# CROP DIVERSIFICATION IN PUNE DISTRICT: A GEOGRAPHICAL ANALYSIS

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*Abstract*

     *Agriculture is one of the ancient techniques of growing crops in the world. Crop diversification means to raise a variety of crops in particular agriculture region. Crop diversification usually leads to changes in the traditional cropping pattern of the agricultural region. Crop diversification is exact opposite of crop specialization, which gives a wider choice for production of variety of crops in any region and increases production related activities. Crop diversification is collectively reflection of physio-climatic, socio-economic and techno-organization inputs. Regional development can be achieved through agricultural development. Agricultural development can achieved through proper agricultural planning and well-designed policies and their implementation. To determine planning strategy for regional agricultural development, study of various aspects of agricultural regionalization is essential. Crop diversification is one of the laying path for the study of agricultural regionalization. Therefore, present study is focused analytical study of crop diversification in Pune district. This study is to examine the tahsil-wise spatio-temporal changes in crop diversification of Pune district during 2001 to 2016. Pune district is an agriculturally pre-dominant district in Maharashtra. It has attained spatio-temporal changes in cropping pattern accordingly development in irrigation facilities, market, transportation, infrastructure and technology. Crop diversification have been computed on the basis of Crop Diversification Index method initiated by Bhatia. On the basis of index value of productivity, the regions were categorized as a high, medium and low crop diversification area. The district crop diversification index was 19.80 (Low) during the period 2001-02, while it was reached 23.10 (Medium) in 2015-16. Crop diversification in Pune district is generally viewed as a shift from traditionally grown less remunerative crops to more remunerative crops. More or less variations in resources endowment, infrastructure level and market accessibility are responsible for crop diversification.*

*Keywords: Crop diversification, Accessibility, Cropping Pattern, High Yielding Varieties.*

## 1. Introduction:

    Crop diversification is a common phenomenon in Indian conditions because the farmers try to satisfy most of family demand from its own land resulted into crop diversification. (Jasbir Singh, 1976). Crop diversification refers to raising a variety of crops on arable land. Generally it is observed that more number of crops in a combination, indicate the greater degree of crop diversification.(Ayyar, 1969). Crop diversification in India is generally viewed as a shift from traditionally grown less remunerative crops to more remunerative crops or cropping pattern. (Hazra, 2001). Crop diversification is collectively reflection of physio-climatic, socio-

economic and techno-organization inputs. Crop diversification pattern have great significance in the agricultural land use planning in any region. The crop diversification takes place due to governmental policies, availability and confirm source of irrigation, land size, location, farming experience, crop selection attitude of farmers and access to agricultural extension services. Infrastructural development, transportation cost, market, higher profitability, production stability and certain other price related support also induce crop diversification. The production stability and profitability induces diversification, for example in case of sugarcane crop replacing wheat and pulses. Crop diversification rising on large number in rainfed agricultural area to reduce the risk factor of crops failure either of heavy rainfall or less rainfall. Crops diversification indicates multiplication of agricultural crops, which involve intense competition for regions, scope for crop rotation and effect of double cropping. Greater competition indicates higher magnitude of crop diversification. While greater the trends to words the specialization where infuse is on one or two crops indicate the lesser magnitude of diversification. In most of the extensive agricultural part in the world has crop diversification. It is a common feature due to irrigation, use of fertilizers and pesticides, high yielding varieties, mechanization and technology. Besides climate, farmer's attitudes and local surrounding are forced farmers for crop diversification.

