Pattern of Levels of Agricultural Development: A Case Study of Sample Selected Villages in Solapur District

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Abstract:

The present paper is an attempt to show the spatial pattern of agricultural development in the Solapur district of selected sample villages. In the sample selected villages of the study area is more variation in the adoption of improved agricultural practices to ascertain level of agricultural development, the spatial variation is determined with the help of twelve variables i.e. net sown area, area under more than once, cropping intensity, irrigation intensity, % of surface irrigation, area under HYV, consumption of fertilizers per hectare, area under food grain crops, area under non-food grain crops, number of agricultural implements per 100 hectares, average food yield, percentage of agricultural workers etc. Concern these variables information collected from the personal interview method to the selected farmers from the selected villages in study area. Besides this the development of villages 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 12 variables using Z-score to get composite scores, On the basis of composite Score the villages have

been classified into high, medium and low development categories. Out of 20 villages of study 9 villages are under the category of high level of agricultural development such as Mundhewadi, Chincholi Bhose, Mahud Bk, Wakhari, Gopalpur, Ozewadi, and Anawali, medium category include 5 villages they are Jainwadi, Bhandi Shegaon, Watambare, Katfal and Shivane and lastly the low development include 6 villages such as Sonanad, Kola, Chincholi, Javala, Medshingi and Snagewadi. 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.

Key words: Levels of development, Irrigation Intensity, Cropping Intensity.

Introduction:

Agricultural productivity is becoming increasingly important issue as the world population continues to grow. India, one of the world's most populous countries, has taken steps in the past decades to increase its land productivity. Agriculture still forms the backbone of Indian economy, in spite concerned efforts towards industrialization in last three decades. Agriculture contributes a high share of net domestic product by sectors in India. Farmers are growing numerous of crops in the field rather than single crop. Agriculture production is influenced by physical, climatologically, socio-economic, and technological and organization factors, farmer's attitude but the availability of irrigation facilities is the most important determinant on the agricultural productivity. Because the inputs of agriculture such as use of HYV, use of fertilizers, use of advanced technology, agricultural mechanization, cropping intensity etc. are totally based on the availability and all these effects on the agricultural productivity. Therefore irrigation is an important determinant of the agricultural productivity. Present study gives an idea of real situation of irrigation facilities and its

effects on the variations in the agricultural productivity in the study area.

Study Area:

