total	Percent
1	M.Shwar	82	792	1170	1962	0.69
2	Wai	158	12744	6089	18833	6.70
3	Khandala	192	6457	4342	10799	3.84
4	Phaltan	487	31964	9921	41885	14.90
5	Man	284	15377	6340	21717	7.72
6	Khatav	309	19469	10842	30311	10.78
7	Koregaon	310	21632	9681	31312	11.14
8	Satara	375	16111	9907	26018	9.25
9	Jawali	109	4074	4835	8909	3.17
10	Patan	218	12923	14034	26957	9.59
11	Karad	562	43686	18623	62309	22.17
	Total	3086	185229	95784	281013	99.95

Source: Socio-economic Abstract of Satara District 2015

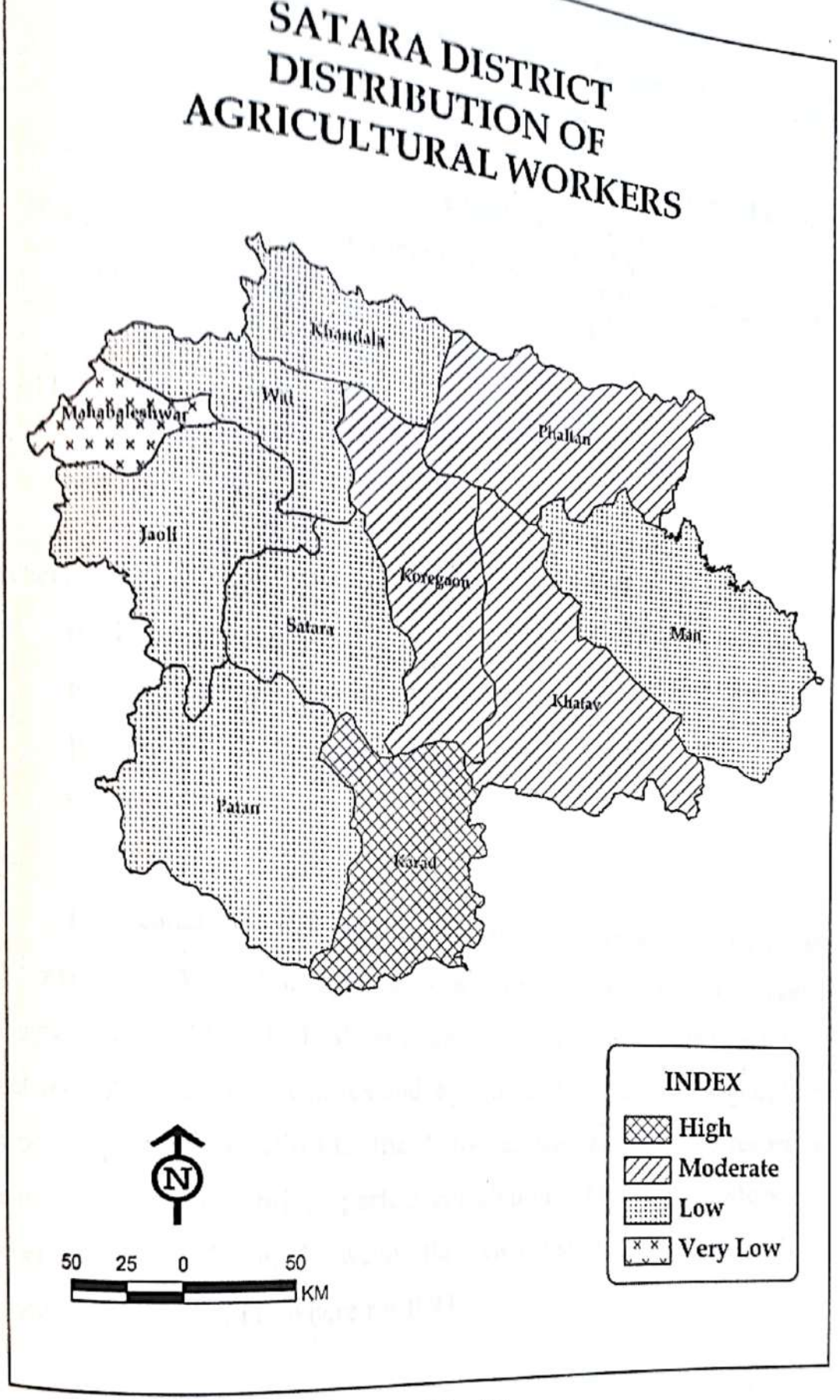
SATARA DISTRICT
DISTRIBUTION OF
AGRICULTURAL WORKERS
Khandala
Wai
Mahabaleshwar
Phaltan
Jaoli
Koregaon
Satara
Man
Khatav
Patan
Karad
INDEX
High
Moderate
Low
Very Low
N
50 25 0 50
KM

Fig. No. 4.3

Karl Pearson's rank correlation coefficient method is used to calculate correlation between different variables which is based on the ranks of given values rather than the actual values.

Here this method is used to study the correlation between agricultural workers and Agro Service centres.

Karl Pearson's Rank correlation coefficient (rs) is calculated by using following formula

$$\text{Karl Pearson's Rank correlation coefficient (rs)} = 1 - \frac{6 \sum (R1-R2)^2}{n^3 - n}$$

Where,

rs - Rank correlation coefficient

R1 – Ranks given to first variables

R2 - Ranks given to second variables

N – Number of Observations

The scatter diagram shown No. of Agro Service centres on the Y' axis and Agricultural workers are on the X' axis. The scatter diagram apparently had shown the very strong correlationship in between Agro Service centres and agricultural labours. The agricultural workers perfectly confirm to the Agro Service centres in the respective circles. This fact brings perfect correlation between two factors. The coefficient correlation between this two variables indicated strong positive correlation i.e. where r = 0.93.

4.4.4 Correlation between net sown area and Agro Service Centres:

The distribution of Agro Service Centres is affected by the net shown areas. In the Satara district Phaltan, Khatav, Koregaon, Satara and Karad have highest net sown area consequently large number of Agro Service centres. In the Khandala, Man, Jawali, Koregaon tahsils has more net sown area but in this region agro service centre's are comparatively less due to irrigation facilities are short.

Here Karl Pearson's Rank correlation coefficient (rs) method is used to study the correlation between net sown area and Agro Service centres.

Table No. 4.7

SATARA DISTRICT - NET SOWN AREA (in hectors)

Sr. No.	Tahsil	No. of ASC'S	Net Sown Area (Hectors)	Percentage
1	M.Shwar	82	6468	0.92
2	Wai	158	50112	7.20
3	Khandala	192	40903	5.87
4	Phaltan	487	64419	9.25
5	Man	284	55851	8.02
6	Khatav	309	83428	11.99
7	Koregaon	310	68817	9.89
8	Satara	375	92158	13.24
9	Jawali	109	45355	6.51
10	Patan	218	92950	13.35
11	Karad	562	95278	13.69
	Total	3086	695739	99.93

Source: Socio-economic Abstract of Satara District 2015

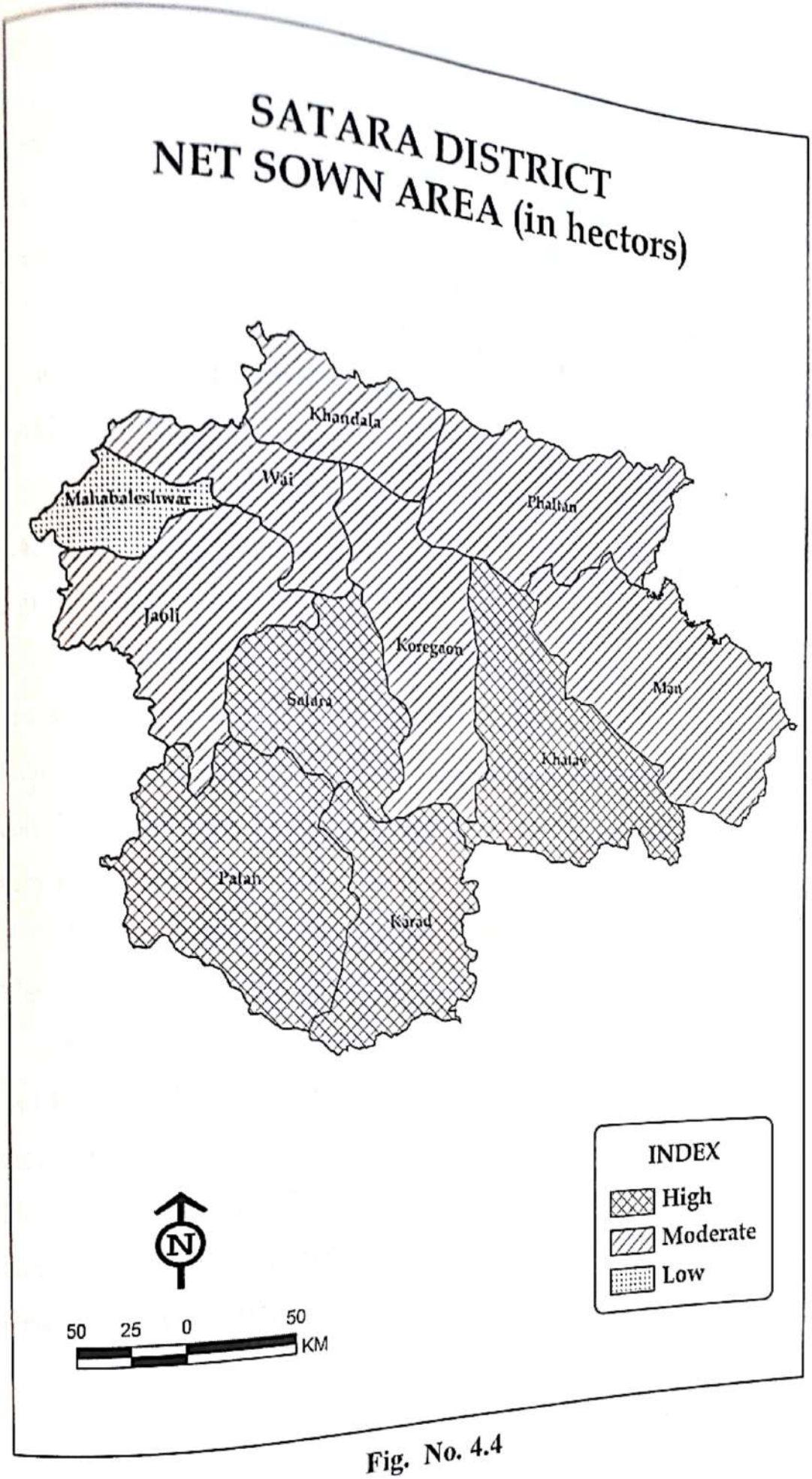
SATARA DISTRICT
NET SOWN AREA (in hectors)
Khandala
Wai
Mahabaleshwar
Phaltan
Jaoli
Koregaon
Satara
Man
Khatav
Patan
Karad
INDEX
High
Moderate
Low
N
50 25 0 50
KM