Many Geographers and Economist have applied diversification concept in variety of sense. Clean (1930) initially applied this concept in order to identify the degree of diversification and concentration in manufacturing field. Later on Horence (1942) and Rain Wald (1949), Gibbs Martin (1974) have used this concept of diversification for computing measurements of diversification for of employment in industries. Bhatia (1965) has applied crop diversification technique in India to understand crop cultivation. This technique provided a method for generalizing relation between the relative strength and number of crops grown in study region. In his formula the cropped are considered for computing crop diversification. In the present research work, Bhatia's method has adopted to measure crop diversification index in the Pune district. The data regarding crop diversification have obtained for (2001 to 2016) over period of 15 years from socio-economic abstract of Pune districts. These obtained data was later on converted into percentage to total geographical area and then categorized into various groups for identification of crop diversification. The volume of change has studied for fifteen years period. The changes in the cropping pattern in a particular period indicate the changes that have taken place in agricultural development.

## 2. Study Area:

Pune district is an agriculturally pre-dominant district which is located in western Maharashtra. Agriculture sector provides the major source of income to the population of Pune district and major crops in this district are paddy, jowar, bajra, gram, sugarcane, groundnut and fodder. Pune district lies between 17.5° to 19.2° N latitudes and 73.2° to 75.1° E longitudes with a total geographical area of 15643 square kilometres. It is bounded by Raighar and Thane districts on the west, Ahmednagar district on the north, Solapur district on the east and Satara district on the south. In 2011 census, Pune district had population of 9429408 of which male and female ware 4924105 and 4505303 respectively. The district consists of 14 revenue tahsils: Junnar, Ambegaon, Khed, Mawal, Mulshi, Velhe, Bhor, Haveli, Pune City, Daund Shirur, Purandar, Baramati and Indapur. In Pune district total cropped area is 884299 hectares, out of which an area of 55458 hectares is under irrigation (2016). Altitude of the District is ranging between 550m to 660m. above mean sea level. Kukdi, Ghod, Indrayani, Pauna, Mula, Ganjauni, Nira and Bhima rivers rise from this part of the Sahyadries in Pune district. BhamaAsakhed Dam, Bhatghar Dam, Chaskaman Dam, Dimbhe Dam, Manikdoh Dam, Panshet Dam, Ujjani Dam etc. are some major dams situated in Pune district. The soils of the district are belong broadly to three main classes, namely, black, red and brown. River valleys are rich in fertile soil and a fair supply of water from wells and rivers, hence the valleys yield luxurious crops. Lower part of river valleys has several feet deep soil which is grey to black in colour. These soils are particularly suited for rabi crops. The district's climate is characterized by a hot summer and general dryness except during the monsoon season. The distribution of rainfall is very uneven in the district, average annual rainfall is around 800 to 900mm.The rainfall decreases as one proceeds towards the east. Seasonal variation in temperature is quite large. From March onwards is a period of a continuous increase in day temperatures, the nights remaining comparatively cool.

## 3. Objective:

The present research paper has been undertaken to make in depth and comprehensive study of crop diversification in Pune District by evaluating following objectivise.

1) To study the crop diversification of  Pune district.

2) To study regional variation in crop diversification in the study area.

3) Suggesting remedial measure for better crop diversification of study regions.

**4. Data based and Methodology:**

The present research work based on the secondary data obtained from the Socio-Economic abstract of Pune district (2001-2016). For evaluating the extents of diversification two periods has been selected 2001-02 and 2015-16. The Bhatia's methods diversification index which provided a clear desperation of commodities inter geographical area has been computed fourteen tahsils, Bhatia's formula applied to work out crop diversification for the study area various thematic maps related to crop diversification and cropping patterns were prepared with the help of the GIS technique to determine the tahsil-wise crop diversification. Study-related data are analyzed through statistical tools and techniques and represented by suitable diagrams in the post field stage.

Crop Diversification (Bhatia's method 1965) Index:

*Index of crop diversification =*

$$\text{Index of crop diversification} = \frac{\textit{Percentage of sown area under 'n' crop}}{\textit{Number of 'n' crops}}$$

Where 'n' indicate the crops which are individually occupy 10 percent or more of the grossed cropped area in the area under study. In this method, higher the value of the diversification index lower is the degree of crop diversification and vice versa.