Solapur district is situated in the western part of Maharashtra state. The district lies between 17^0 10' to 18^0 32' North latitude and 74^0 42' to 76^0 15' East longitude. It is bounded by Pune and Satara district to the West, Osmanabad district to the east, Sangli district and Karnataka state to the South, Ahmednagar district to the North. The total geographical area of the district is 14,895 sq. km with population of 43.16 lakh of which 22.34 lakh were males and 20.82 lakh females as per 2011 census. The maximum and minimum temperature throughout the year is 40.1^0 C and 16.1^0C respectively with an average rainfall of 561.47 mm annually. In the year 2008-09, the total area under crop cultivation was 10,30900 hectares of which 2,27100 hectare was irrigated and 7,59,900 hectare was non-irrigated or rainfed area. Jawar, bajara, maize, millets, groundnut and soybean are the major crops grown in *kharif* season, whereas, wheat, potato, gram, tur are the important crops grown in *Rabi* season. Sugarcane is the important commercial crop raised in the district.
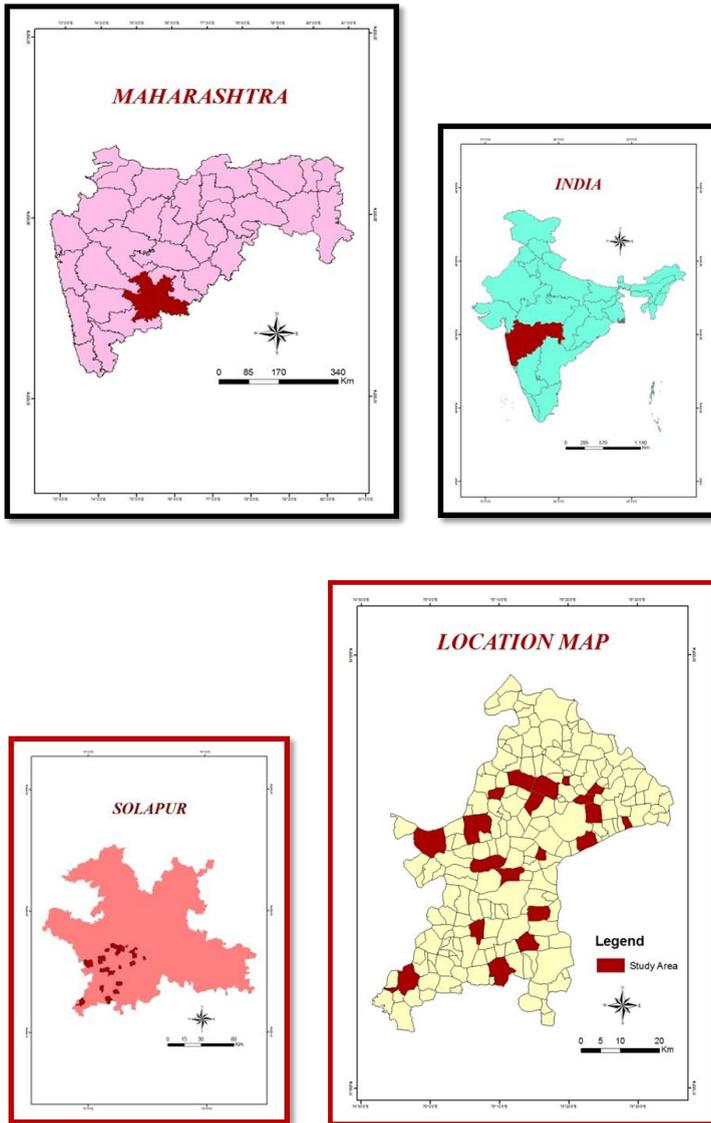
Figure 1: Location Map of Study Area

Aim and Objectives:

The present study is undertaken with the specific objectives of the investigation as follows.

➢ To analyse the spatial variations of different variables
as certain to the levels of agricultural development in
the sample villages of the study area.

➢ To examine the spatial pattern of levels of agricultural
development in the selected villages of study area.

Data Base Methodology:

Present study mostly relies on the primarily data collected
through questionnaire to the farmers in the selected different
villages in the case studies.

Methodology:

The detail study of agricultural development is conducted to
understand the variations in the study area. In this concern
agricultural development are applied for the identification of
variations in the village to village. The collected information
under different variables is termed as measurement of levels of
agricultural development. Collected information tabulated,
arranged in proper format and statistical methods are applied
for the obtaining results. A comparative analysis is made
among 20 villages with 20 farmers to each village to
understand the agricultural development condition of the
present situation due to the variations in the determinants of
agricultural development. The identification of intensity of
cropping, agricultural productivity and levels of agricultural
development in the selected villages of case studies on the basis
of spatial distribution of irrigation facilities.

To study the cropping intensity, agricultural
productivity and levels of agricultural development there are
several statistical techniques available which provides truthful
results.

Methodology for Levels of Agricultural Development:

To determine the level of agricultural development various indicators variable have been used such as Gross cropped area, Net sown area, Net irrigated area, Agricultural implement, Agricultural workers, use of HYV seeds, use of fertilizers per hectare, use of tractors, use of threshers, use of sprayers 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

$$Z - Score\ (Zi) = \frac{Xi - \overline{X}}{S.D.} \qquad (1)$$

Where, Zi -Z-Score For i[th] observation Xi - Original Value of i' the observation $\overline{X}$ - Mean value of X' variables S.D.-Standard Deviation of X' variable.

