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"SPATIAL ANALYSIS OF AGRICULTURAL DEVELOPMENT IN NASHIK DISTRICT: A TAHSIL LEVEL STUDY"

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Abstract:

Agriculture is not only an importance sector of an economy rather it feeds other sectors of economy. Agriculture plays an important role in economic development of the country. Agricultural development is an integral part of overall economic development in the country like India. For well agricultural development requires modernization and commercialization of agriculture. It is highly possible if good agricultural infrastructure is provided to agriculture activity dominated area. At national and local level, availability of such agricultural infrastructure is not well distributed, which is responsible to create regional disparity in agricultural development. In Nashik district also, such regional disparity in agricultural development is observed in large scale. Therefore it is important to highlight the less developed agricultural region and try to promote the agricultural development. Present work is an attempt in the same direction but at tahsil level.

The aim of the present paper is to analyse the level of Agricultural development in Nashik District in 2014-15.For determining the level of Agricultural development, ten variables were selected. By using the data about all variables, the co-efficient index are calculated for each tahsil. On the basis of co-efficient index, all tahsils were categorized into three categories i.e. low, medium & high, according to their level of Agricultural development. The level of agricultural development is very low in the western part of the study region, where topography is rugged, agricultural infrastructure is not well developed and economic condition of farmer is not sound. Niphad tahsil is highly developed due to well-developed agricultural infrastructure, good area under major cash crops and development of agro-based industries. Whereas the level of agricultural development in the rest part of the study region is medium.

Key Words: Irrigation, Co-efficient Index, Cropping Intensity, Cash crops, Horticulture and Agro-based industry.

Introduction:

Agriculture is not only an importance sector of an economy rather it feeds other sectors of economy. Agriculture plays an important role in economic development of the country. Agricultural development enhances social and cultural development due to an increase in per capita income (Kazma Khan & Lubna Khalil, 2013) Agricultural development is an integral part of overall economic development in the country like India. For well agricultural development requires modernization and commercialization of agriculture. It is highly possible if good agricultural infrastructure is provided to agriculture activity dominated area. At national and local level, availability of such agricultural infrastructure is not well distributed, which responsible to create regional disparity in agricultural development.

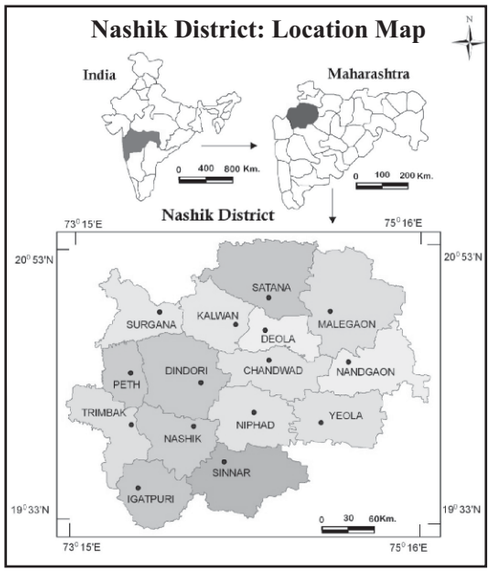
Nashik district is a major agriculturally dominant district in the Maharashtra. In Nashik district also, such regional disparity in agricultural development is observed in large scale. Therefore it is important to highlight the less developed agricultural region and try to promote agricultural development. Present work is an attempt in the same direction but at tahsil level.

Study Area:

Nashik District is situated partly in the Tapi basin and partly upper Godavari basin. It lies between 19° 33` to 20° 53` north latitude and 73° 15' to 75° 16' east Longitude (Nashik Gazetteer,1983). Nashik is one of the agriculturally dominant district in the Maharashtra. Nashik

District has an area of 15,530 Sq.k.m. Nashik District had population 6,109,052 as per the 2011 census. Location of the study area is showed in Map No.1. The district is divided into 15 tahsils, which consisting of 1930 villages. The main system of hills is the sahyadries, which run north- south in the western portion of the district. In the extreme north is selbari range, which approximately forms and boundary between Nashik and Dhule district. Next is the Satmala range which runs right across district. Kalsubai range is located in the south part of the district. The district has two main rivers the Girna and the Godavari.