**5. Spatio-Temporal changes in crop diversification (2001-2016):**

Crop diversification in the Pune district is generally viewed as a shift from traditionally grown less remunerative crops to more remunerative crops. The crops shifting also takes place due to Government policies and thrust on some crops over a given time, for example creation of the technology mission on oilseed to give thrust on oilseed productions, pluses production also due to mission. Infrastructural development, transportation cost, market and certain other price related support also aid in crop diversification. An effective strategy for achieving food and nutrition security, poverty alternative employment generation, judicious use to land and water resources, sustainable agricultural development and environmental empowerment from low value to high value crops. For the improved agriculture output, farmers applying various strategies such as  changes in the crops from water blowing to water saving crops, from single crop to multiple and mixed crops. The total cropped area of the Pune district during 2015-16 is 884297 hectares of land. It amounts to 56.52% of the total geographical area of the Pune district. Tahsil level data for various crops have been collected, and the index of crop diversification is worked out by adopting Bhatia's method. The level of diversification is

categorized under three major groups, i.e. high, moderate and low. By this method crop diversification index have been found out for each block in the District. This gives an idea of how many blocks are having high and low diversification of crops and thus laying path for the study of agricultural regionalization. As the major wet and dry crops such as Paddy, jowar, bajra, gram, sugarcane, groundnut and fodder showed only their distribution of concentration in the District. During the year 2001-02, the average value of index was 19.80 it was indicating high crop diversification (Table 1). But during 2015-16 the index was 23.10, it was shifted in medium crop diversification. In first investigation period farmers was more focused on cereals and fodder, so diversification index was high but in second investigation period, traditional pattern change towards cash crop especially sugarcane. Sugarcane is valuable crop but it is long durational crop which can get 10 to 14 months for harvesting. Within this long period, land can be utilised two or three times for other crops. Therefore area under other crop reduced and average index of Pune district is shifted in medium category of crop diversification. Individually every tahsil range computing (18.52) high diversification of crops and (62.58) low diversification of crops in (2001-02). High diversification are found in Haveli (18.52), Junnar (18.85) and Khed (19.21) tahsils. These tahsils are situated middle and northern part of district where irrigation facilities are well developed as well as market, infrastructural facilities and connectivity of transportation network supportive for rising variety of crops. Medium diversification of crops found in Mawal (22.35), Ambegaon (23.51), Velhe (23.48) and Bhor (25.86) tahsils. Low crop diversification observed in Daund (30.37), Shirur (31.92), Mulshi (35.28), Purandar (33.20), Baramati (31.59) and Indapur (65.58) tahsils (Table 1 and Fig. 1). Low diversity found in six tahsils, most of these tahsils located eastern part of the district which is comes under low rainfall zone of district. Most of the area of this tahsils under cereals likes jowar and bajra. Scarcity of water forced to farmers to retained traditional crops. Also more or less variation in resources endowment, infrastructure level and market accessibility are responsible for low crop diversification level.

**Table 1: Index of crop diversification in various tahsils in Pune district, 2001-2016.**

| Tahsil | 2001-02 | | | 2015-16 | | |
|---|---|---|---|---|---|---|
| | No. of crops | Area % | Index of Diversification | No. of crops | Area % | Index of Diversification |
| Junner | 3 | 56.54 | 18.85 | 4 | 48.31 | 12.08 |
| Ambegaon | 2 | 47.01 | 23.51 | 4 | 60.54 | 15.14 |
| Shirur | 2 | 63.84 | 31.92 | 2 | 58.10 | 29.05 |
| Khed | 3 | 57.62 | 19.21 | 4 | 61.42 | 15.35 |
| Mawal | 3 | 67.05 | 22.35 | 3 | 70.51 | 23.50 |
| Mulshi | 2 | 70.56 | 35.28 | 2 | 68.30 | 34.15 |
| Haveli | 4 | 74.07 | 18.52 | 4 | 66.61 | 16.65 |
| Pune City (Urban Area) | 0 | 0.00 | 0.00 | 0 | 0.00 | 0.00 |
| Dound | 2 | 60.74 | 30.37 | 3 | 74.66 | 24.89 |
| Purandar | 2 | 66.40 | 33.20 | 2 | 64.89 | 32.44 |
| Velhe | 3 | 70.44 | 23.48 | 2 | 71.78 | 35.89 |
| Bhor | 2 | 51.71 | 25.86 | 4 | 72.94 | 18.23 |
| Baramati | 2 | 63.18 | 31.59 | 2 | 62.68 | 31.34 |
| Indapur | 1 | 62.58 | 62.58 | 3 | 76.81 | 25.60 |
| Pune District | 3 | 59.40 | 19.80 | 2 | 46.20 | 23.10 |