Fig. No. 4.4

The net sown area and Agro Service centres plotted on the graph. Number of Agro Service centres are on the X axis and Net sown area in hectors are on x axis. The scatter diagram exhibits moderate positive correlationship between two variables. The Net sown area is perfectly confirming to the Agro Service centres. There is a very slight difference in Net sown area and agro service centre. This presentation shows moderate positive correlation between net sown area and Agro Service centres is 0.55.

4.4.5 Correlation between agricultural implements and number of Agro Service centres.

Agricultural implements are the major tool in the agricultural operation of the study region. Agro Service centre's provides the facilities of repairs and maintenance of agro farm implements. The correlation between agricultural implements and Agro Service centre is very significant.

In the Satara district Karad, Patan, Satara, Khatav, Koregaon, Man and Phaltan tahsils have higher number of agricultural implements.

One identical feature noticed in the study region that Wai, Phaltan and Khatav tahsils have more number of agricultural implements even though they have comparatively less number of agro services centres. Phaltan has more number of Agro Service centres and less number of farm implements due to rural area more and more agricultural operation done by the human powers.

Table No. 4.8

SATARA DISTRICT: AGRICULTURAL IMPLEMENTS

Sr. No.	Tahsil	No. of ASC'S	Total No. of agricultural implements	Percentage
1	M.Shwar	82	1186	0.91
2	Wai	158	11288	8.75
3	Khandala	192	3253	2.52
4	Phaltan	487	11491	8.90
5	Man	284	12286	9.52
6	Khatav	309	16620	12.88
7	Koregaon	310	11656	9.03
8	Satara	375	15646	12.13
9	Jawali	109	7157	5.54
10	Patan	218	17314	13.42
11	Karad	562	21095	16.35
	Total	3086	128992	99.95

Source: Socio-economic Abstract of Satara District 2015

The quantity of the agricultural implements and Agro Service centres plotted on graph. The Agro Service centre's are shown on the 'Y' axis and farm implements are on the 'X' axis. The scatter diagram exhibit strong positive relationship in between this two variables.

The ranks of Agro Service centres and agricultural implements are remarkable. The high difference in two variables shown by Phaltan i.e. more Agro Service centres and fewer farms implement exactly opposite of this is Patan and Khatav tahsils less number of Agro Service centres and more farm implements.

There is high degree of positive correlation between two variables i.e. 0.72.

SATARA DISTRICT
AGRICULTURAL IMPLEMENTS

INDEX
- High
- Moderate
- Low

N

50 25 0 50 KM

Map No. 4.5

REFERENCES:

1. Ambrose, P. (1969): "Analytical Human Geography, Longman, London.
2. Brush, J.E. (1953): "Hierarchy of Central Places in South Western Wisconsin".
3. Clark, P. and Evans, F. (1954): "Distance to nearest neighbour as a measure of spatial relationship in population". Ecology, 35, pp. 445-453.
4. Dacey, M.F. (1962): "Analysis of central place and Point Pattern by a nearest neighbour method". Land Studies in Geography, Series B-24, pp. 55-75.
5. Dixit, R.S. (1988): "Spatial Organization of Market Centres", Pointer Publishers, Jaipur.
6. Deshmukh, P.W. (1985): "The Location of service Activities, A study of Central Places in Upper Krishna valley". Ajab Pustakalaya, Kolhapur.
7. Gettis, A. (1964): "The temporal landuse pattern", Analysis with the use of nearest neighbour and quadract method", Ann. Assoc. Am. Geogr. 54.
8. Hamound, R. and Mcullagh, P.S. (1974): "Quantitative Techniques in Geography". Oxford, pp. 238-239.
9. King, L.J. (1962) : "A Quantitative Expression of the pattern of Areas in Selected Areas of the United States", Tijdschr. Econ. Soc. Geogr. 53.
10. Reddy, N.B.K. (1970): "Distributional Aspects of Urbanism in Krishna and Godawari Deltas". The Deccan Geographer, vol. 8, No. 1 and 2, pp. 101-117.
11. Shinde, S.D. (1980): "Agriculture in an underdeveloped region: A Geographical Survey, Himalaya Publishing House, Bombay, p. 115.

CHAPTER - V

LEVEL OF AGRICULTURAL DEVELOPMENT

CHAPTER - V
LEVEL OF AGRICULTURAL DEVELOPMENT

CHAPTER - V
LEVEL OF AGRICULTURAL DEVELOPMENT

5.1 INTRODUCTION:

In the Satara district spatial variation in the adoption of improved agricultural practices to ascertain level of agricultural development, the spatial variation is determined with the help of six variables viz. Net soon area, irrigated area, agricultural implements, Agricultural workers Numbered Satara districts central co-operative banks and crop productivity of yield index of Rice, wheat, Jowar, sugarcane, Groundnut and gram crops. Besides this the development of tehsils are taken with their respective categories viz. high, medium and low on the basis of scores of standard deviation. These analysis have been carried out by transfer and combining the data relate to 11 variables using Z-score to get composite scores, on the basis of composite score the tehsils have been classified into high, moderate and low development categories. As a result of the analysis shows that the modern technological inputs through agro service centres have reciprocal relationship with agricultural development in the study area.

The growth rates of total food of grain production were less in the last two decades making traditional farming a non viable agricultural activity. Disparities in productivity across the district and even within crops persist with significant increase in small and marginal land holdings. Agricultural development denotes the equality of agricultural system of the region. It is multidimensional concept which mainly includes development in real strength of cropped area? Farming system and irrigated area, high yielding improved verities of seeds, chemical

fertilizers, insecticides and pesticides and specialization and commercialization of agriculture (Mohammed-1986).

The changing scenario of agro-economy drew attention of researcher on diffusion of technological development in agriculture. Major Indian population depends on agricultural produce, so vast rural mass tries to earn their lively hood from agriculture. Fast increasing pressured of growing population on agriculture, tradition methods of techniques of production cannot crop with growing demand. As a result new techniques and commercial crops are adopted to develop agro-economy.

Data base and Methodology:

The assessment of agriculture development is based on the secondary data for the period 2010-11, collected from District statistical handbook, Socio-Economic abstract of district profile of Satara districts. The crops of the districts are Rice, wheat, Jowar, Sugarcane, Groundnut, and gram.

To determining the level of agricultural development various indicators variable have been used such as Net sown area, Irrigated area, Agricultural Implement, Agricultural Workers, Number of SDCC Banks and Crop Productivity Yield index of the different crops.

For calculation overall levels of agricultural development and it's even, distribution the data of all variables indicators have been transformed into Z score techniques. The formula is

$$\text{Z-Score (Zi)} = \frac{Xi - X}{S.D.}$$

Where,

Zi - Z-Score For i' th observation

Xi - Original Value of i' th observation

X - Mean value of X' variables

S.D. - Standard Deviation of X' variable

In order to classify tehsils according to their levels of development, the composite Z-score have been grouped into high, medium and low. The result of the standard score obtained for different indicators were aggregated by composite standard score (CSS). So that regional disparities in the level of development of the study regions may be obtained on a common sale. The composite Z-score may be algebraically expressed as

$$CSS = \frac{\sum Zij}{N}$$

Whereas,

CSS - Composite Standard Score

Zij - Scored of an Indicator J in the Districts.

