CHAPTER-VII

SUMMARY AND CONCLUSION

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7.1 General Introduction

In order to meet increasing demand of food for rapid growth of population researchers have been carried out research all over the world. This research is depending on scientific study of landuse which carried out at both micro as well as macro level. In India, research in agricultural geography aims to find out general landuse, crop landuse, crop productivity, crop combination, crop diversification, food security, distribution of agricultural products, land under irrigation, problems and prospects of agriculture. To study landuse pattern, surveys have been carried out in Great Britain, United State of America, Poland, France, Japan, Italy, former USSR, Pakistan, Bangladesh etc. The landuse survey have carried out at regional level and it has its own limitations. It is not possible to fully uncover landuse characteristics at village level. In present investigation, an attempt has been made to assess, analyse, describe and interpret the agricultural landuse pattern in study region with a view to investigate influence between variables on landuse pattern and to provide remedial measures for better agricultural landuse in study region.

7.2 Summary

The preceding chapters have studied crop landuse pattern in Pune district of Maharashtra state. Pune district lies in west part in Maharashtra state. The areal extent of study region is 14,642 square kilometers having total population of 72,32,555 in 2001 Census. This district consists of 14 tehsils of namely, Junnar, Ambegaon, Rajgurunagar, Maval, Mulshi, Velhe, Bhor, Haveli, Purandar, Pune city, Indapur, Daund, Baramati and Shirur. The largest taluka is Shirur occupying 10 percent area in study region.

The study region is bounded by Thane, Raigad, Satara, Solapur and Ahmednagar district in all sides. The region seems to be triangular in shape. The physiography shows diversified relief. The Sahyadri lies in west part and is divided into three ranges, namely, Harishchandra range, Jeevdhan range and Dhak-Ahupe range. Bhima river basin region covers whole district draining towards the east. The rivers in study region originate from western ghat. The tributaries of Bhima river are Kukdi, Meena, Ghod, Vel, Bhama, Indrayani, Mula, Mutha, Karha and Nira. The rivers are flowing from northwest to southeast. The eastern part has broad valley beds. There are two
types of soil appears, namely, black and laterite soil. Black soil can be grouped as deep black soil, medium deep black soil and shallow black soil and mostly found in Bhima and its tributaries. Laterite Soil can be sub-grouped as deep laterite soil, medium deep laterite soil and shallow laterite soil and found in the western part of the district. Rice is cultivated on this soil. The study region receives rainfall mainly from south-west monsoon. The monsoon arrives in June and intensity of rainfall increases during July and August. The western part in study region receives more than 2500 millimeter while in eastern part rainfall has found less than 500 millimeters. Average rainfall is 600 mm in study region.

Forest cover is spread over 162,303 hectares area and has five types of forest namely, sub-tropical hill forest, semi-evergreen forest, moist mixed deciduous forest, dry mixed deciduous forest, dry teak forest. Fifty percent forest is in Maval, Bhor, Mulshi, Ambegaon and Velhe talukas. This forest produces wood, fodder, honey, wax, gum and other medicinal products. The district has total length of 13,642 km of roads of by National Highways (331 km) and State Highways (1368 km), district road (5388 km) and village roads (6555 km). The taluka places and major market centres are connected by metalled roads. The study region has 311 km railway route. According to 2001 census, there were 72,32,555 persons and 15,17,041 households in study region and population density was 462 persons per square kilometre. Haveli taluka alone contributes 18.71 percent and Baramati, Indapur, Junnar, Daund and Khed talukas together contributes 24.56 percent population. These talukas are found densely populated (250 and 300). Ambegaon, Khed, Purandar and Indapur talukas show the density of 200 to 250 persons per square kilometer. The sex ratio of the district is 919 females per 1000 males. This ratio is higher in Velhe and Bhor taluka. According to 2001 census, 40.85 percent population is engaged as workers. The study region has cultivators (26.9 percent) and agricultural labourers (12.7 percent) together constitute 39.6 percent of the workers. The net sown area has decreased by 3.72 percent from 1980-81 to 2005-06 due to urbanisation, industrialisation and infrastructural development in study region. The agricultural land has brought under new constructions and fragmentation of land. The middle and eastern talukas have recorded more area under net sown area than western talukas where has undulating topography. The land not available for cultivation has increased by 4.46 percent during the study period. The lowest cultivable waste land is recorded 5.72 percent in 1985 and highest is 8.05 percent in 2005. Fallow land has 2.84 percent in 1980 and it
has increased up to 4.18 percent in 2005. The forest has declined by 1.49 percent due to increasing demand for agricultural outputs.

