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Impact of Relationship Between Agricultural Performance and Technology on Agriculture Development of Solapur District: A Geographical Analysis

Dr. Chandrakant Narhari Kale
Dept. of Geography, Karmaveer Bhaurao Patil Mahavidyalaya Pandharpur
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Abstract:

Agriculture is significant activity as concern to India, have important role in country economic. There development and growth depends on different technology which are used in agricultural activities. The research study examines the spatial interrelationship between agricultural performance and agricultural technology in Solapur district, Maharashtra, a drought- prone region in the Bhima-Sina-Man river basins. In research paper, using tahsilwise research data from 2020, also, where, agricultural performance has measured through Jasbir Singh's (1990) Weighted Composite Index and incorporating crop yield and cropland occupancy for major crops such as Jowar, Bajra, Wheat, Gram, and Sugarcane. The whole analysis of research reveals that significant spatial variations across the district's 11 tahsils. Sangola tahsil, it shows very high performance (index 1411) and very high technology (103.5) which is driven by horticultural crops like pomegranate and grapes, beside farmers' innovative practices. Tahsils such as Pandharpur represent high performance with moderate technology which is benefiting from canal and lift irrigation from the Bhima River and Ujjani Dam. In contrast, Madha tahsil, Mangalwedha tahsil and Karmala tahsil show high performance, but low technology, relying on natural rainfall as well as limited irrigation despite projects like Bhima-Sina link. Malshiras tahsil records moderate performance with high technology, supported by agro-based industries and subsidized inputs from sugar factories. Moderate to low categories dominate in eastern and central tahsils like North Solapur tahsil which constrained by rain-shadow effects, unreliable rainfall and inadequate irrigation. The research findings underscore a positive, but uneven correlation during technology adoption as well as performance which is influenced by irrigation facilities, cooperative support, farmer attitudes, and physiographic factors. The enhanced technology dissemination in low-performing areas could reduces regional disparities as well as promote sustainable agricultural development in semi-arid Solapur district.

Keywords: Agricultural performance, Agricultural technology, Spatial variation, Composite index, Irrigation, Horticulture, Technology.

Introduction:

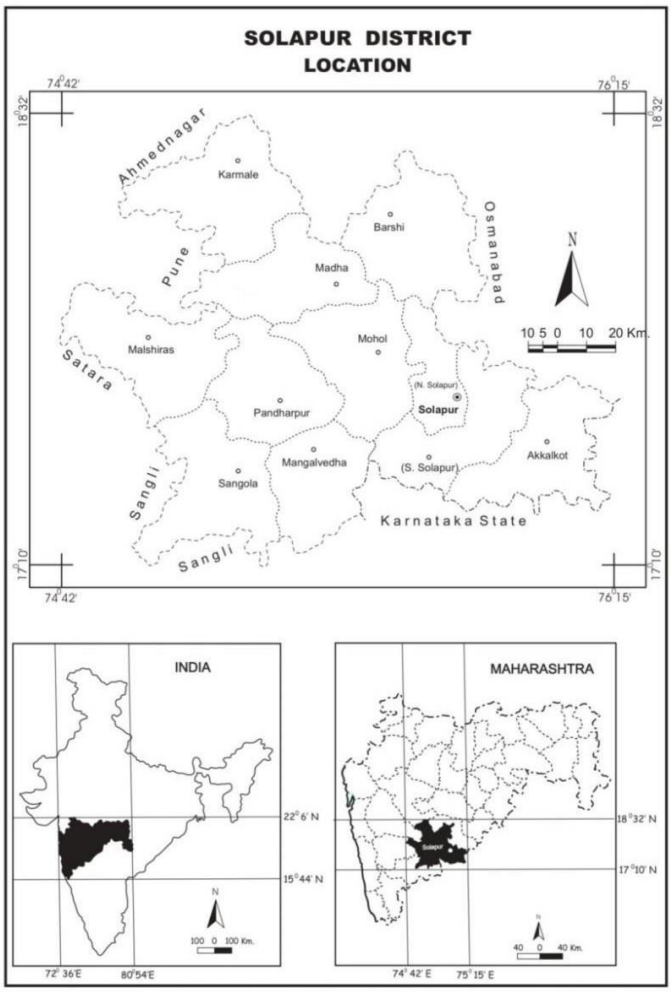
The agricultural productivity is also defined as the level of existing performance of a unit of land which differentiates from one area to another (Muhammad Ali, 1979). The differential partly by soil types and climate and partly by the farming techniques, Agricultural productivity a dynamic in its spatio temporal perspectives, The development of Technology facilities, Irrigation, Mechanization, use of fertilizers and high yielding verities of seeds adoption of other components of new technology leads to variation in agricultural efficient per unit of time and space. (Ajagekar B.A., 1988)Being a n interdisciplinary study, many scholars 1960 Agriculture Mechanization from different fields like Economic, Agriculture, and Geography etc. have evolved different methods to measure the agricultural productivity. Agricultural development implies maximum economic utilization of land and this means land has to be provided with adequate water and fertilizer which