The district is surrounded by Dhule district in the north, Jalgaon and Aurangabad districts in the east, Ahemadnager district in the south, and Thane district in the south- west and Gujarat state in the north- west. Rice, Sugarcane, Onions, Grapes, Pomegranate and Vegetables are the dominant crops of this region. The climate of the district is generally dry except during the monsoon season. The average annual rainfall of the district as a whole is 1034.5mm. The rainfall in general decreases from west to east. The summer season is moderately hot and the temperature varies from 36° c to 43° c. The air is humid during the monsoon season and is generally dry during the rest of the year.



Map. No.1

Objectives: The main objectives of the present paper are as fallows.

i) To analyze the agricultural development in Nashik District.

ii) To analyze the availability of agricultural infrastructure for agricultural development in Nashik District.

iii) To analyze the problems of agricultural development in Nashik District.

Data and Methodology:

The present study is based on the primary and secondary source of data. Primary data is collected from the field work (2014-15) and interviews of 719 farmers from 204 villages of the study region. Secondary data is obtained from the socio-economic abstract of the Nashik district (2013), District census handbook and District Gazetteers. All data were suitably converted into tables drawn

for analysis the agricultural development of the study region. The basic unit for investigation is tahsil and district as a whole.

A Geographical Information System (GIS) technique is also used to prepare the maps. For that purpose, Autodesk Map 2004 and Illwis 3.8 software are used. Statistical tools like percentage and average have been used in the study. Data is processed and represented with the Choropleth map. The Kendall's ranking co-efficient index method (1939) is used to determine the level of agricultural development of Nashik District. For that purpose, co-efficient Index is calculated for each tahsil of the study region. The levels of Agricultural development have been determined on the basic of 10 variables. They are as follow.

X1=Percentage of Gross Cropped Area
X2= Percentage of Irrigated Area
X3= Numbers of Tractors (Numbers converted into %)
X4=Numbers of Iron Plough (Numbers converted into %)
X5=Number of Electrical Pump used for Irrigation (Numbers converted into %)
X6= Cropping Intensity.
X7=Percentage of Major cash crops (Grapes, Sugarcane, Onion & Pomegranate) to Gross Cropped Area.
X8=Use of fertilizers in agriculture (MT)
X9= Use of electricity for agriculture (000 KW)
X10=Number of agricultural credit society

By using data about above 10 variables the Co-efficient Index is calculated for each tahsil of the Nashik District by using the Kendall's co-efficient Index methods. The Co-efficient Index is inversely related to development i.e. lower the index the more development and higher the index low the development. For the calculation of Co-efficient Index, following formula of Kendall's is used.

$$\text{Kendall's Co-efficient Index} = \frac{\sum R}{N}$$

Where $\sum R$= Sum of rank, N=Numbers of variables.

Results & Discussion:

The variables for Agricultural Development: Ten variables are selected to determine the level of Agricultural development in the study region. all These variables are shown in the Table No.1.

i) Percentage of Gross Cropped Area (X1):

This is a vital variable to determine the levels of agricultural development in the region. This variable shows area under cultivation of the region. It is highest in Dindori tahsil (64.01%) & Nashik tahsil (61.22 %), whereas it is very low in Peth (23.63 %) & Trimbak (23.89 %) tahsil of the study region due to undulating topography of the region

ii) Percentage of Irrigated Area (X2):

Water is basic input in agriculture (Patel, 2013).For agriculture development supply of artificial water in the form of irrigation is important. Irrigation is necessary for almost any kind of agricultural development and prerequisite for the success of modern technology in agriculture (Gomatee Singh and S. W. Ashraf, 2012).Irrigation makes possible the growth of more than one crops where one is grown, and one or more where nothing is possible. The Niphad tahsil having maximum irrigated area (86.53 %) followed by Nashik (78.93%) tahsil of the study region. It is very low in the western part as well as in rain shadow areas of the district. Percentage of the irrigated area in these areas is ranging from 15 % to 40 %.

iii) Use of Tractors (X3):