The maximum increase in net sown area has recorded in Khed taluka, followed by Purandar taluka (more than 10 percent). It is 4.46 percent increase from 1980. Velhe shows more than 10 percent growth in land not available for cultivation whereas Purandar shows negative trend. By the time the land under this category is having positive trend because of urbanization and development of the region. The use of non-agricultural land has found increased (22.32 percent), and simultaneously barren and uncultivated land decreased respectively.

The land under cultivable waste has declined by 0.59 percent during study period. The maximum decline is found in Khed and Baramati talukas. Bhor and Indapur have recorded highest positive change under this land. Fallow land is having only 1.34 percent of positive change over 25 years. The highest decline is found in Bhor taluka inclining trend under the area of fallow land in the talukas like Mulshi, Velhe, Haveli and Khed.

The forest area has declined from 1980-81 to 2005-06 (1.49 percent) except Maval and Shirur. Pune district experiences kharif, rabi and summer seasons. Kharif season practiced in rainy seasons and rabi season in winter. Sugarcane, fodder crops, fruits and vegetables are sown both in kharif and rabi seasons. Area under rice, wheat, jowar, groundnut, gram, sugarcane, fruits and vegetables area have found little increase. Jowar is cultivated on 44.79 percent area in 1980-81 and has increased by of 1.78 percent during 25 years and it has found 46.58 percent in 2005-06. Bajara has cultivated in the north and east part in study region in dry region. Bajara is declined of 3.12 percent in overall volume of the study region. Maximum decrease of bajara is found in Indapur talukas, 8.47 percent. Rice is found grown mainly in west part in study region in Mulshi, Velhe, Bhor and Maval talukas. Mulshi shows highest percent of 36.22 followed by Velhe, 31.53 percent.

Wheat has grown up in east and north parts in study region. This is a main staple food of the district. From 1980-81 to 2005-06, the overall increase is 2.52 percent in study region. The maximum growth of wheat is occurred in Purandar taluka (5.06 percent) followed by Khed, Ambegaon and Daund taluka. Groundnut has 6.20 percent and 6.17 percent of area in Bhor and Junnar taluka respectively. Fodder crop has identified highest in Baramati taluka (27.96 percent) followed by Daund taluka. There is substantial growth in area under fruits and vegetables, increased by 4.78
during study period. Junnar shows the highest growth accounting 10.05 percent in study region because of the increase in urban population, increasing irrigation facilities and transport facilities in the western part of the district. Gram is cultivated in north, east and central part in study region. Baramati has found maximum growth of 6.41 percent. Safflower is encircled in few talukas such as Shirur (2.56 percent), Purandar and Baramati. Jowar is identified as first ranking crop in five talukas occupying 85.19 percent area in study region and it is concentrated in north and east parts. Rice as a second crop has identified in first ranking crop. It is on 6.35 percent of land. Bajara shows first rank in Ambegaon taluka and Fodder in Haveli taluka on 5.55 percent area. Five crops have been identified as second crops ranking crops, namely, bajara, fodder crop, jowar and sugarcane.

There are ten crops which have considered computing crop combination regions in study region by applying Doi’s method. These are six crops combination regions, namely, monoculture, two, three, four, seven and eight crop combinations have been identified. Monoculture and four crop combination region have found in four talukas each. Three crop combinations is found in two talukas and seven and eight crop combination regions in one taluka each. Jowar is a monoculture crop found in four talukas, namely, Shirur, Daund, Indapur and Baramati. Whereas two crop combinations are found in Velhe taluka and three crop combinations in Khed and Mulshi talukas in study region. Gibbs–Martins Index of Diversification has applied for crop diversification in study region and is divided into area of high, moderate and low crop diversification. The high crop diversification class covers 48.62 percent area. The moderate crop diversification covers 39.98 percent area and low diversification covers 11.40 percent area.