is conjunction with multi cropping land to increased yield and income from the land (Shinde S.D. 1980). In fact, agricultural change cannot be understood separately from general process of development. However agro-technical determinants like irrigation, fertilizers, high yielding verities of seeds, agricultural landscape and provide a frame of parameters to measure the level of agricultural development of region. the need arises for measuring and mapping the region inequalities and further to identify backward and advanced areas in terms of agricultural developments. In the succeeding analysis, an attempt has been made to examine the spatial pattern of levels of development in Solapur District. Primary as well as secondary data has been used. The primary data have been generated from sample village and farm level data have been collected from field survey through schedule method .The secondary data obtained from the records maintained by zilla Parishad and Agricultural development office of Solapur district. Physiography of the district may be grouped into three parts i.e. 1) The Hills and Ghats II) The Foot hills. III) The Plains and Plateau. The present study has been made to examine the spatial pattern of Impact of Agriculture Performance and technology on Agricultural development of the region.

Study Area:

Solapur district area under present investigation lies entirely in the Bhima Sina-Man river basins of Krishna river system of South Maharashtra. The district is bounded by 17o 10' North and 18o 32' North latitudes and 74o 42' East and 76o 15' East longitudes.

The district is fairly well defined to its west as well as its east by the inward looking scarps of Phaltan range and Osmanabad plateau respectively. The adjoining districts are Sangli to its south west, Satara to its west, Pune to its north-west, Ahmadnagar to its north, Bhir and Osmanabad to its east and Bijpur district of Karnataka state to its south. Broadly the Physiography of the district may be grouped into three parts i.e. 1) The Hills and Ghats height between (750-850) meters II) The Foot hills (650-750) meters. III) The Plains and Plateau (below 500-600) meters. The soils vary from deep medium black alluvial of the river tracts and further to poor gray soils in the east. The region is drained by Bhima River and its tributaries Nira, Man, Sina, Bhogavati etc. The Bhima River on Ujjani irrigation project is a major irrigation project in solapur district. The district has a total area of 14886 Kms2 and population of 4317756 personsas per 2011 census which constitute purposes; the district is divided into eleven tahsils (Fig.No.1) e.g. North Solapur, BarshiAkkalkot, South Solapur, Mohol Managalwedha, Pandharpur, Sangola, Malshiras, Karmala and Madna.The Solapur district is located in Southern Maharashtra. Its latitudinal extent is from 17˚ 10' north to 18˚32' North and longitudinal is 74˚ 42' east to 76˚ 15' east. The average annual rainfall in the district is 584.3 mm. The region has predominantly a drought prone area of South Maharashtra.



Objectives:

1. In the present study an attempt has been made to examine the spatial pattern of Impact of Relationship between Agriculture Performance & Technology on Agricultural development of the region.

Database:

The study also intends to examine the levels of Agricultural performance & Technology Primary as well as secondary data has been used. The primary data have been generated from sample village and farm level data have been collected from field survey through schedule method .The secondary data obtained from the records maintained by District Headquarter and Agricultural development office of Solapur district. The spatial analysis therefore has been attempted here at tahsils level for the year 2020. The data were abstracted for the present analysis, from the published records of District Headquarter of Solapur District.