N - Number of indicators.

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

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 Implement

X4-Number of Agricultural Workers,

X5-Number of SDCC Banks

X6-Crop Productivity Yield index of the different crops.

X6a - Rice,

X6b - wheat,

X6c - Jowar,

X6d - Sugarcane,

X6e - Groundnut,

X6f - Gram.

Agricultural development is a multi dimensional activity and key to which is crop productivity as one of the vital aspect of rural development. The objective of agricultural development is usually increased growth of agricultural output to provide the livelihood to growing population.

Table No.5.1

LEVELS OF AGRICULTURAL DEVELOPMENT IN SATARA DISTRICT

Sr. No.	Tehsil	X1	X2	X3	X4	X5	X6						Composite Index
							X6a	X6b	X6c	X6d	X6e	X6f	
1	Mahabaleshwar	-2.18	-2.50	-2.18	-1.48	-0.13	-1.8	-1.5	-0.03	-0.1	-	-	**- 1.07**
2	Wai	-0.50	-0.12	-0.09	-0.4	-0.05	0.41	0.4	0.04	-0.1	-0.35	0.11	**- 0.45**
3	Khandala	0.00	-0.72	-1.75	-0.92	-0.03	-0.6	0.93	-0.03	0.0	0.14	-0.69	**-0.51**
4	Phaltan	0.04	1.46	-0.05	1.02	0.05	-	3.1	-0.01	0.0	2.67	1.20	***0.86***
5	Man	-0.28	0.04	0.11	-0.24	-0.03	-	0.1	-0.04	-	-0.70	0.44	***-0.05***
6	Khatav	0.77	0.19	1.01	0.2	0.01	-	-0.4	0.00	0.0	0.41	-2.05	***0.01***
7	Koregaon	0.21	0.06	-0.01	0.3	0.00	1.30	0.0	0.02	-0.1	0.01	0.51	***0.39***
8	Satara	1.10	0.16	0.81	0.02	0.11	-0.7	-0.8	0.00	0.1	-0.10	0.26	***0.06***
9	Jaoli	-0.68	-0.37	-0.94	-1.04	-0.08	0.64	-1.5	0.01	0.1	-	-0.64	***-0.40***
10	Patan	1.18	0.56	1.15	0.08	0.00	0.08	-0.6	-0.01	-0.1	-	-	***0.23***
11	Karad	1.24	1.23	1.94	2.3	0.18	0.83	2.11	0.04	0.0	-0.00	1.37	**1.02**

Source: Compiled by Researcher

5.2 NET SOWN AREA TO TOTAL CROPPED AREA:

The net sown area can be defined as the total area sown in a year. High net sown area higher will be the crop production which can be reflected in agricultural development. The top position occupied by the Karad tahsil (1.24) followed by Patan (1.18) and Satara (1.10) tahsils in the high developed category.

The medium group ranges from (1.00 to 0.00) in which Khatav (0.77), Koregaon (0.21), Phaltan (0.04) and Khandala tahsils are comes they has moderate level of development.

There are only four tahsils comes under low level of development such as Wai (-50), Man (-0.28) and Jawali (-0.68) and Mahabaleshwar (-2.18) tahsils of the study region.

5.3 IRRIGATED AREA TO TOTAL CROPPED AREA:

Irrigation is very vital for any kind of agricultural development and requirement for the success of modern technology in agriculture. The need of artificial and additional water supply is always felt in successful farming operation. Irrigation plays significant role in the entire agriculture sector. The changing trends in intensity of irrigation portrays main's 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 percent of the total sown area and further calculated Z-score of total irrigated (above 0.70).

The high level of irrigation has been observed in Phaltan (1.46) and Karad (1.23) and whereas medium level of irrigation has been observed in Man (0.04), Khatav (0.19), Koregaon (0.06) Satara (0.16) Wai (0.12), Khandala (0.72) and Patan (0.56). There is only two tahsil indicates low level of irrigation i.e. Mahabalewhwar (-2.18) and Jawali (-0.37).

