CHAPTER IX

Levels of Agricultural Technology, Levels of Agricultural Performance and Level of Agricultural Development.
CHAPTER IX

Levels of Agricultural Technology, Levels of Agricultural Performance and Level of Agricultural Development.

9.1 Levels of Agricultural Technology
   9.1.1 Introduction
   9.1.2 Methodology
   9.1.3 Spatial Variations in the level of Agricultural Technology

9.2 Level of Agricultural Performance
   9.2.1 Introduction
   9.2.2 Methodology
   9.2.3 Regional Pattern of the levels of Agricultural Performance.

9.3 Relationship between level of Agricultural Technology and Level of Agricultural performance.

9.4 Levels of Agricultural Development
   9.4.1 Introduction
   9.4.2 Methodology
   9.4.3 Spatial pattern in the level of Agricultural Development.
9.5 Summary

References.

CHAPTER IX

Levels of Agricultural Technology, Levels of Agricultural Performance and Level of Agricultural Development.

9.1 Levels of Agricultural Technology –

9.1.1 Introduction –

Irrigation and modern inputs, such as farm implements, high yielding varieties and chemical fertilizer have played as the key factors affecting the agriculture. In irrigated areas farming is generally carried out scientifically and with commercial attitude. Farmers in such areas prefer the modern technology to maximize agricultural production. In India technological variables have made a significant impact on both agricultural pattern and agricultural productivity. After independence, the introduction of economic planning has brought about structural changes in rural economy and transition from traditional farming to modern farming in rural India, since early seventies with the application of new farm technology (Green Revolution) agricultural productivity has shown marked improvements.

Regional inequalities in the level of agricultural technology are responsible for regional imbalances in the levels of agricultural performance. Therefore attempts has been made here of measuring and mapping the regional inequalities to identify backward and advanced areas in terms of agricultural technology which are responsible for agriculturally prosperous and backward areas in IndapurTahasil.
Chapter IX - Levels of Agricultural Technology, Levels of Agricultural Performance and Level of Agricultural Development.

9.1.2 Methodology –

For the computation of the levels of technology the equation evolved by Dutt and Sen Gupta (1969) which further modified by Jasbir Singh (1994) is employed here and composite index values have been derived. The equation is an under –

\[
I_{te} = \frac{I_e}{I_r} + \frac{T_e}{T_r} + \frac{Toi_e}{Toi_r} + \frac{Poi_e}{Poi_r} + \frac{Fe}{Fr} + \frac{Pe}{Pr}
\]

Where,

\( I_{te} \) implies the composite index of the level of agricultural technology.

\( I = \) means percentage of irrigated area to total cropped area.

\( T = \) abbreviates tractors per 1000 hectares of cultivated area.

\( Toi = \) means tractor operated implements per 1000 hectares cultivated area.

\( Poi = \) power operated implements 1000 hectares cultivated area.

\( F = \) stands for fertilizer consumption per 1000 hectares cultivated area.

\( P = \) means pesticide consumption per 1000 hectares cultivated area.

The above procedure is adopted to compute the index value of each Revenue circle. The summed up index value of all parameters then multiplied by 100 to derive the Degree of agricultural technology.

\[
\text{Degree of agricultural technology} = \frac{\sum I_{QS}}{N} \times 100
\]

Here, \( N \) specifies the number of parameters of agricultural technology.
9.1.3 Spatial variations in the levels of Agricultural Technology:

After the calculation of index values classified with the help of standard deviation method can conveniently be described into three different zones.

1) High level of Agricultural technology Region-

It includes Sansar Revenue circle which have recorded high (above 140 index value) level of Agricultural technology. This region has been characterized by assured irrigation facilities i.e. canal and irrigation etc. substantial development of agro-industries like sugar industries are also plying vital role for promoting the use of new agricultural
Chapter IX - Levels of Agricultural Technology, Levels of Agricultural Performance and Level of Agricultural Development.
technology, high literacy rate of this region are responsible for the forward looking attitude of farmers. Substantial income from sugarcane farming and positive role of co-operative has regarding financial assistance to farmers. All these have led to high level of agricultural technology. (Fig.9.1)

2) **Moderate level of Agricultural Technology Region** –

It includes Indapur, LoniDeokar, Bhigwan, Bawda and Anthurne Revenue circles which have recorded moderate (70-140 index value) level of agricultural technology. These regions are endowed with the substantial developments in irrigation facilities i.e. lift and well irrigation besides in this part the co-operative sector is playing vital role for promoting and introducing the new technology. Farmers are well aware about the new farm technology. Some parts of all these Revenue circles have physiographical adverse conditions for cultivation of land under different crops. Consequently, the existing situation shows moderate level of agricultural technology.

3) **Low level of Agricultural Technology Region** –

The Revenue circles of NimgaonKetki and Kati have recorded the low level of Agricultural Technology (below 70 index value). This is mainly due to the lack of irrigation facilities, adverse physiographic condition less amount of rainfall; poor fertile soil etc. farmers in such area are unable to allocate more land under cash crops which can fetch them high income. Above all factors are responsible for discouraged to farmers to use application of agricultural technology.