Methodology:

In the present study, an attempt has been made to compute the agricultural performance for selected crops. Jasbir Singh (1990) method of 'weighted composite level of agricultural performance' has been employed. The technique takes into consideration both the cropland occupancy and productivity of crop for ascertain the level of agricultural performance which have been calculated for each tahsil based on the formula –

$$Vw = \frac{Yae}{Yar} + \frac{Pae}{Par} + \frac{Ybe}{Ybr} + \frac{Pbe}{Ybr} + \frac{Yce}{Pbr} + N = \frac{\sum LQs}{N} X\ 100$$

Where,

Vw - denotes weighted composite index of regional inequality in agricultural performance.

Y - Means crop yield of crop 'a' in Kilograms per hectare

P - Implies cropland occupancy of crop 'a' in percentage of gross cropped area.

a, b and c subscripts denote crops considered

e and r subscripts denote tahsils and district respectively.

N - Is number of crops holding more than 5 per cent of the total cropped area.

LQS - Means location quotients. In the present study Jawar, Bajara, wheat, Gram, Sugarcane etc are selected as they have occupied cultivated area significantly.

The summed up location quotients (LQS) were divided by the number of crops considered in the tehsil and multiplied by 100 to obtain the weighted composite index for the level of agricultural performance. Thus the formula Is

$$\text{Weighted composite Level of Agricultural performance} = \frac{\sum LQS}{N} X\ 100$$

Agriculture Technology For the computation of the levels of technology the equation evolved by Dutt and Sen Gupta (1969) with further modified by Jasbir Singh (1994) is employed here and composite index values have been derived.

The equation is as under –

$$Ite = \frac{I_e}{I_r} + \frac{T_e}{T_r} + \frac{Toi_e}{Toi_r} + \frac{Poi_e}{Poi_r} + + \frac{F_e}{F_r} + \frac{P_e}{P_r}$$

Where,

Ite - implies the composite index of the level of agricultural technology. I - means per cent of irrigated area to total cropped area.

T - Abbreviates tractors per 1000 hect. of cultivated area.

Toi - means Tractor Operated implements per 1000 hect. of cultivated area.

Poi - denotes power operated implements per 1000 hect. of cultivated area.

F - Stands for fertilizer consumption per 1000 hect. of cultivated area.

P - Means pesticide consumption per 1000 hect. of cultivated area.

e and r subscripts symbolize respectively the tahsils and the entire region district.

The above procedure is adopted to compute the index value of each tehsil. The summed up index values of all parameters then multiplied by 100 to drive the degree of agricultural technology.

$$\text{Weighted composite Level of Agricultural Technology} = \frac{\sum LQS}{N} X\ 100$$

Here N specifies the number of parameters of agricultural technology.

Relationship Between Levels of Agricultural Performance and Levels of Agricultural Technology:

On the basis of the value in percentage the relationship between performance and technology of the region can be established which is the reflection of the impact of agricultural technology on Agricultural performance. The region can conveniently be divided into nine categories and they depicted in Table 1. This is an attempt show to how levels of agricultural technology determine the level of agricultural performance because any fluctuation in it may lead to change in agricultural performance.

Table 1: Relationships between Levels of Agricultural Performance and Levels of Agricultural Technology

Sr. No.	Levels of Agricultural performance	Levels of Agricultural technology	Tahsils
1	High	High	Sangola
2	High	Moderate	Pandharpur
3	High	Low	Madha, Mangalwedha, Karmala
4	Moderate	High	Malshiras
5	Moderate	Moderate	South Solapur, Barshi
6	Moderate	Low	Mohol, Akkalkot
7	Low	High	----------
8	Low	Moderate	----------
9	Low	Low	North Solapur

Source – Compiled by the Researcher based on the field work 2020.