SATARA DISTRICT
AGRICULTURAL DEVELOPMENT
Net Sown Area

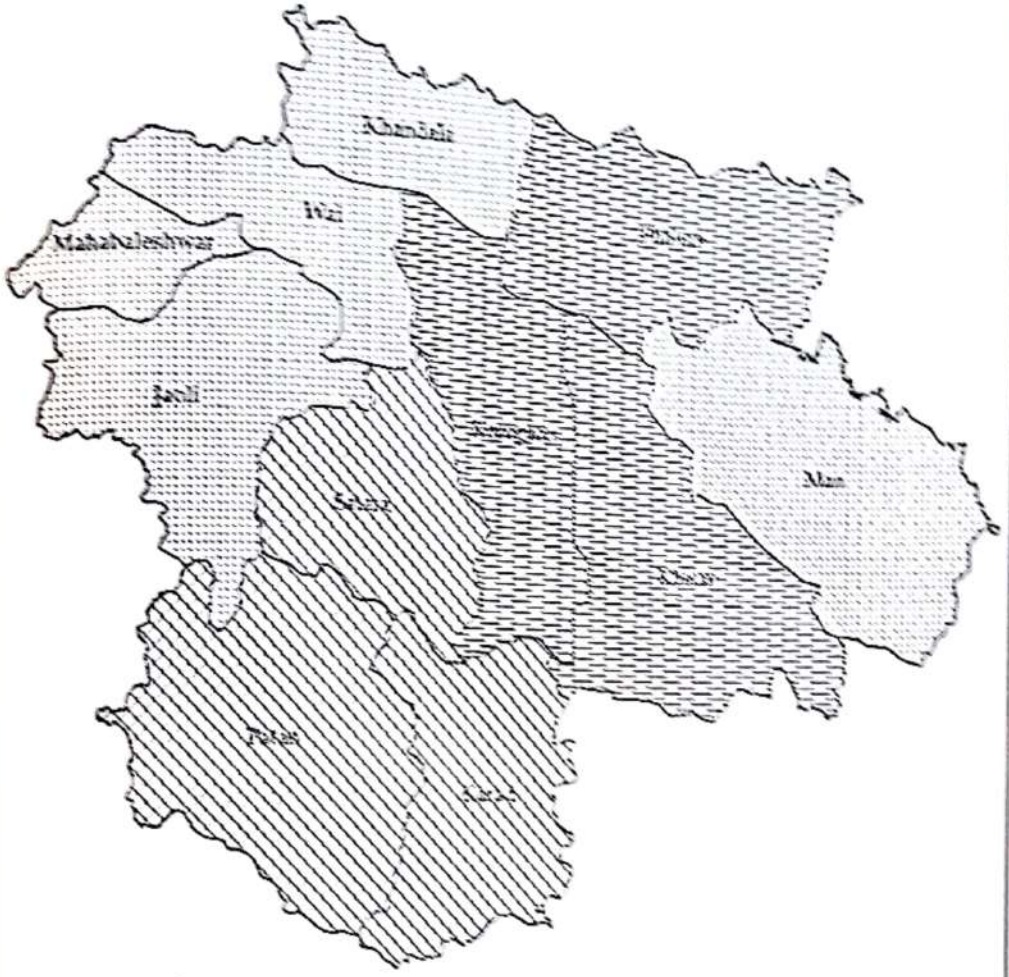

Fig. No. 5.1

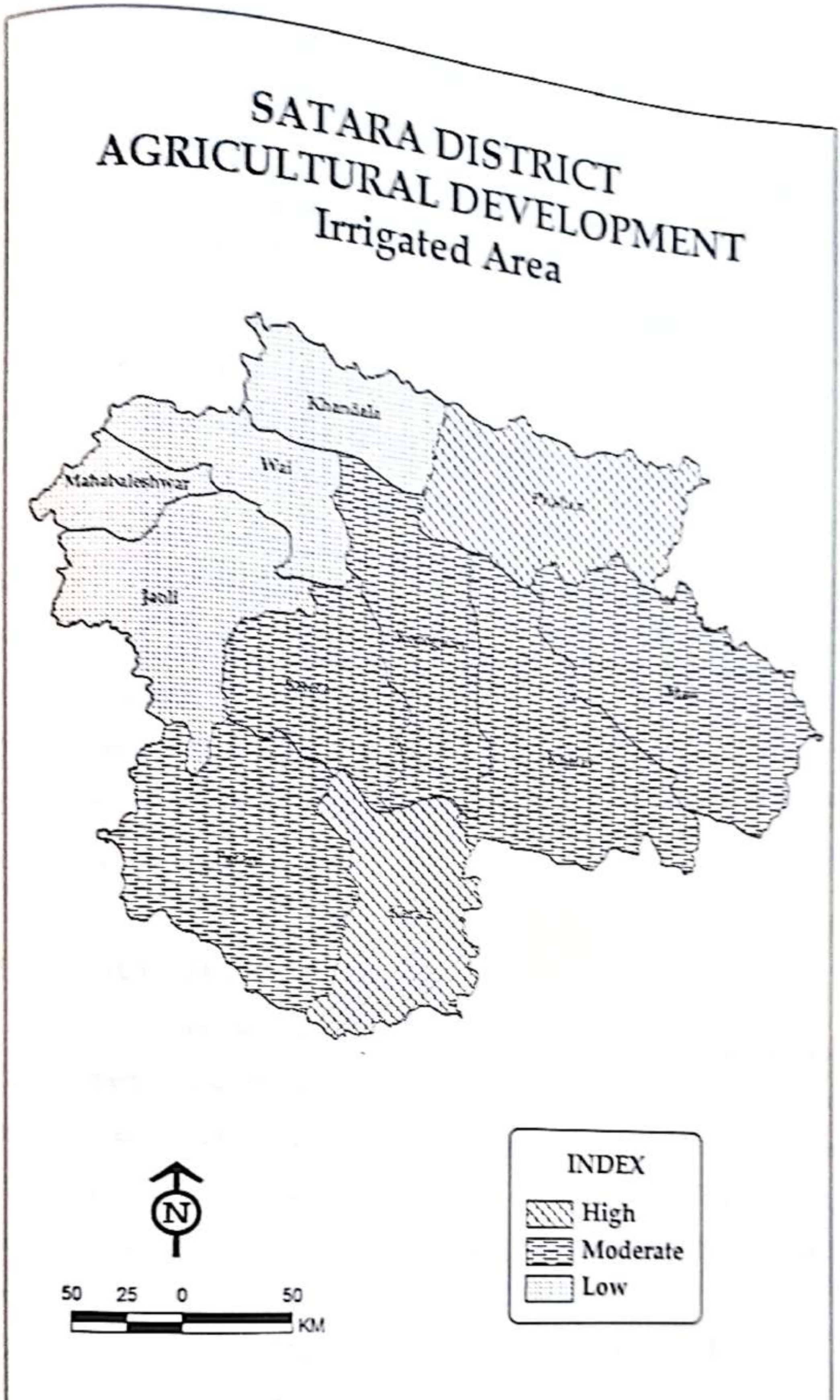
SATARA DISTRICT
AGRICULTURAL DEVELOPMENT
Irrigated Area
Khandala
Wai
Mahabaleshwar
Jaoli
INDEX
High
Moderate
Low
N
50 25 0 50
KM

Fig. No. 5.2

5.4 AGRICULTURAL IMPLEMENT:

Advanced agricultural technology is not only the package of Hybrid seeds and other modern inputs, but it also incorporates new agricultural practices. This has made the mechanical power necessary for some operations which are very necessary during scarcity of labours relatively high wages labours particularly during peak season. Agricultural implements development or in other works these are the key to the modern agricultural development.

High level of development in the agricultural implements has been recorded in Karad (1.94), Patan (1.15) and Khatav (1.01) which ranges above (1.00) whereas the medium level of agricultural implements observed in Satara (0.81) and Man (0.11) tahsils.

Mahabaleshwar (-2.18), Khandala (-1.75), Jaoli (-0.94), Wai (-0.09), Phaltan (-0.05) and Koregaon (-0.01) tahsils belongs to low development due to highest percentage of barren land, rugged topography and lack of irrigation facilities.

5.5 AGRICULTURAL WORKERS:

Agricultural workers are also important factors for agricultural development like chemical fertilizers, HYV seeds, machineries etc. There are many activities in the field which they perform. The highest number of agricultural labour has been found in Karad (2.3) and Phaltan (1.02) tahsils. In the moderate development category four tahsils belongs such as Khatav (0.2), Koregaon (0.3) Satara (0.02) and Patan (0.08) tahsils.

The tahsils like Mahabaleshwar (-1.48), Jaoli (-1.04), Khandala (-0.92), Man (-0.24) and Wai (-0.4) tahsils has less agricultural workers and this category showing lowest level of development in agricultural labours/workers.

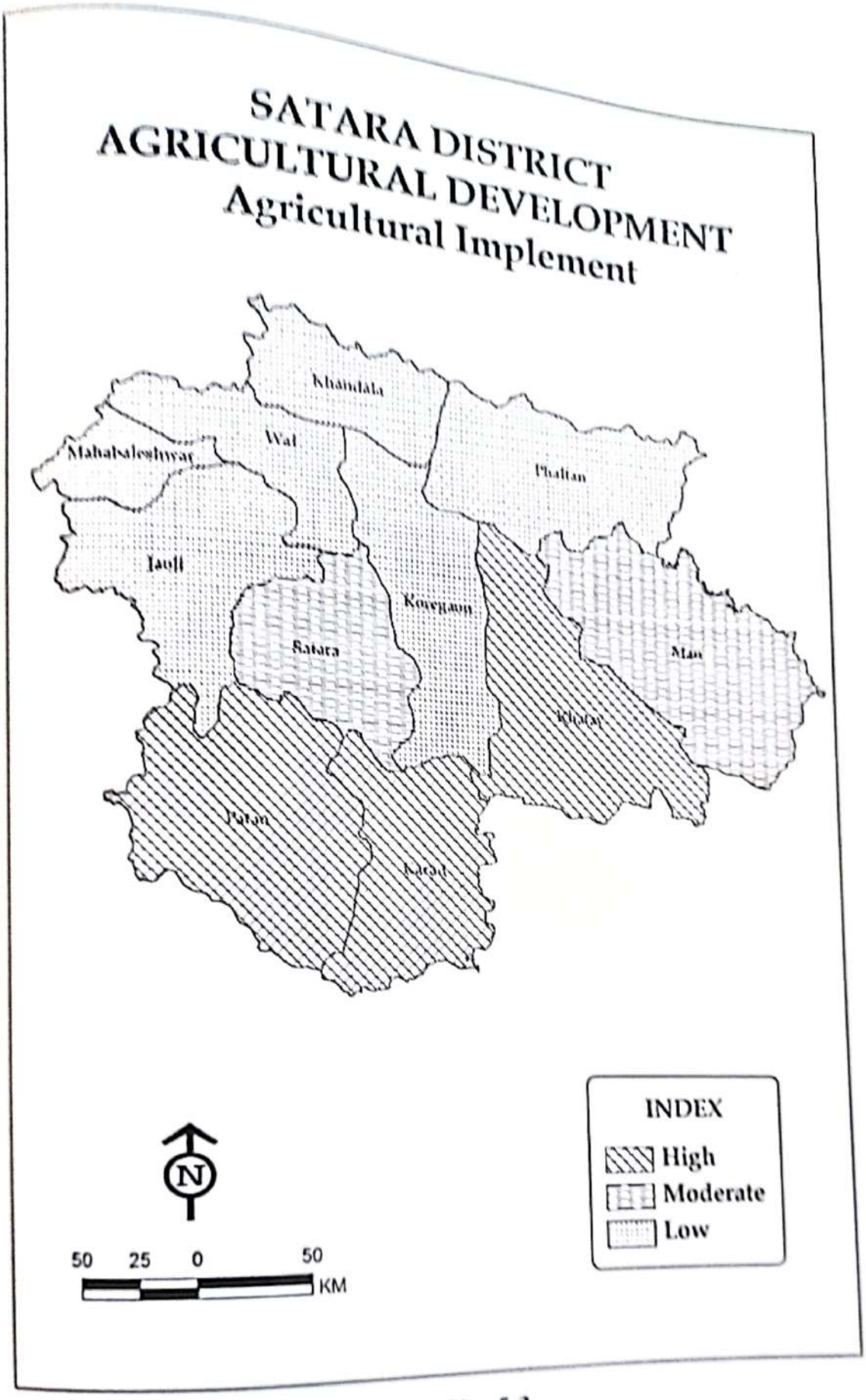
SATARA DISTRICT
AGRICULTURAL DEVELOPMENT
Agricultural Implement
Khandala
Wai
Mahabaleshwar
Phaltan
Jaoli
Koregaon
Satara
Man
Khatav
Patan
Karad
INDEX
High
Moderate
Low
N
50 25 0 50
KM