In order to classify blocks according to their levels of development the composite Z-score have been grouped into high, medium and low.

Further, 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 block may be obtained on a common sale. The composite standard score may be algebraically expressed as

$$CSS = \frac{\Sigma Zij}{N} \qquad (2)$$

Where, CSS= composite standard score, Zij = Z- score of an indicator *j* in block *i*, and N = number of indicators.

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

Table 1: List of Selected Variables

Sr. No.	Variables	Particulars
1	Xi	Percentage of net sown area to the gross cropped area
2	Xii	% of sown area under more than once to gross cropped area
3	Xiii	Cropping Intensity
4	Xiv	Irrigation Intensity
5	Xiv	% of Surface Irrigation to net irrigation area
6	Xv	Percentage of area under HYV to NSA
7	Xvi	Chemical fertilizer (NPK) consumption Kg/hectare
8	Xvii	Number of agricultural implements per 100 hectare
9	Xix	Percentage area under non-food-grain to gross cropped area
10	Xx	Percentage area under food-grain to gross cropped area
11	Xxi	Average yield of food grain
12	Xxiii	Percentage of agricultural workers to the total main workers.

Discussion of the Distribution of Variables:

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

Distribution of variables

Net sown area (Xi):

The net sown area can be defined as the total area sown in a year. Higher the net sown area; higher will be the crop production and in turn will be reflected in agricultural development. The Table 2 shows the position of net sown area (NSA) of the different villages. The Z-score of the villages are categorized under three groups. The high level of NSA lies above 0.50 in the villages of Gadegaon, Ozewadi, Mundhewadi,

Gopalpur, Sonand, Medshingi, Mahud Bk. and Shivane. The eight out of twenty villages fall under this category. The medium group ranges from 0.50 to - 0.50. There are nine villages under this category viz. Tavashi, Anawali, Wakhari, ChincholiBhose, Javala, Katfal, Watambare and Sangewadi. The villages under low NSA below -0.50, include Jainwadi, BhandiShegaon, Kola and Chincholi. Impact of irrigation on the NSA of the selected villages has been observed positive and also negative.

Percentage of sown area under more than once (Xii):

The area under more than once crops in an agricultural year in the same field is known as the area sown more than once. Irrigation is closely influenced on the area sown more than once. It has been observed that the high level of area sown more than once in the villages of Gopalpur, Ozewadi, Jainwadi, BhandiShegaon and Mahud Bk. the moderated found the villages of Gadegaon, Tavashi, Anawali, Mundhewadi, Wakhari, Chincholi, Bhose, Katfal and Watambare. It is occupied ranging from 0.50 to -0.50, the low level of the villages of Sonand, Javala, Kola, Medshingi, Shivane, Chincholi and Sangewadi. It is lies below the -0.50 Z-score index.

Cropping intensity (Xiii):

The intensity of crop refers to the use of a field several times during a cropping year. It is a measure of land efficiency, which is defined as the extent to which the net area sown is cropped or sown. The value of cropping intensity is ranging above from 0.50 under high category which is listed in Table 2. The villages, viz. Gopalpur, Mahud Bk. Ozewadi and Jainwadi come under this category. In medium category the value ranges from - 0.50 to 0.50 and remaining villages, namely Gadegaon, Tavashi, Anawali, Mundhewadi, Wakhari, Chincholi, Bhose and Katfal. The low level of cropping intensity in the villages of Sonand, Javala, Kola, Medshingi, Watambare, Shivane,

Chincholi and Sangewadi are under low category which ranges below from -0.50.

Irrigation Intensity (Xiv):

Irrigation is necessary for almost any kind of agricultural development and prerequisite for the success of modern technology in agriculture. The need of additional and artificial water supply is always felt in successful farming operation. Irrigation plays a significant role in entire agriculture sector. The changing trends in the intensity of irrigation, portrays man's dynamic attempt to overcome environmental limitations to transform the potential of the area into agricultural resources (Singh, 1974).