Tractors also helps to increase cropping intensity by enabling the farmer to save time and hence grow an extra new crops or to devote more area to existing crops. The maximum use of tractors is found in Niphad (66.67 %), Dindori (62.26 %) & Nashik (57.05 %) tahsils. Whereas it is very less in Surgana (00.00 %) and Peth (01.54 %) tahsil because low income of farmers and not in condition to buy tractor for agricultural operations.

iv) Use of Iron plough numbers (X4):

This is another important variable, which is used to determine the agricultural development. With the help of iron plough farmers enable to carry out farming operation more quickly for ploughing the agriculture land. In the use of iron plough Nandgaon (92.11 %) is top in the list, while in Peth (15.38 %) tahsil use of iron plough for agriculture is very less.

v) Use of Electrical Pump for irrigation(X5):

By using electrical pump irrigation water is possible to provide to crops within short time & according to their requirement. Therefore it is important variable in measuring agricultural development. The use of electrical pump is maximum in Niphad (98.15%) & Chandwad (97.87 %), while it is very less in Peth (27.69 %) & Trimbak (46.15 %) tahsil due to rugged topography and availability of limited irrigation facilities.

vi) Cropping Intensity (X6):

Cropping intensity is refers to the use of a field several times during a cropping year. The highest cropping intensity is observed in Dindori tahsil due to horticulture development (146.04), whereas is lowest in Peth (103.06 tahsil lack of irrigation facility of the study region.

Table No.1: Nashik District: Spatial Distribution of Agricultural Development

Sr. No.	Name of Tahsil	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10
1	Surgana	49.62	19.31	00.00	33.33	55.56	123.87	07.24	3428	19.81	00
2	Kalwan	26.09	69.4	16.95	57.63	77.97	103.15	12.87	16642	528.28	18
3	Deola	53.23	70.95	38.46	88.46	80.77	121.33	49.24	12300	589	40
4	Satana	42.32	65.03	25.00	81.25	75.00	123.38	56.21	25054	1512	92
5	Malegaon	48.37	68.76	16.67	68.33	88.33	140.53	41.8	28243	3034	128
6	Nandgaon	53.09	61.52	39.47	92.11	89.47	127.16	33.67	19622	581	70
7	Chandwad	42.63	75.69	42.55	91.49	97.87	117.73	56.44	22254	664	82
8	Dindori	64.01	69.53	62.26	64.15	96.23	146.04	49.22	27120	564	34
9	Peth	23.63	29.07	01.54	15.38	27.69	103.06	04.32	3490	190	00
10	Trimbak	23.89	33.39	09.62	42.31	46.15	110.99	04.4	3417	1268	07
11	Nashik	61.22	78.93	057.5	62.5	80.00	128.29	30.06	34460	3342	59
12	Igatpuri	55.36	56.76	28.95	52.63	71.05	139.22	04.79	6603	1268	28
13	Sinnar	39.06	63.42	34.62	61.54	90.38	134.83	24.44	19044	1085.4	98
14	Niphad	57.41	86.53	66.67	68.52	98.15	135.5	67.51	46948	1676	132
15	Yeola	41.28	72.76	23.53	78.43	96.08	129.07	35.1	25546	1146	82

Source: Compiled by Author, based on Field Survey 2014-15.

N.B.: Data of Use of fertilizer, Electricity & No.of Agri. Credit Society (Year 2012-13), Nashik District Socio-Economic Abstract 2013.