Fig. No. 5.3

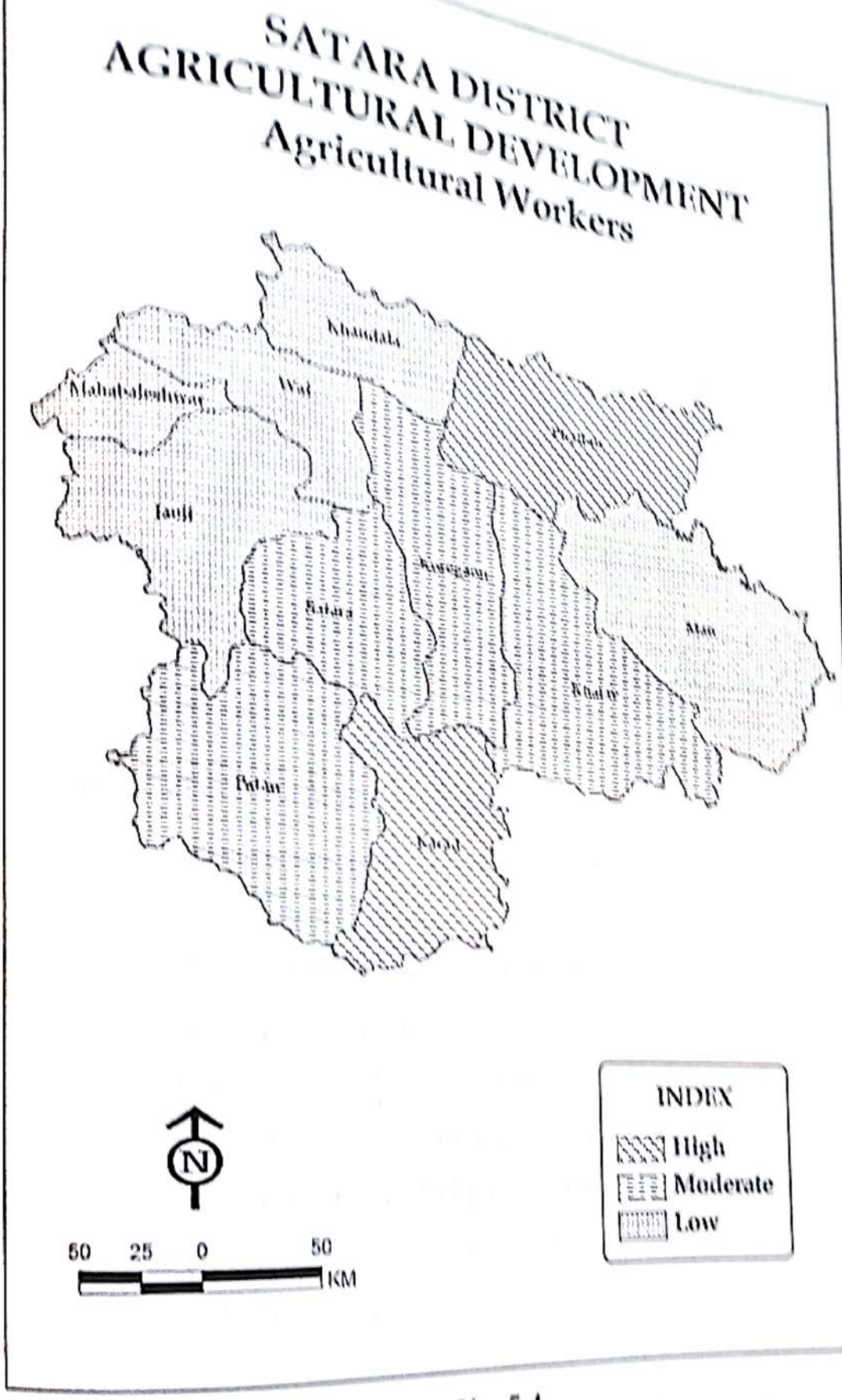
SATARA DISTRICT
AGRICULTURAL DEVELOPMENT
Agricultural Workers
Khandala
Wai
Mahabaleshwar
Patan
Karad
Koregaon
Satara
Man
Khatav
INDEX
High
Moderate
Low
N
50 25 0 50
KM

Fig. No. 5.4

5.6 DISTRICT CENTRAL CO-OPERATIVE BANK:

S.D.C.C. Bank plays 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 to the cultivators by the co-operative of government. These Banks provide loan and subsidies to the farmers in terms of cash or machines and tools like tractors and pump sets. With the help of these facilities farmers accelerated the productivity of different crops.

Branches of S.D.C.C. Bank not equally distributed in the study regions. The high Z-score of S.D.C.C. Banks has been recorded in Karad (0.18), Satara (0.11), Phaltan (0.05) and Khatav (0.01) tahsils whereas low level recorded in Mahabaleshwar (-0.13), Jaoli (-0.08), Wai (-0.05), Khandala (-0.03) and Man (-0.03) tahsils because physiographic condition are not suitable for the development of large cities so in this tahsils population is minimum as compare to other tahsils therefore banks are very limited in these region.

5.7 CROP PRODUCTIVITY YIELD INDEX:

Agricultural productivity determines the level of agricultural development in any region. It refers to per acre or hectors of yield in a unit (Kgm/quintals) of any crops of field. A farmer adopts each kind of technique to increase the productivity of crop because it leads to over all developments (social as well as economic) of the farmer. The agricultural productivity yield index and Z-score is calculated for selected crops.

1. Rice:

Rice is not cultivated in the Phaltan, Man and Khatav tahsils as the physiographic and climatic conditions in this tahsils are not suitable for

rice crop. The top places in the productivity of rice are secured by Koregaon tahsil (1.30) there this tahsil belongs to high development.

In the study region Karad (0.83), Jaoli (0.64), Wai (0.41) and Patan (0.08) tahsils are belongs to moderate level of development. Tahsils like Mahabaleshwar (-1.8), Satara (-0.7) and Khandala (-0.6) are belongs to low level of development in terms of rice cultivation.

2. Wheat:

Wheat is produced on large scale in Phaltan (3.1) and Karad (2.11) tahsils so these two are comes under the high level of development. In the study region tahsils such as Khandala (0.93), Wai (0.4) and Man (0.1) are belongs to the moderate level of development in terms of wheat production where as lowest level of development is observed in Mahabaleshwar (-1.5), Jaoli (-1.5), Satara (-0.8), Patan (-0.6) and Khatav (-0.4) tahsils.

3. Jowar:

Jowar is major crop cultivated in the district which produced everywhere in the study region. The tahsils under high category above (0.00) are Wai (0.04), Koregaon (0.02), Jawali (0.01) and Karad (0.04) and the tahsils like Man (-0.04), Mahabaleshwar (-0.03), Khandala (-0.03), Phaltan (-0.01) and Patan (-0.01) comes under low development in Jowar production in the Satara district.

4. Sugarcane:

Sugarcane is most significant crop cultivated in the study area where irrigation facilities are available. Karad is the prime tahsil in the production of sugarcane due to fertile soil, river basin availability irrigation facilities like lift irritation. High level of has been observed in

Khandala, Phaltan, Khatav, Karad and Satara whereas others tahsil are located under the category of low level, i.e. the Wai, Koregaon and Patan in the study region.

5. Groundnut:

Mahabaleshwar, Jawali and Patan tahsils are not producing groundnut. High level (above 0.00) has been observed in the Phaltan (2.67). The moderate level of groundnut production is observed in the Khandala (0.14), Khatav (0.41) and Koregaon (0.01) tahsils whereas low level ranging from (1.00 to 0.00) observed in Man (-0.70), Wai (-0.35), Satara (-0.10) and Karad (-0.00) tahsils of the study region.

6. Gram:

Phaltan (1.20) and Karad (1.37) tahsils are comes under the high level category of gram production. The moderate level of gram production is observed in Koregaon (0.51), Man (0.44), Satara (0.26) and Wai (0.11) tahsils where as tahsils like Khatav (-2.05), Khandala (-0.69) and Jaoli (-0.64) falls under low level of productivity of gram.

5.8 LEVELS OF AGRICULTURAL DEVELOPMENT:

To assess the level of agricultural development in Satara district all the eleven variables have been aggregated. The z-score value of all variable transformed and combined with help of Z-score and composite score was prepared (table-composite value).

The composite score ranges from highest (1.02) value belongs to Karad to (-1.07) Mahabaleshwar lowest value in Satara district. Karad is the most developed tahsil in Satara district and Mahabaleshwar is less develops tahsil in terms of agriculture. On the basis of composited Z-score the tahsils have been categorized into two classes viz. high and low

which clearly shows the spatial variation in level of agricultural development in Satara district on an average six tahsils such as Karad (1.03), Phaltan (0.86), Koregaon (0.39), Patan (0.24), Satara (0.06) and Khatav (0.001) which ranges their composite Z-score above (0.00) are highly developed tahsils while remaining 5 tahsils are comes under low categories of development Mahabaleshwar (- 1.07), Khandala (-0.51), Wai (- 0.43), Jaoli (-0.10) and Man (-0.05).

5.9 THE SPATIAL PATTERN AND LEVEL OF AGRICULTURAL DEVELOPMENT:

The spatial distribution of variables and agricultural development is not uniform in Satara district. It provides very significant information about level of agricultural development. The study highlights that the majority of district come under high development of agriculture and it located at middle and southern part of study region.

Table No.5.2

SPATIAL PATTERN OF LEVELS OF AGRICULTURAL DEVELOPMENT IN SATARA DISTRICT

Sr. No.	Z-Score	Level of Development	No. of Tehsils	Tehsils
1	Above 0.00	High	06	Satara, Patan, Karad, Phaltan, Koregaon, Khatav
2	Below 0.00	Low	05	Mahabaleshwar, Wai, Khandala, Jawali, Man

In the study region Satara, Patan, Karad, Phaltan, Koregaon and Khatav tahsils are highly developed in agriculture because of fertile black soil and well develop irrigation facilities.