The correlation coefficient and multiple regression technique have applied to find out relationship between selected agricultural landuse variables by selecting eighteen variables namely, rice, wheat, jowar, bajara, groundnut, gram, sugarcane, fruits and vegetables, fodder crops, net sown area, cultivable waste, fallow land, area not available for cultivation, rainfall, population density, agricultural density, irrigated area and pumping sets. Area under rice has strong positive correlation with rainfall (0.904) and fallow land (0.807) and area not available for cultivation. Area under wheat has strong positive correlation with jowar and net sown area 0.766 and 0.765 respectively. The moderate correlation exhibits with irrigated area, gram and sugarcane.
Jowar shows positive correlation with wheat, sugarcane, net sown area and irrigated land. These four variables show above 0.6 positive strong correlation. The strong negative correlation is found with area under rice (-0.635) and rainfall (-0.634). The area under jowar decreases with increase in these two variables. The increasing area under jowar does not proportionally increases with rice, groundnut, fodder crops, fallow land, area not available for cultivation, rainfall, population density and, agricultural density. Bajara is another important crop, strongly co-relate with gram (0.695) and moderately associated with net sown area (0.543). Positive correlation of groundnut is found with agricultural density (0.673) and moderate positive correlation is found with bajara, gram in study region.

Sugarcane is positively associated with irrigated land (0.775) and jowar (0.623). Jowar is being replaced by sugarcane because of provision of water. Moderate positive correlation is established between sugarcane and fruits and vegetables (0.523), net sown area (0.396), population density and wheat. Net sown area shows high moderate positive correlation with area under wheat (0.765), jowar (0.655) and irrigated area (0.602) and low moderate positive correlation with gram (0.579), pumping sets (0.550), bajara (0.543) and fruits and vegetables (0.424).

The degree of correspondence between several variables in correlation coefficient is obtained by computing multiple regressions. The twelve significant variables in correlation have considered for computing multiple regressions. The multiple correlation value 0.869 shows high degree of association for wheat. The variable area under jowar has giving a high multiple correlation value of 0.883. Bajara has 0.732 and 0.673 correlation with groundnut. Sugarcane is governed by jowar and irrigation facility and hence has found multiple correlations (0.777). The multiple correlation value of 0.973 is computed for net sown area. The multiple correlation value of area under gram (0.796), fruits and vegetables (0.633), fallow land (0.945), area not available for cultivation (0.827) and irrigated land is 0.960. The total observations of 13 talukas x 18 variables were computed. The first six variables account for 91.93 percent variances. The first two Factors together accounts for 48.60 percent. The first two factors (Factor-I & II) are geographically plotted to present concentration of interrelated variables in Pune district. These two variables increase proportionally with each other. The second group-B includes fruits and vegetables, gram and pumping sets. These variables are interrelated with each other showing positive relationship. The third group-C also shows positive correlation includes
variables like irrigated area and sugarcane. The communalities of both variables are 0.920 and 0.918 respectively. Group-D shows inverse proportion including fodder crops and area not available for cultivation. The fifth group-E shows correlation between two variables as rice and rainfall. The scores of Factor-I and II are used as the base for demarcating agricultural regions into three categories as agriculturally backward, developing and developed region in study region. The Shirur, Indapur, Baramati and Daund talukas are found most developed regions due to plain, fertile and irrigation facilities inspite rain-shadow area. Haveli, Khed, Purandar and Junnar talukas represent developing region. The underdeveloped regions identified in Maval, Bhor, Mulshi, Ambegaon and Velhe talukas. Rugged topography, medium coarse soils are responsible for this backwardness. Three villages are choosen for sample study, namely, Nimbut, Padali and Naigaon sample study summary.