The total irrigated area has been calculated as per cent of the total sown area and further calculated Z-score of the percentage of total irrigated area. Table 2 indicates that high level of irrigation has been observed in Mundhewadi, Ozewadi, Gopalpur, Chincholi, Bhose, Wakhari and Gadegaon. The medium level of irrigation intensity has been observed in Jainwadi, Bhandi Shegaon, Katfal, MahudBk and Snagewadi. There are obtained in the villages under this category viz. Tavashi, Sonand, Javal, Kola, Medshingi, Watambare, Shivane and Chincholi, are come under the low level of irrigation intensity.

Percentage of Surface Irrigation to net irrigation area (Xv):

Surface irrigation is an important for the development of sub-surface and totally development of the agriculture. High level of surface irrigation is occupied in the villages of Chincholi, Bhose highest i.e. 2.12, followed by Mundhewadi, Gopalpur, Gadegaon,

Tavashi, Anawali and Wakhari. The moderate level of surface irrigation has been observed in Jainwadi, Ozewadi, BhandiShegaon, Katfal, Mahud Bk. and Sangewadi. The low

level of surface irrigation obtained in the villages of Sonand, Javala, Kola, Medshingi, Watambare, Shivane and Chincholi are under low category which is below from -0.50.

Area under HYV seeds (Xvi):

The HYV of seeds are the most important factor in agricultural production under the new technique. The success of this programme has revolutionized agriculture and brought about a phenomenal and rapid increase in the food grain production in India and study region. Table 2 shows that area under high yielding varieties of seeds in different villages of the study area. In the high category there are nine villages, viz. Chincholi, Bhose, Wakhari, Gadegaon, Gopalpur, Anawali, Mundhewadi, Jainwadi, Ozewadi and Bhandi Shegaon. There are six villages i.e. Tavashi, Katfal, Watambare, Mahud Bk. Shivane and Sangewadi under medium category. Remaining five villages are under low level using HYV seeds. These are Sonand, Javala, Chincholi, Medshingi and Kola.

Table 2: Standard score and Composite Z-Score of the variables for the agricultural development in Study Area