Agriculture is not developed in Wai, Khandala, Patan, Jawali and Mahabaleshwar due to undulating topography and less develop irrigation facilities. For the agricultural development in this tahsil there is need of irrigation facilities as well as use of modern technologies. The study highlights the impact of location and Agro Service Centres on agricultural development planning for the study region.

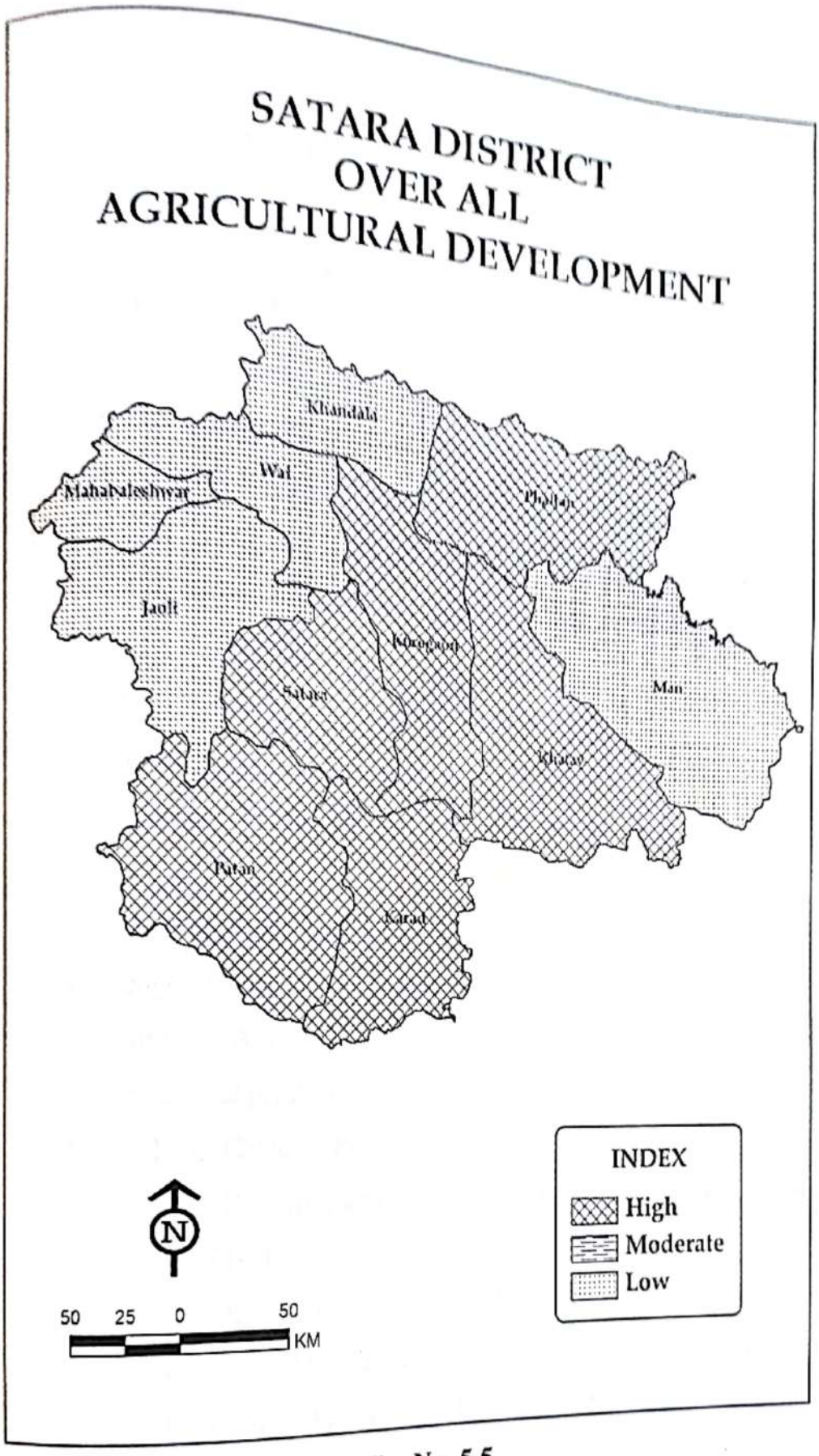
SATARA DISTRICT
OVER ALL
AGRICULTURAL DEVELOPMENT
Khandala
Wai
Mahabaleshwar
Phaltan
Jaoli
Koregaon
Satara
Man
Khatav
Patan
Karad
INDEX
High
Moderate
Low
N
50 25 0 50
KM

Fig. No. 5.5

REFERENCES:

1. Agalave, P. (2000), "Research Methodology and Techniques", First eidition, Vidya Publishing, Nagpur.
2. Aslam Mohmood, "Statistical Methods in Geography."
3. Cole ,J. P. and King, A. M, (1968) , " Quatitative Geography", John Hilley and Sons, London.
4. Deshmukh Ram, (2005), 'Fundamental Statistics' Vidya Prakashan, Nagpur.
5. District Census Hand book of Satara District – 2011.
6. Gomatee Singh, Syed Was Ashraf, (2012), 'Spatial Variation in Level of Agricultural Development In Bulandshahr District Of Western U.P'. (India)
7. Gupta, C .B. (1978), "An introduction to Statistical Methods", Vikas Publication house, New Delhi.
8. International Journal Of Development And Sustainability Vol. I June- 2012, Page 47-56.
9. Karlekar Shrikant, and Kale Mohan. (2006), "Statistical Analysis of Geographical Data", Diamond Publication. Pune.
10. Mohammed, A. (1980), 'Regional imbalances in levels and growth of agricultural productivity'. A case study of Assam.
11. Negi, B.S, (2006) "Practical Geography" National Council of Educational Research and Council Statistics for Economics, First Edition PP.74-91.
12. Savanur S. K. (2008), 'Research Methodology for Information Sciences'Universal Prakashan, Pune.
13. Singh, J. (1974), 'Agricultural Geography of Harayana', Vishal publication, Kurushetra, Harayana
14. Socio economic review and District Statistical abstract of Satara District 2014-15.

CHAPTER - VI

SUMMARY, CONCLUSION AND SUGGESTIONS

CHAPTER - VI

SUMMARY, CONCLUSION AND SUGGESTIONS

6.1 SUMMARY AND CONCLUSION

6.2 SUGGESTIONS

CHAPTER - VI
SUMMARY, CONCLUSION AND SUGGESTIONS

6.1 SUMMARY AND CONCLUSION

The present investigation has presented Agro Service Centre and Agricultural Development in Satara District. The main objective of this chapter is to present summary and conclusion of research carried out as well as suggests some suggestions for the development of agriculture in the Satara district.

Satara district is one of the districts located in the western Maharashtra which has significant physical as well as economic location in the Maharashtra state. The Satara district is a part of Deccan ballistic plateau with an average height of 600 above mean sea level. Sahyadri and Mahadeo are two main systems of hill ranges are laying in the district. Foothills are present in the central and eastern part of the study region. which covers 29.12 percent area of the district. The plain region covers major portion of the river valleys and shares 26.77 percent of the total area of the district. The Krishna, Koyana, Venna, Tarali, and Mand rivers covers major portion of the district with fertile plain region. These rivers facilitate the irrigation facilities in the district.

The river basin is covered by fertile soil in river basins and low quality soil in other part of the region. The rivers basins are covered by highly fertile black soil and in other portion mainly in hilly and foothill region medium and shallow laterite soil is observed.

The climate of Satara is hot and dry even though world famous tourist centre Mahabaleshwar and Panchgani located in the western part of the district. The amount of rainfall varies from east to west. Heavy

rainfall is observed in west region and less or some scanty in eastern region which creates very severe droughts.

In the Satara district only 13.7 per cent area of the total geographical area of the study region is under forest. The forests in the district are confined to the western part of the study region. The forests are found mainly on the undulating terrain and hill ranges of Sahyadri on the eastern slopes.

The study region has relatively good network of transport by roads and railways. The total length of roads in the study region is 10451.14 kms. having an average density of 99.61 kms. of road length per 100 sq. kms.

In the Satara district natural growth of population is positive, since 1931 to 2011 but in the year 1911 and 1921 observed negative population growth. It is observed that 18.99 percent population is settled in urban area whereas 81.01 percent population is settled in rural areas of the study region. Satara and Karad tehsil has highest population density which is more than 500 persons per sq. km. whereas Mahabaleshwar, Man, Jaoli and Khatav tehsil has lowest population density due to Mahabaleshwar and Jaoli tehsils are located in the hilly region whereas Man and Khatav tehsils are located in the drought prone region of the district.

In the Satara district total sex ratio is 988 in 2011. In the study region 64.63 percent working population engaged in primary sector whereas 32.82 percent population is engaged secondary sector and 2.55 percent working population are engaged in tertiary sector. Therefore most of the population is depends on the agriculture because agricultural is major primary economic activity.

In the Satara district distribution of Agro Service Centres is uneven. The study region composed with 11 tehsils and each tehsil has different number in agro service centres. Total 3086 Agro Service Centres providing facilities to the farmers of district farmers are getting satisfied by purchasing all necessary inputs like fertilizer, weedicides, fungicides and insecticides along with guidance and consultancy service through agro care centres.