*Source: Compiled by author.*
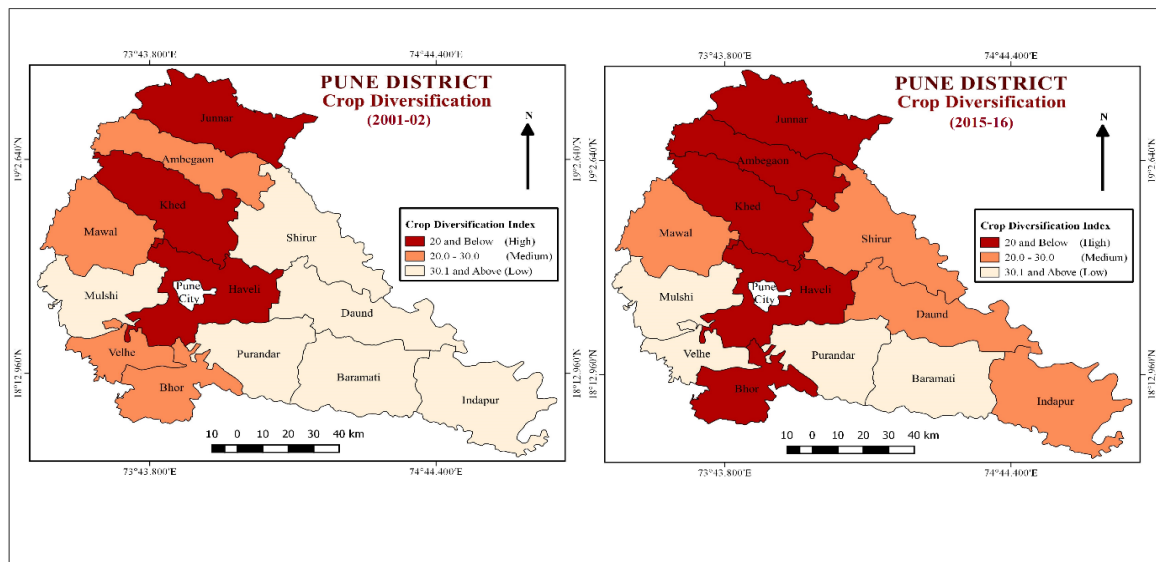


**Figure 1: Crop diversification in Pune district (2001 to 2016)**

Crop diversification for the period at 2009-2016, there was a remarkable variation in crops diversification during the period under reported cropping pattern are introrsely noticeable. It presents regional diversification of pattern of crop diversification grouped into three categories. Area of high diversification (below 20), area of medium diversification (20-

30 %) and area of low diversification (above 30%).Area of high diversification were observed in Junnar, Ambegaon, Khed, Haveli and Bhor tahsils. Two more tahsils taking place in the high diversification category during period of 2009 to 2016. Improvement in irrigation facilities, availability market, infrastructural development and changing attitude of farmers are responsible for change in crop diversification from medium to high category of Bhor and Ambegaon tahsils. Medium diversification was registered in Mawal, Daund, Shirur and Indapur tahsils. Low diversification was found in Baramati, Purandar, Mulshi and Velhe tahsils.