Sr. No	Name of Village	Xi	Xii	Xiii	Xiv	Xv	Xvi	Xvii	Xviii	Xix	Xx	Xxi	Xxii	Composite Z-Score
1	Gadegaon	0.58	0.16	0.06	0.84	0.92	0.85	1.10	0.09	1.32	-1.32	0.53	-0.59	0.38
2	Tavashi	0.25	0.09	-0.02	-1.09	0.90	-0.07	1.68	1.11	1.20	-1.20	0.03	0.71	0.30
3	Jainwadi	-1.22	0.83	0.75	0.03	-0.20	0.64	0.82	-1.22	1.05	-1.05	1.01	1.55	0.25
4	Anawali	0.38	0.10	0.00	0.52	0.84	0.81	-0.21	-0.27	0.83	-0.83	1.28	0.50	0.33
5	Ozewadi	0.51	1.06	1.01	1.41	-0.27	0.62	-0.69	-0.42	0.90	-0.90	1.46	-0.57	0.34
6	Mundhewadi	0.58	0.25	0.15	1.58	1.56	0.79	1.05	1.33	0.95	-0.95	1.21	0.28	0.73
7	Gopalpur	0.58	1.97	2.20	1.56	1.27	0.82	-0.99	-1.44	0.77	-0.77	0.75	-0.91	0.48
8	Wakhari	0.45	0.04	-0.06	1.08	0.91	0.89	1.56	-0.49	1.12	-1.12	0.99	0.70	0.51
9	BhandiShegaon	-0.55	1.58	1.67	0.30	-0.25	0.57	-0.42	-1.22	-0.23	0.23	0.37	0.56	0.22
10	ChincholiBhose	0.31	0.26	0.15	1.14	2.12	0.90	0.89	0.31	1.09	-1.09	0.66	1.15	0.66
11	Sonand	0.55	-1.90	-1.60	-1.25	-1.14	-2.63	-1.81	-0.05	-1.22	1.22	-1.42	-0.84	-1.01
12	Javala	0.39	-0.97	-0.93	-1.46	-1.14	-2.10	-0.55	1.26	-1.37	1.37	-1.36	-0.35	-0.60
13	Kola	-3.67	-0.79	-0.78	-1.12	-1.14	-0.55	-0.51	1.48	-1.32	1.32	-1.11	-2.22	-0.87
14	Katfal	0.25	-0.33	-0.39	-0.17	0.11	0.12	-0.59	1.92	-0.18	0.18	-0.72	-0.12	0.01
15	Medashingi	0.58	-0.89	-0.87	-1.06	-1.14	-0.77	-0.60	0.09	-0.90	0.90	-1.41	-0.75	-0.57
16	Watambare	0.37	-0.47	-0.52	-0.87	-1.03	0.33	0.29	0.60	-1.08	1.08	-1.74	-0.26	-0.28
17	Mahudbk	0.58	1.68	1.79	0.13	-0.41	-0.29	1.28	-0.64	-0.28	0.28	0.44	2.46	0.58
18	Shivane	0.58	-0.81	-0.81	-1.09	-0.63	0.23	-0.13	0.02	-1.50	1.50	-0.33	-0.61	-0.30
19	Chincholi	-1.09	-0.68	-0.70	-0.61	-1.14	-1.42	-0.50	-1.37	-0.36	0.36	-0.59	-0.36	-0.70
20	Sangewadi	-0.39	-1.18	-1.09	0.11	-0.16	0.27	-1.66	-1.08	-0.81	0.81	-0.05	-0.33	-0.46

Source: Compiled by Researcher

Consumption of Chemical (NPK) Fertilizer (Xvii):

For improving the yield rate, timely and adequate provision of inputs like fertilizer, HYV seeds and insecticides is of prime importance. Chemical fertilizers have played their crucial role in increasing agricultural production and solving the problem of low yield in area. The consumption of fertilizers in different villages is ranging from 1.68 to -1.81 of their z-score. High level of consumption of fertilizer has been recorded in villages' viz. Tavashi, Wakhari, MahudBk, Gadegaon, Mundhewadi, Chincholi, Bhose and Jainwadi. There are five villages having medium level of consumption; they are Anawali, BhandiShegaon, Watambare, Shivane and Chincholi. The low level of fertilizer consumption recorded in the villages of Sonand, Sangewadi, Ozewadi, Gopalpur, Javala, Kola, Katfal and Medshingi.

Agricultural implements (Xviii):

New agricultural technology is not only a package of hybrid seeds and other modern input, but it also incorporates new agricultural practice. This has made the mechanical power necessary for some operations which are very necessary during scarcity of labour and relatively high wages rates particularly during the peak season. Agricultural implement are other important factors of agricultural development. If we use modern agricultural implements we can advance our agriculture in time saving period. The high number of agricultural implements has been recorded in the villages of Katfal, Kola, Mundhewadi, Javala, Tavashi and Watambare. The moderate agricultural implements are occupied in the villages of Chincholi Bhose, Gadegaon, Medshingi, Shivane, Anawali, Ozewadi and Wakhari. Remaining villages viz. Chincholi, Sangewadi, Jainwadi, Gopalpur, Bhandi Shegaon and MahudBk come under the low category.