Table No.2 Nashik District: Ranking Co-efficient Index

Sr. No.	Name of Tahsil	X1	X2	X3	X4	X5	X6	X7	X8	X9	X 10	∑R	Co-Efficient Index
1	Surgana	07	15	15	14	13	09	12	14	15	15	129	12.9
2	Kalwan	13	07	11	11	10	14	11	10	13	12	112	11.2
3	Deola	05	05	06	03	08	11	04	11	10	09	72	7.2
4	Satana	10	09	09	04	11	10	03	06	04	04	70	7.0
5	Malegaon	08	08	12	07	07	02	06	03	02	02	57	5.7
6	Nandgaon	06	11	05	01	06	08	08	08	11	07	71	7.1
7	Chandwad	09	03	04	02	02	12	02	07	09	06	56	5.6
8	Dindori	01	06	02	08	03	01	05	04	12	10	52	5.2
9	Peth	15	14	14	15	15	15	15	13	06	14	136	13.6
10	Trimbak	14	13	13	13	14	13	14	15	14	13	136	13.6
11	Nashik	02	02	03	09	09	07	09	02	01	08	52	5.2
12	Igatpuri	04	12	08	12	12	03	13	12	05	11	92	9.2
13	Sinnar	12	10	07	10	05	05	10	09	08	03	79	7.9
14	Niphad	03	01	01	06	01	04	01	01	03	01	22	2.2
15	Yeola	11	04	10	05	04	06	07	05	07	05	64	6.4

Source: Compiled by Author, 2015.

vii) Percentage of area under major cash crops to Gross Cropped Area (X7):

Cash crop is a highly specialized crop grown for the purpose of earning cash income. This is very useful parameter for measuring level of agricultural development. In Nashik district grapes, sugarcane, onion & pomegranate are the major cash crops, therefore combine area under all these cash crops is considered to determine the level of agricultural development of the region. The area under pomegranate is increasing rapidly during the last 15 years in the study area. It is very high in Niphad (67.51 %) & Chandwad (56.44 %) tahsil, while it is low in Peth (4.32 %) & Trimbak (4.40 %) due to unfavorable environment and lack commercialization in agriculture.

viii) Use of fertilizer in agriculture (X8):

Use of fertilizers play a vital role in agricultural production by replenishing fertility of the soil (Singh M.B. & Singh D.K., 2007).The use of fertilizer is more in Niphad and Nashik, where area under cash crops and vegetable is high. On other hand it is very less in Peth, Surgana and Trimbak tahsil where economic condition of farmer is not sound and awareness about use of fertilizer is also less. ix)

Use of electricity for agriculture (X9):

The use of pumping set for irrigation require power to draw underground water for purpose of cultivation. The area of regular use of irrigation increased the use of electricity. In the study area use of electricity for agriculture is highest in Nashik whereas it is lowest in Surgana tahsil.

x) Number of agricultural credit society (X10):

Agricultural credit is considered as an important infrastructure facility for agricultural development. For the purpose of agricultural development, the farmer need money (capital).It is requires for digging a well, installing a tube well, for purchase of seeds, manure's, fertilizers and other agricultural implements (Patel, 2013).The major source of credit is agricultural co-operative society. Such societies provide loans for farmers for productive purpose. Therefore availability of such societies is very important in agricultural development. The availability of such societies are highest in Niphad (132) and it is totally absent in Peth and Surgana tahsils of the study region.

Level of Agricultural Development:

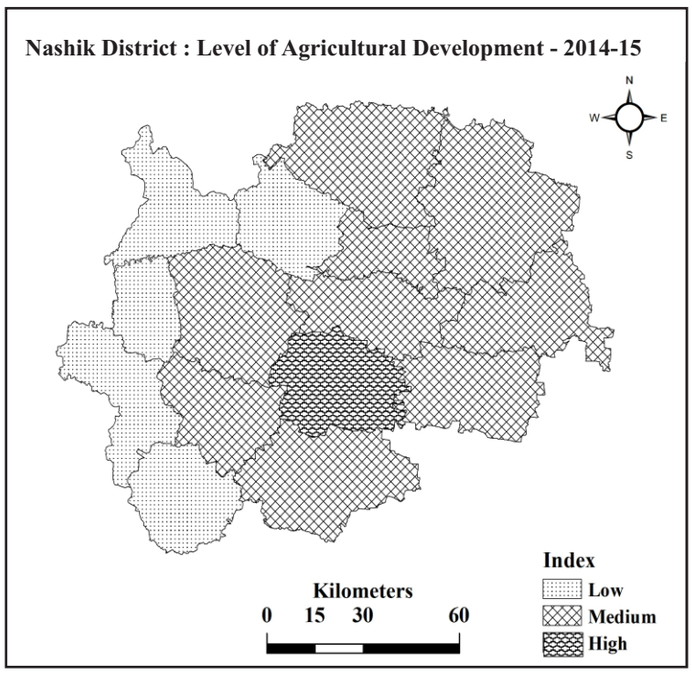
For the measuring the levels of agricultural development in the study region ten variables

have been taken into account collectively. By using data about above 10 indictors the Co-efficient Index is calculated for each tahsil, which are shown in the Table No.2. On the basis of Co-efficient Index, the agricultural development have been categorized into three categories i.e. Low, medium & high. The Table No.3 & Map No.2 indicates the classes about level of agricultural development in each tahsil of the study region.