7.3 Suggestions

The agricultural land in Haveli, Maval and Baramati talukas is being, converted into non-agricultural land. This process is hampering the growth crops and production too. Government should be restricted this conversion by byelaws. The dryland agriculture in central and east parts in study region in Indapur, Baramati, Purandar, Daund and Shirur talukas, evaporation losses can be reduced by mulches, anti-transpirants, wind breaks and weed control. Most of the part of Maval, Ambegaon, Mulshi, Bhor and Velha talukas are still rain-fed. In these talukas planners must give attention on the development of non-arable land and irrigation facilities. Agro-forestry, pasture development, horticulture and alternate landuse in these areas will help to reduce the problems of rain-fed area.

It has revealed during the field visits that farmers were reluctant about crop insurance in Purandar, Bhor, Maval and Ambegaon talukas due to uncertainty of uneven rainfall and failure of crop production. In these areas farmers must adopt crop insurance scheme. This will provide insurance coverage and financial support to farmers in the event of failure of any of the notified crop as a result of natural calamities, pests and diseases. Baramati, Daund and Indapur talukas have salinity problem due to excessive canal irrigation to sugarcane. Measures should be applied to reduce salinity of soil by proper water management and selecting alternative suitable
crops. Application of farm yard manure at 5 ton per hectare at 10 - 15 days before transplanting or ploughing the crops can be the alleviate the problems of salinity. The central and east part in study region, watershed management is highly requires particularly in Shirur, Purandar, Haveli, Junnar, Maval, Khed and Mulshi talukas. This will increase the underground water table where canal irrigation is not possible. Farmers have to construct the field pond in their farms for irrigation purpose and attempt to recharge the underground water in wells and tube-wells. Farmers in these areas should recharge their wells through rainwater harvesting and watershed development. Low productivity of agriculture is observed in Maval, Velha, Ambegaon and Bhor talukas due to use of traditional seeds by farmers, so it is very essential to use high yielding variety of seeds. The Seed Testing Laboratory at each taluka is essential for testing the quality of seeds sown by farmers.

Minimum support price of fruits and vegetables must be decided by the government for wheat, rice and jowar. Farmers should form their association on needs basis to determine the price for their own produce. Exim Bank, Ministry of Commerce and Industry, Commodity Boards, Federation of Indian Export Organisations, APEDA, FICCI and NABARD gives support in this regards. To minimize the damage caused by the insects, efficient application of integrated pest and insect management programme is essential in this area. Farmers also should have to take plant quarantine facilities to prevent the introduction of any insect, fungus or other pest, which may be destructive to crops. Government should establish Plant Quarantine Stations at every taluka level to facilitate every farmer.

Traditional methods of irrigation are responsible for the wastage of water and causing problems by over irrigation in Daund and Baramati talukas. Therefore, farmers in this area should be guided and trained for the advanced method of irrigation such as drip, sprinkler etc. which saves water and decreases threat of salinization. Purandar, Shirur, Haveli and Junnar talukas have water scarcity during summer season. It is suggested that, farmers in these talukas should use drip irrigation. Overdoses of chemical fertilizers are responsible for soil degradation in Baramati, Daund and Indapur talukas. The use of organic agriculture and fertilizer management programme is one of prime requirement in study region. Godowns and storage houses should be created to store vegetables such as onion and tomatoes at Junnar, Baramati and Haveli talukas. Fruits storage facility be provided in Purandar,
Baramati, Indapur and Shirur talukas. Market hubs and cargo hubs should be constructed at Baramati, Pune and Junnar talukas connected by roads and railways.

7.4 Concluding Remarks

Pune district belongs to western part of Maharashtra state where rainfall varies between 500 to 600 millimeters. The study region has varied topography, soil and climate. Land in river valleys is fertile which resulted to cultivate sugarcane and fruits and vegetables besides jowar and bajra. Agriculture department and farmers in Pune district are making efforts to improve agricultural practice to cultivate maximum area under crop. New planning strategies needs to be introduced to enhance the knowledge of farmers and for increased yield. These typical characteristics of this region can be same background for immense development of agriculture sector. Such study has much potential to attract experts from various fields like planning, agriculture, economics and administrators for further study and to prepare plan for overall development of agriculture for Pune district.