Area under Food-Grain (Xix):

Irrigation is an impact on the area under different crops and is determinant the level of agricultural development in any region. A farmer adopts each kind of technique for cropping practices to increase the area of crops because choice of crops leads to the overall development of the farmer. The area of the selected food grain crops is calculated for each twenty villages of the study area. The spatial variation and to demarcate the area of food grain region the index value further calculated the Z-score and categorized under three groups. The value of the high area under food grain villages are Shivane, Javala, Kola, Sonand, Watambare, Medshingi and Sangewadi. Under the moderate category occupied the villages of Chincholi, Mahud Bk., Katfal and Bhandi Shegaon. The low food grain area is recorded in the villages of Gadegaon, Tavashi, Wakhari, Jainwadi, Chincholi, Bhose, Ozewadi, Anawali, Gopalpur and Mundhewadi.

Area under Non-Food-Grain (Xx):

The HYV of seeds are the most important factor in agricultural production under the new technique. The success of this programme has revolutionized agriculture and brought about a phenomenal and rapid increase in the food grain production in India and study region. Table 2 shows that area under high yielding varieties of seeds in different villages of the study area. In the high category there are nine villages, viz. Chincholi, Bhose, Wakhari, Gadegaon, Gopalpur, Anawali, Mundhewadi, Jainwadi, Ozewadi and Bhandi Shegaon. There are six villages i.e. Tavashi, Katfal, Watambare, Mahud Bk. Shivane and Sangewadi under medium category. Remaining five villages are under low level using HYV seeds. These are Sonand, Javala, Chincholi, Medshingi and Kola.

Average yield of food grain (Xxi):

Agricultural productivity determines the level of agricultural development in any region. It refers to per acre or hectare of yield in a unit (kg/quintals etc.) of any crop in region or field. A farmer adopts each kind of technique to increase the productivity of crop because it leads to the overall development of the farmer. The agricultural productivity of the selected food grain crops is calculated for each twenty villages of the study area. The spatial variation and to demarcate the productivity region the index value further calculated the Z-score and categorized under three groups. The value of the high productivity villages are Ozewadi, Anawali, Mundhewadi, Jainwadi, Wakhari, Gopalpur, Chincholi, Bhose and Gadegaon. Under the medium level of crop productivity is recorded in villages Tavashi, Bhandi Shegaon, Mahud Bk., Sangewadi and Shivane come under this category. The low productivity is recorded in the villages of Watambare, Sonand, Medshingi, Javala, Kola, Katfal and Chincholi.

Agricultural Workers (Xxii):

Like the other inputs such as chemical fertilizers, HYV seeds, machineries etc. agricultural labourers are also the important factor for agricultural development because there are many activities in the field which they perform. Table 2 indicates that the number of agricultural workers in the selected villages. In high category the villages are Mahud Bk., Jainwadi, Chincholi Bhose, Tavashi, Wakhari, Anawali and Bhandi Shegaon. In the villages of Mundhewadi, Javala, Katfal, Watambare, Chincholi and Sangewadi are under this category. Remaining villages namely Kola, Gopalpur, Medshingi, Sonand, Shivane, Ozewadi and Gadegaon are under the low category.

Levels of Agricultural Development in Selected Villages:

To assess the level of agricultural development in study area, all the twelve variables have been aggregated. The Z-score value of twelve variables transformed and combined with the help of Z-score and prepared composite score (Table 2). The composite score ranges from 0.73 (highest) in Mundhewadi of Pandharpur tehsil to -1.01 (lowest) in Sonand village of Sangola tahsil. Mundhewadi is the most developed village and Sonand is at the bottom village in the study area.

On the basis of composite Z-score, the selected villages have been categorized into three classed viz. high, medium and low (Figure 2) which clearly shows the spatial variation in level of agricultural development in study area.

High Levels of Agricultural Development:

On an agreement nine villages viz. Mundhewadi is highest followed by ChincholiBhose, Mahud Bk. Wakhari, Gopalpur, Gadegaon, Ozewadi, Anawali and Tavashi, which ranges their composite Z-score above 0.30. They are highly developed villages. It has been observed that wherever the highly intensity of irrigation obtained those majority of villages are highly agricultural developed.