In the study region total 3086 agro service centres are working, in this Karad and Phaltan tehsils has highest numbers of agro service centres because this tehsils is under the influence of Krishna - Koyana basin which plays a vital role in agriculture.

In the Satara district has total 10610.16 sq. km. area on which 3086 agro service centres are located therefore average density of agro service centres is 0.31. The Karad (0.54) and Phaltan (0.41) tehsils has highest density of Agro Service Centres due to fertile plain region and developed agriculture activity whereas Jaoli (0.13), Patan (0.16) and Man (0.19) tehsils has lowest density of Agro Service Centre because these tehsils located in hilly region of the district therefore in this region agriculture activity is subsistence agriculture level.

Population and distribution of agro service centres refers to ratio between number of agro service centres and 10000 persons. In the Study region total 3003741 persons are depends on 3086 agro service centres, therefore it is observed that 11 agro service centres provides facility to per 10000 persons.The Khandala and Phaltan (14) tehsils has highest Agro Service Centres per 10000 population where as Satara and Patan (7) tehsils has lowest Agro Service Centres per 10000 population.

Agricultural area and distribution of agro service centres refers to ratio between number of agro service centres and agricultural area in Sq. Km. simply it is agricultural density of agro service centres per sq. km.

area. In the Satara district total 6857.39 sq. km. agricultural area depends on 3086 agro service centres therefore district average agricultural density of agro service centres is 2.22. Patan (4.26) tehsil has highest agricultural density of Agro Service Centres where as Mahabaleshwar (0.79) tehsil has lowest agricultural density of Agro Service Centres in the study region.

Dependency of agricultural area on agro service centres is refers to agricultural area in sq. km. depends on one agro service centre. In the Satara district averagely 0.45 sq. km. agricultural area is depends on one agro service centres. Mahabaleshwar tehsil (1.27) has highest agricultural dependency of per Agro Service Centres while Patan (0.23) tehsil has lowest agricultural dependency of per Agro Service Centres in the study region.

In the Satara distirct for the calculation of degree of concentration of Agro Service Centres location quotation was calculated for each tehsils. The result of degree of concentration shows that the Karad tehsil has very high degree of concentration of Agro Service Centres with 1.85 L.Q. value where as Jaoli and Patan tehsils has low degree of concentration with 0.43 and 0.50 L.Q. value respectively.

In the high degree of concentration class Mahabaleshwar (1.27), Khandala (1.23), Phaltan (1.41), Koregaon (1.12) and Satara (1.42) tahsils are located because these all tahsils fertile soil and irrigation facility is developed therefore well developed agriculture needs maximum numbers of Agro Service Centres.

Fertilizers, seeds and insecticides distribution services important function of any agro service centre in the study region. Out of 3086 Agro Service Centres there are 1254 fertilizer distribution centres, total 1076 Agro service centre has seeds distribution facilities and 756 Agro Service Centres has insecticide distributions facilities in the Satara district.

The centrality and hierarchy of agro service centres in the study region is calculated to assess the centrality as well as hierarchical orders of agro service centres in the Satara district.

The highest centrality value is obtained by Karad tehsil and its centrality is very high in the study region. Satara, Phaltan, Mahabaleshwar, Khandala and Koregaon tahsils has high centrality in the Satara district whereas Wai and Khatav tehsils has moderate centrality while Man, Patan and Jaoli tehsils has low centrality agro services centres.

It is observed that the places having high centrality are located in the central part of the district in Krishna and Koyna river basin where highest area is found under agriculture. The moderate and low centrality is observed in the hilly tehsils as well as rain shadow region of the district. In hilly region due to undulating surface agricultural land is very limited and in rain shadow region has very minimum rainfall as well as seasonal rivers therefore irrigation facilities are limited.

The high concentration of Agro Service Centres is in plain and deep black soil belt and lower concentration in shallow and medium laterite soil belt in the study area. The analysis also reveals that Agro service centres located in urban areas have high centrality where as rural areas having low centrality.

The hierarchical class system is a very important part of the spatial model of agro service centres and is useful in the regional planning. For the present investigation Peter Davis's (1975) method has been used to determine the hierarchy of agro service centres. In the study region 1580 agro service centres has lower class i.e. class – I and thses centres are located in the rural areas. Class – II and class – III agro service centres are 884 and 477 respectively basically they are located in the fringe area

class. Out of total only 144 agro service centres has higher

The maximum highest order agro service centres are located in Karad, Satara and Phaltan tehsils whereas, Jaoli, Patan, Mahabaleshwar and Wai all these hilly tehsils have more lower order agro service centres than higher order service centres.

The co-relation between agro service centre and various physical and economic factors such as altitude, soil types, agricultural workers, net sown area and agricultural implements are assessed.

The hilly region with above 1200 mt altitude of the district has minimum numbers of agro service centers. Large numbers of agro service centers are located in the region of height in between 500 to 1200 mt whereas highest Agro Service centre in the district is located in the areas of height below 500 i.e.

Deep, medium and shallow black soil has large number of agro servicer centres whereas the areas of laterite soil less number of Agro Service centres.

Agricultural workers affecting the distribution of Agro Service centres in the study area. The coefficient correlation between this two variables indicated strong positive correlation.

The distribution of Agro Service Centres is affected by the net shown areas. The Net sown area is perfectly confirming to the Agro Service centres. There is a very slight difference in Net sown area and agro service centre. In the study region correlation between net sown area and Agro Service centres is moderate positive.

The agro service centre's provides the facilities of repairs and maintenance of agro farm implement therefore the correlation between agricultural implements and agro service centre is very significant. The correlation between this two variables is high degree perfect positive.

The assessment of agriculture development is based on the secondary data which is collected from District statistical handbook, Socio-Economic abstract of Satara districts.

In the Satara district spatial variation in the adoption of improved agricultural practices to ascertain level of agricultural development, the spatial variation is determined with the help of six variables viz. Net soon area, irrigated area, agricultural implements, Agricultural workers Numbered Satara districts central co-operative banks and crop productivity of yield index of Rice, wheat, Jowar, sugarcane, Groundnut and gram crops.

The calculation of overall levels of agricultural development and it's even, distribution the data of all variables indicators have been transformed into Z score techniques. In order to classify tehsils according to their levels of development, the composite Z-score have been grouped into high, medium and low.

High net sown area higher will be the crop production which can be reflected in agricultural development. The Karad, Patan and Satara tahsils are located in the high developed category whereas Khatav, Koregaon, Phaltan and Khandala tahsils are comes in moderate level of development and Wai, Man, Jawali and Mahabaleshwar tahsils comes under low level of development.

Irrigation is very vital for any kind of agricultural development and requirement for the success of modern technology in agriculture.

The high level of develop in irrigation has observed in Phaltan and Karad and whereas medium level of development in irrigation has been observed in Man, Khatav, Koregaon, Satara, Wai, Khandala and Patan while Mahabalewhwar and Jawali tahsils has low level of development in terms of irrigation facility.

Advanced agricultural technology is not only the package of Hybrid seeds and other modern inputs, but it also incorporates new agricultural practices. High level of development in the agricultural implements has been recorded in Karad, Patan and Khatav tahsils whereas the medium level of agricultural implements observed in Satara and Man tahsils while Mahabaleshwar, Khandala, Jaoli, Wai, Phaltan and Koregaon tahsils belongs to low development due to highest percentage of barren land, rugged topography and lack of irrigation facilities.

Agricultural workers are also important factors for agricultural development. The highest development in agricultural labour has found in Karad and Phaltan tahsils. The moderate development in agricultural labour is observed in Khatav, Koregaon, Satara and Patan tahsils. The tahsils like Mahabaleshwar, Jaoli, Khandala, Man and Wai tahsils has less agricultural workers therefore it shows low level of development.

These Banks provide loan and subsidies to the farmers in terms of cash or machines and tools like tractors and pump sets. The high Z-score of S.D.C.C. Banks has been recorded in Karad, Satara, Phaltan and Khatav tahsils whereas low level recorded in Mahabaleshwar, Jaoli, Wai, Khandala and Man tahsils.

Agricultural productivity determines the level of agricultural development in any region. It refers to per acre or hectors of yield in a unit (Kgm/quintals) of any crops of field.

The top places in the productivity of rice are secured by Koregaon tahsil so it belongs to high development. Karad, Jaoli, Wai and Patan tahsils are belongs to moderate productivity of rice while Mahabaleshwar, Satara and Khandala are belongs to low level of development in terms of rice production.

Wheat is produced on large scale in Phaltan and Karad tahsils so these two are comes under the high level of development. Khandala, Wai and Man are belongs to the moderate level of development where as lowest level of development is observed in Mahabaleshwar, Jaoli, Satara, Patan and Khatav tahsils in terms of wheat production.

Jowar is major crop cultivated in the district which produced everywhere in the study region. The tahsils under high development category are Wai, Koregaon, Jawali and Karad and the tahsils like Man, Mahabaleshwar, Khandala, Phaltan and Patan comes under low development in Jowar production.