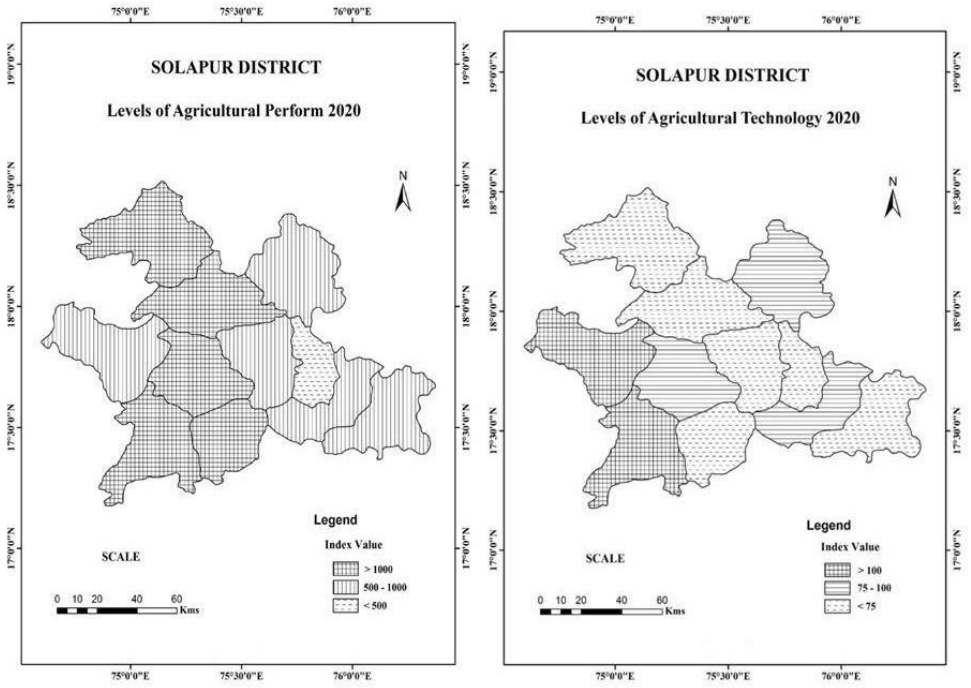


Fig. No. 2

Zone of High Level of Performance and High Level of Technology:

It includes one tehsil namely Sangola tehsil in Solapur district. In Sangola, the index values for level of performance and level of technology are 1411 and 103.5 respectively. This is due to forward looking attitude of farmers and dominance of Pomegranates, Bhir and Grapevine horticulture crops are cultivation leading to high level of agricultural performance and high level of technology.

Zone of High Level of Agricultural Performance and Moderate Level of agricultural technology:

It includes one tahsils (Table no. 1) namely in Solapur district. The index values for level of performance and level of technology are 1348 and 78.33 respectively, This is endowed with irrigation facilities mainly from wells, tube wells, Canals and Bhima and Man rivers in lift irrigationsystem were developed. Besides this substantial and positive role of co-operative Sugar factories, co-operative banks regarding financial assistance to farmers. Generally, the nature of farmers in this fact is highly innovative. This zone has also dense network of roads.

Zone of High Level of Agricultural Performance and Low Level of Agricultural Technology:

It includes three tahsils (Table 1) namely Madha, Mangalwedha and Karmala tahsils of Solapur district. The index values for these tahsils level of performance and level of technology are Madha1721 and 72.5, Mangalwedha 1780 and 66.16 and Karmala 2492 and 50.5 respectively, these tahsils located in the central and northern part of the region. The zone also possesses high level of performance and low level technology which is resulted from This is endowed with irrigation facilities mainly from wells, tube wells, Bhima – Sina link project and Back water lift irrigation systems were developed. Apart from this the poor financial conditions of subsistence farmers and too much dependence of agriculture on rainfall have discouraged large scale application of agricultural technology.