Table 3: The spatial pattern of level of agricultural development in Selected Villages

Z-score value	Level of agricultural development	No. of Villages	Name of the Villages
0.30 and above	High	9	Mundhewadi, Chincholi Bhose, Mahud Bk, Wakhari, Gopalpur, Gadegaon, Ozewadi, Anawali, Tavashi
-0.30 to 0.30	Medium	5	Jainwadi, BhandiShegaon, Katfal, Watambare, Shivane.
Less than – 0.30	low	6	Sonand, Kola, Chincholi, Javala, Medshingi, Sangewadi.

Source: Compiled by researcher

Moderate Levels of Agricultural Development:

The villages fall under the medium category having their
composite Z-score ranging from the -0.30 to 0.30. This category
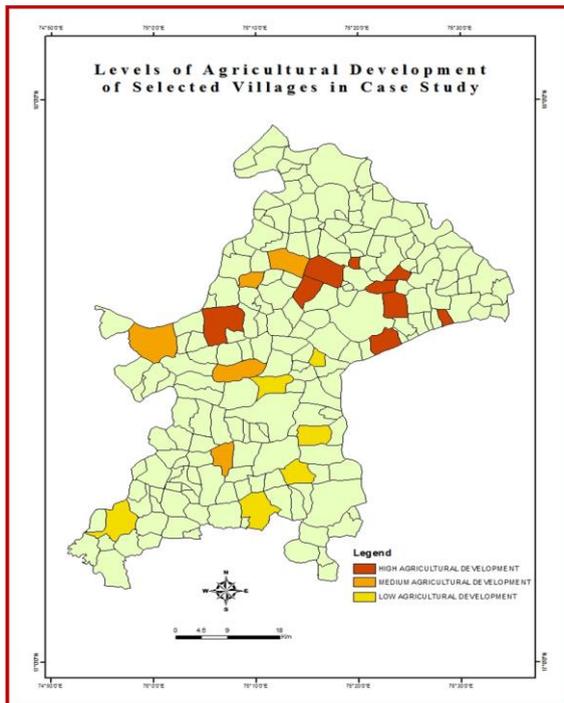includes the villages namely, Jainwadi, BhandiShegaon, Katfal,
Watambare and Shivane.

**Figure 2: Selected villages of levels of agricultural development
prepared by composite Z-score technique.**

Low Levels of Agricultural Development:

Six villages having their composite Z-score below -0.30 come
under the low level of agricultura development, these are
Sonand, Kola, Chincholi, Javala, Medshingi and Sangewadi.
Sonand village is shows the lowest level of agricultural
development in the study area.

In short, it has been observed that the irrigation is an
important determinant influenced on the levels of agricultural

development. The above discussion and table shows the wherever highly developed irrigation facilities that villages with well-developed to the other variables and automatically highly agricultural developed.

Conclusion:

It has been observed that the spatial distribution of variables and agricultural development is not uniform in the study area. It provides very significant information about the level of agricultural development in the study area. The study highlight that the nine villages of the district come under the high category of agricultural development and the medium level of agricultural development is seen in five villages of the study area, while the six villages lying on the Sangola tehsil, are agriculturally less developed because of low development of irrigation facilities and its impacts on the other variables of the responsible for the agricultural development. For development there is a need for re-structuring of the agriculture which has to be done within certain limits of economic, social, and political factors, as well as the national goal; and to making the agricultural society more dynamic. Therefore, it has been concluded through the study that high level of agricultural development is found in the villages of Pandharpur tahsil. These villages attained this status due to a variety of reasons. But most important reason of these villages, the farmers living in this portion enjoy better irrigation facilities mainly surface irrigation facilities; so cropping intensity is high with plenty of agricultural workers coupled with more production of food grains. The medium level of agricultural development is found in the some villages of Pandharpur tahsil and some Sangola tahsil wherever moderate availability of irrigation facilities of the study area.

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