High to low area of crop diversification were not recorded in any tahsil, high to medium diversification recorded in Shirur, Daund and Indapur tahsil. Medium to high crop diversification was recorded into Velhe tahsil. Medium to low diversification occurred in Bhor tahsil. No any changes observed in eight tahsils, they are hold their previous category of crop diversification. Considerable variation exists in magnitude and growth of diversification both hectors and within tahsil due to difference in the structured variable such as rainfalls. The adopting of agricultural technology high yielding varieties, chemical fertilizers use and mechanization pattern of crops diversifications may be classified as field crops,plantations crops, commercial crops floricultural crops, grasses, condiments and spices, medicinal and aromatic plants. In recent years Pune district agricultural production which includes vegetable, fruits, spices, and floriculture has been recognized as important avenues for diversification in agriculture in an eco-friendly ranges through efficient land use optimum utilization of natural resources and creation of employment opportunities.

The Pune district agricultural is gradually diversifying to high value food commodities, this show that there is immense implementation of crop diversification. The production in case of groundnut has increased in Junnar and Ambegaon tahsils while bajra was decreased. Sugarcane increased in Shirur, Indapur and Baramati tahsils during 2009-2016. No any remarkable changes observed in jowar crop.

**Conclusion:**

1. Pune district agricultural is gradually diversification to high value food commodities.
2. Medium to low area of crops diversification was registered in Velhe tahsil in the period of (2001-02) to (2015-16).
3. Pune district is generally viewed as a shifting from traditionally grown less remunerative to more remunerative crops.

4. The contribution of crop diversification agricultural growth is significant. The study has revealed that crop diversification is the ultimate solution to many problems. It must be viewed as an opportunities particular in low rain area, which were rather by present the green revolution phase. It can be used as effective measure to evaluated rural poverty and generally rural employment and conserve natural resources.

5. Therefore, farmers in this area should be guided and trained for the advanced method of irrigation such as drip, sprinklers etc. Which save water and decreases threat of salinities. Velhe, Mulshi, Purandar and Baramati have scarcity during summer season. In the tahsils like Havili, Shirur, Daund and Indapur due to over irrigation as well as use of the chemical fertilizers results into soil degradation. To overcome on the issue of soil degradation use of organic manures and fertilizers management programme is one of the prime requirements in this study area.

**References:**

Ayyar, N.P.,(1969): Crop Regions of Madhya Pradesh, A Study in Methodology, Geographical Review of India, Vol.31, No. 1, pp. 1-19.

Bhatia, S.S., (1965): Patterns of Crop Concentration and Diversification in India, Economic Geography, 41, pp. 40-56.

Census of India (2001 and 2011), District Census Handbook of Pune 2011.

Hazra, C. R. (2001): Crop Diversification in the Asia-Pacific Region, RAP Publication, 2001/03,Thailand, pp-32-36.

Husain, M., (1972): Crop Combination Regions of Uttar Pradesh: A Study in Methodology, Geographical Review of India, Calcutta, 38/1.

Husain, M., (1976): "A New Approach to the Agricultural Productivity Regions of the Sutlej-Ganga Plains-India", Geographical Review of India. 36, pp.230-236.

Jasbir Singh, (1976): "An Agricultural Geography of Haryana", Kurukshetra, Vishal Publications, pp. 131-138, 187-190.

Kendall, M. G., (1939): 'The Geographical distribution of crop productivity in England', Journal of the Royal Statistical Society, 52: pp.21-48

Siddiqui, S. H., (1984): 'Regional Analysis of Agricultural productivity in Bihar', The Geographer, 31(1), pp.77-85.

Socio-Economic Reviews & Statistical Abstracts of Pune District, 2005-2016.

Stamp, L.D,. (1952): The Measurement of Agricultural Efficiency with Special Reference to India, Silver Jubilee Souvenir Volume, Indian Geographical Society, pp. 177-78.