Zone of Moderate Level of Agricultural Performance and High Level of Agricultural Technology:

It includes one tahsils namely Malshiras in Solapur district, (Table No.1) Malshiras tahsils are located in Western part of Solapur district. Malshiras tahsils are Moderate level performance and High level technology, The index values Malshiras tahsils for level of performance and level of technology are 770 and 146.83 respectively, which is resulted from role played by agro based industries by promoting and introducing the new technology at subsides rates have been provided by farmers by Sugar factories so farmers are well aware about the use of new farm technology leading to High level of Agricultural technology and Moderate level of Agricultural performance.

Zone of Moderate Level of Agricultural Performance and Moderate Level of Agricultural Technology:

It includes (Table no. 1). South Solapur and Barshi tahsils of Solapur district. These tahsils located in Eastern and central part of the region. The zone also possesses Moderate level of performance and technology, The index values for level of performance and levelof technology in South Solapur 629 and
77.35 and Barshi 681 and 75 respectively, which is resulted from role played by agro based industries by promoting and introducing the new technology. Different technologies at subsides

rates have been provided to farmers by sugar factories, So farmers are well aware about the use of new farm technology leading to moderate level of performance and technology.

Zone of Moderate Level of Agricultural performance and Low level of Agricultural Technology:

It includes two tahsils namely Mohol and Akkakot tahsils of Solapur district. These tahsils located in centraland eastern parts of the region (Table no. 1). They possess Moderate level of agricultural performance and low level agricultural technology, The index values for level of performance and level of technology are Mohol 936 and 71.50 and Akkalkot 523 and 59.18 respectively, as this zone is depending on inadequate irrigation facilities mainly from well and tube wells. Beside this, recent developments of agro based industries and positive role of co-operative regarding financial assistance to farmers have led to Moderate level of agricultural performance.

Zone of Low Level of Agricultural performance and Low level of Agricultural Technology:

It includes one tehsil of located in eastern parts of the region. This tahsils namely North Solapur tahsils low level performance and low level technology of Solapur district. The index values for level of performance and level of technology are North Solapur 438 and 65.16 respectively, (Table no. 1) The tehsil is located in rain shadow area having high variability and poor reliability of rainfall. The seasonal nature of well irrigation, inadequate water supply has resulted into low agricultural performance. Apart from this the poor financial conditions of subsistence farmers and too much dependence of agriculture on rainfall have discouraged large scale application of agricultural technology.

Conclusion:

Agricultural productivity is a function of various factors like Physical, Socio-Economic technical and organizational. The level of agricultural productivity as a concept means the degree to which the economic cultural, technical and organizational variables are able to exploit the biotic resources of the area for agricultural production. In Solapur district, agricultural performance and technology levels differ across its tahsils. Sangola tahsil stands out with very high performance (index 1411) and high technology (103.5) which credit to progressive farmers and widespread cultivation of high-value crops like pomegranate and grapes. The Pandharpur tahsil shows high performance (1348) but only moderate technology (78.33). Good irrigation from canals, rivers, wells, and lift schemes, plus support from cooperative sugar factories and banks, help farmers achieve strong results even without the latest technology. Madha tahsil (1721 performance, 72.5 technology), Mangalwedha tahsil (1780, 66.16), and Karmala tahsil (2492, 50.5) have very high performance despite low technology. They benefit from irrigation projects like Bhima-Sina link and backwaters, but poor finances and rain dependence limit the use of modern technology. Malshiras tahsil has moderate performance (770) but high technology (146.83), mainly because sugar factories and agro-industries promote and subsidise new tools and methods. South Solapur tahsil (629 performance, 77.35 technology) and Barshi tahsil (681, 75) fall in the moderate range for both, helped by agro-industries and some subsidised technology from sugar factories. Mohol tahsil (936, 71.50) and Akkalkot tahsil (523, 59.18) have moderate performance with low technology due to limited irrigation and only recent growth in agro-industries and cooperatives. Finally, North Solapur tahsil has the lowest performance (438) and low technology (65.16). It

lies in a rain-shadow zone with unreliable rainfall, seasonal well irrigation, and financial constraints that restrict both output and adoption of new technology. Generally, better irrigation, supportive industries, and farmers' willingness to adopt new methods generally lead to higher agricultural performance and technology use across the district.

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