Table No.3: Nashik District: Level of Agricultural Development-2014-15

Sr. No.	Co-efficient Index	Level of Agricultural Development	Names of Tahsils
1	0-4	High	Niphad
2	4-8	Medium	Nashik, Dindori, Chandwad, Malegaon,Yeola, Nandgaon , Satana, Deola and Sinnar
3	Above 8	Low	Peth, Surgana, Kalwan, Trimbak and Igatpuri

Source: Compiled by Author, 2015.



Map. No.2

1)Low Agricultural Development:

This category consists of five tahsils i.e. Peth, Surgana, Kalwan, Trimbak and Igatpuri tahsils of the study region. all These tahsils are located in the western parts of the study region. This entire belt has been characterized by adverse conditions like hilly, poor soils, less accessibility and low income of farmers. The farmers also not well aware about new farm technology and lack of commercial attitude about agriculture. Therefore this part of the study area in not too much developed.

2)Medium Agricultural Development:

The medium level categories comprises in nine tahsils i.e. Nashik, Dindori, Chandwad, Malegaon,Yeola, Nandgaon, Satana, Deola and Sinnar.These tahsils achieved medium agricultural development due to dominance of three to four variables of agricultural development. Main factors for medium agricultural development in these area are increasing the area under cash crops and developing agricultural infrastructure. Mostly Dindori tahsil developing rapidly due to horticulture and agro-based industrial development. In most villages of this tahsil farmers used polly houses and green house for horticulture purpose.

3) Highly Agricultural Development:

Only one tahsil come under this category i.e. Niphad. Many variables are dominated in this tahsil. These tahsil achieved high agricultural development due to well-developed agricultural infrastructure. It includes well irrigation facilities, developed agro-based industries, availability of credit (capital) & transportation network. One importance factors which responsible for high agricultural development is area under cash crops is increased during last 25 years and notable gainer includes sugarcane, grapes and onion. These cash crops gives good return to farmers.

Conclusion:

The present study reveals that agricultural development is not well distributed in the study region. The majority of the tahsils come under medium agricultural development. It is laying in the central, eastern and south part of the study region. While the tahsils located in the western part are less developed as agricultural development is considered. Where physical environment is unfavorable & agricultural infrastructure is less developed. The study is highlight that Niphad is the highly developed tahsil due to enjoying the many agricultural infrastructural facilities. It includes irrigation, road network, agro-based industries and good income of the farmers. It is clear that agriculture in western part cannot develop, unless irrigation is provided over much wider areas.

In all part of study region facing some agricultural problems, only the nature of such problems are different from palace to place. Therefore, special attention should be given to agriculturally backward areas by the planners, so that regional disparities could be minimized. Irrigation facilities should be developed in western the study region; it will help to increase cropping intensity of the region. Seeing the adverse effects of use of chemical fertilizers in Niphad tahsil, there is need to promote the use of natural and organic manures. It is also important for sustained agricultural production. Adequate attention is necessary for market incentives, especially in the medium developed region of the study area. During the rainy seasons in the western part of the study region, roads become muddy and thus very inconvenient for vehicles. Roads must be compliment and coordinate with railway station and other important market places. Western region has limitation for agricultural development, so some allied occupation of agriculture, like animal husbandry, agro-tourism etc. should be developed in this region. Post-harvest management and marketing linkages also important for overall development of agriculture in the study region. For this purpose crating awareness in the farmer is very important. Role of Government is very important in less developed region. Government should promote an irrigation facilities and other agricultural infrastructure for balanced development of agriculture of the region.

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