Sugarcane is most significant crop cultivated in the study area. High level of development has been observed in Khandala, Phaltan, Khatav, Karad and Satara whereas others tahsil are located under the category of low level.

In the Satara district Phaltan tahsil has high level in groundnut production whereas low level observed in Man, Wai, Satara and Karad tahsils of the study region.

Phaltan and Karad tahsils are come under the high level category in gram production. The moderate level is observed in Koregaon, Man, Satara and Wai tahsils where as tahsils like Khatav, Khandala and Jaoli falls under low level of productivity of gram.

In the assessment of overall agricultural development in Satara district it is observed that Satara, Patan, Karad, Phaltan, Koregaon and Khatav tahsils are highly developed in agriculture because of fertile black soil and well develop irrigation facilities whereas low developed is observed in Wai, Khandala, Patan, Jawali and Mahabaleshwar due to undulating topography and less develop irrigation facilities.

Agro Service Centres are playing very important role in providing advanced technology services and inputs for different agricultural

activities. The study highlights that the impact of agro service centres is observed in agricultural development in the study region.

Agro Service Centers are very important for the development of agriculture. Day by day the need of it increasing. It came into notice by the study, increasing trend in number of Agro Service Centers all over the District.

6.2 SUGGESTIONS:

1. Government should form a policy regarding to the material availability, quality through Agro Service Centres, sufficient storage of fertilizer, seeds and other required material.
2. There should be a proper policy regarding to the permission of Agro Service Centre. It should be given to such a person who has completed specific qualification in agricultural study.
3. The prices of the commodities available in Agro service center should be same everywhere, but there is change in rates or prices. It should be fixed for specific span.
4. There should be specific benefits to the propitiator for providing all the essential service to the farmers.
5. Soil testing laboratories should be at every taluka places at reasonable prices. Farmer should get results well in time.
6. Every Agro Service Center should be accessed by cattle food and farm implements facilities.
7. Agro service centers should enlisted in the list of essential services.
8. During the time of natural calamities owner of agro service centers and farmer should get help very soon as early as possible.

9. There should be coordination in between companies and Agro Service Centres owner for given agricultural inputs at reasonable prices.
10. Along with chemicals there should be some organic material available at Agro Service Centres

BIBLIOGRAPHY

BIBLIOGRAPHY

1. Agalave, P. (2000), "Research Methodology and Techniques", First eidition, Vidya Publishing, Nagpur.
2. Agricultural development office, Agriculture department, Satara Zilla Parishad Satara.
3. Ambrose, P. (1969): "Analytical Human Geography, Longman, London.
4. Aslam Mohmood, "Statistical Methods in Geography."
5. Bracey, H.E. (1953): "Towns as Rural Service Centres" An Index of Centrality with special reference to somerset, Tran, Inst, of Br, Geographer.
6. Brush, J.E. (1953): "Hierarchy of Central Places in South Western Wisconsin".
7. Chakrawarthy K. (2006): 'Geography of Population', Mohit Publications, New Delhi, Pp. 116-117.
8. Chandana R. C. (2006): 'Geography of Population, Concepts, Determinants and Pattern', Kalyani Publishers, New Delhi, Pp. 4950.
9. Clark, P. and Evans, F. (1954): "Distance to nearest neighbour as a measure of spatial relationship in population". Ecology, 35, pp. 445-453.
10. Cole ,J. P. and King, A. M, (1968) , " Quatitative Geography", John Hilley and Sons, London.
11. Dacey, M.F. (1962): "Analysis of central place and Point Pattern by a nearest neighbour method". Land Studies in Geography, Series B-24, pp. 55-75.
12. Deshmukh Ram, (2005), "Fundamental Statistics" Vidya Prakashan, Nagpur.

13.Deshmukh Ram, (2005), 'Fundamental Statistics' Vidya Prakashan, Nagpur.

14.Deshmukh, P.W. (1985) : "The Location of service Activities, A study of Central Places in Upper Krishna valley". Ajab Pustakalaya, Kolhapur.

15.District Census Hand book of Satara District – 2011.

16.Dixit, R.S. (1988): "Spatial Organization of Market Centres", Pointer Publishers, Jaipur.

17.Fefellow V.P.,(1979), "Organization of agro chemical services, world agricultural economics and rural Sociology" Abstract volume-21 pp.69.

18.Gettis, A. (1964): "The temporal landuse pattern", Analysis with the use of nearest neighbour and quadract method", Ann. Assoc. Am. Geogr. 54.

19.Gharpure V. T., (1989), "Spatial Organization and Hierarchical ordering of Agro Service Centres in Panchaganga basin of Kolhapur district": Indian Journal of regional science, Vol.23 No.2 pp. 23.

20.Gharpure V. T., (2005), "A role of Agro Service Centres in agriculture development" first edition. Raj publishing house, Jaipur (Rajasthan).

21.Ghosh B. N. (1985): 'Fundamentals of Population Geography', Sterling Publishers Private Ltd, New Delhi, Pp.25.

22.Gomatee Singh, Syed Was Ashraf, (2012), 'Spatial Variation in Level of Agricultural Development In Bulandshahr District Of Western U.P'. (India)

23.Gupta, C .B. (1978), "An introduction to Statistical Methods", Vikas Publication house, New Delhi.

in Geography". Oxford, pp. 238-239. (1974): "Quantitative Techniques

25.I. C. A. R. (1989): 'Hand Book of Agricultural', I. C. A. R. New Delhi, Pp. 11-20.

26.Ingle K.D.(1995), "A role of Agro Service Centres in agriculture development" in Bhusaval taluka. A Geographical Analysis unpublished M.Phil. Dissertation, submitted to North Maharashtra, University, Jalgaon.

27.Jadhav D.R (1979) A role of Agro Service Centres in communication of Agricultural technology, AGRESCO, MP Krishi Vidyapeeth.

28.Jadhav M. G., (1986), "Sugarcane Cultivation a Regional Survey". Himalaya Publishing house, Bombay.

29.Karlekar Shrikant, and Kale Mohan. (2006), "Statistical Analysis of Geographical Data", Diamond Publication. Pune.

30.King, L.J. (1962) : "A Quantitative Expression of the pattern of Areas in Selected Areas of the United States", Tijdschr. Econ. Soc. Geogr. 53.

31.Kumbhar K.S.(1991), "Spatial Analysis of Agro Service Centres in Dule District" Unpublished M.phil. Dissertation, University of Pune.

32.Maharashtra State Gazetteer, Satara District- 2001.

33.Mate, G.R., (1968), "Asa Ghadala Satara Jillha" Maharashtramitra Mudranalaya, Satara.

34.Mohammed, A. (1980), 'Regional imbalances in levels and growth of agricultural productivity'. A case study of Assam.

35.Narkhede N. N., (1977),"Agro Service Centres- A promise to increase agriculture production by taking modern agriculture technology village farmers", MASCA Souvenir.

36.Negi, B.S. (2006) "Practical Geography" National Council of Educational Research and Council Statistics for Economics, First Edition PP.74-91.

37.Nevase, S.V., (2009), "Spatio-Temporal Analysis of SC and ST Population in Satara District" (1991-2001),Unpublished M.Phil.Dissertaton Submitted to TMV Pune, pp10 to 25.

38.Pawar, C.T. and Gharpure, V.T. (1985): "Delineation of sphere of influence of Agro Service Centres in the Panchaganga Basin (Mah)", Journal ofShivaji University, vol.XXII, pp. 155-161.

39.Reddy, N.B.K. (1970): "Distributional Aspects of Urbanism in Krishna and Godawari Deltas", The Deccan Geographer, vol. 8, No. 1 and 2, pp. 101-117.

40.Sapre S.G., and Deshpande V., (1964), "Interdistrict variation in agricultural efficiency in Maharashtra state" Indian Journal of Economics.

41.Savanur S. K. (2008), 'Research Methodology for Information Sciences'Universal Prakashan, Pune.

42.Sawant S. B. and Athawale A. S. (1994): 'Population Geography', Mehta Publishing House, Pune, Pp. 25-26.

43.Sharma, P.S. (1973): "Agricultural Regionalization in India", New Heights, Delhi

44.Shinde S.A. (2009), "A spatial perspectives on Agro Service Centres in Karad taluka" –A geographical Analysis, Unpublished M,Phil dissertation submitted to TMV. Pune.pp. 1 to 10.

45.Shinde, S.D. (1980): "Agriculture in an underdeveloped region: A Geographical Survey, Himalaya Publishing House, Bombay, p. 115.

46.Singh J, Dhillon S, (1984),"Water resources in India -A Geographical perapectives", Geographical Review of India Vol.48,49

47.Singh, J. (1974), 'Agricultural Geography of Harayana', Vishal publication, Kurushetra, Harayana

48.Wagh A. S.,(2009),"Irrigation and its impact on cultivated area –A case study of Satara district" (1984-85 to 2004-05), Unpublished M.Phil, dissertation submitted to T. M. V. Pune.

49.Wagh L. N.(1977), "Role of agro services centres in rural development" Souvenir National Entrepreneur convention.

PHOTO PLATES

PHOTO PLATES