9.2 **Level of Agricultural Performance**

9.2.1 **Introduction**
Chapter IX - Levels of Agricultural Technology, Levels of Agricultural Performance and Level of Agricultural Development.

Today, the foremost challenges facing the world in general and underdeveloped and developing countries in particular are the appalling increasing in population and a corresponding upsurge in food demands. Food shortage is primarily due to insufficient production of food grains despite best efforts to enhance the same. The causes are not far to seek. They are unfavorable physiographic and weather conditions, socio economic constraints and or index methods of farming which together stand in the way of successful application of new farm technology which together enhance farm production.

Agricultural productivity is a measure of overall performance of an region, which is quite useful in planning the developmental programmers in rural areas. Agriculture has always occupied an important place in Indian economy. The proportion of cultivable land per man has been decreased considerably during the recent past. The increase in crop production is must in India since the areal spread of crop land has almost reached its saturation limit (Vidyanath, 1985). It needs, therefore to improve the agricultural productivity. 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 also to exploit the biotic resources of the area for agricultural production (Singh, J. 1984).

The differential in productivity per unit area is determined partly by soil types and climate and partly by the farming techniques. The agricultural productivity is also defined as the level of existing performance of a unit of land which differentiates from one area to another (Mohammad Ali, 1979). Agricultural productivity is a dynamic in its spatiotemporal perspectives. The development of irrigation facilities mechanization, use of fertilizers and high yielding varieties of seeds, adoption of other components of new technology leads to variation in agricultural efficiency per unit of time and space (Ajagekar B.A., 1988). Being an interdisciplinary study, many scholars from different fields like economic, agriculture geography etc. have evolved different methods to measure the agricultural productivity and also several techniques adopted for computing
efficiency in level of agricultural productivity. Determining output in relation to input or output, Input ration and profitability of farming measured in terms of the return for the sum total of human efforts or paid-out cost in relation to the output (Khusro, 1964). The ranking co-efficient of principal crops for a unit of area was used in analyzing and estimating the agricultural efficiency, by kendall(1939). This method was further applied by stamp (1952) for measuring the agricultural efficiency in India. Buck used Shafi(1960), grain equivalents per head of population for the first time in India (1967). In India did similar work on U.P.(1979) has taken into account the yield of crops and their areal spread, M.Hussain (1976) and Shinde and JadHAV (1978) calculated the agricultural productivity of sutlaj-Ganga plains and Maharashtra plateau in terms of money value of crop production in proportion to the whole region respectively. Ramanaiah and Reddy (1984) have also suggested the new methods of measuring agricultural productivity.

9.2.2 Methodology –

In the present research work, on attempt has been made to compute the agricultural performance for selected crops. The main objective is to examine the spatial pattern of agricultural performance by which ‘weaker areas’ can be identified which would be useful in designing proper strategy in agricultural planning. The regionalization in attempted to identify the regional variations in levels of performance has also been attempted by overlapping the map of the levels of technology on the map showing the levels of agricultural performance at Revenue circle level. This kind relationship gives idea of the factors responsible for the emergence of certain level of performance. Finally considering other socio-economic aspects, the level of agricultural development has been examined which could be useful for planning too. The village wise data were collected and those converted into Revenue circle wise and processed to calculate indices by employing statistical procedure which is discussed in succeeding pages. Jasbir Singh (1990) method of ‘Weighted composite level of Agricultural performance has been employed for to assess the agricultural performance. The technique takes into
consideration both the cropland occupancy and productivity of crop for ascertaining the level of agricultural performance. The indices of inter regional inequalities in agricultural performance are calculated for each Revenue circle based on following formula –

\[
VW = \frac{\sum LQS}{N} = \frac{\sum LQS}{N}
\]

Where,

- \( VW \) – denotes weighted composite index of regional inequality in agricultural performance.
- \( P \) – implies cropland occupancy of crop ‘a’ in kilograms per hectare.
- \( a, b \) and \( c \) subscripts denote crops considered, \( e \) and \( r \) subscripts denote Revenue circle and Tahasil 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 the crops like Jowar, Wheat, Maize, Bajra, 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 Revenue circle and multiplied by 100 to obtain the weighted composite index for the level of agricultural performance. Thus,

\[
\text{Weighted composite level of agricultural performance} = \frac{\sum LQS}{N} \times 100
\]
9.2.3 Regional pattern of the levels of Agricultural Performance -

The composite index values in percentage giving the level of agricultural performance for each Revenue circle are depicted in fig.9.2. The entire region can conveniently be divided into three sub region.

1] High level of Performance Region (above 120 percent index value)

It includes Indapur, Sansar and Anthurne Revenue circle. This zone has been characterized by assured supply of water mainly form lift and canal irrigation, dominance
Chapter IX - Levels of Agricultural Technology, Levels of Agricultural Performance and Level of Agricultural Development.
Fig.9.2

of sugarcane and grapevine cultivation. The farmers in this zone, is generally carried out scientifically and with commercial attitude. As a result of this zone possesses high level of agricultural performance. In this zone grapevine cultivation is dominant and grape growers have adopted modern technology. This has led to high level of performance of agriculture.

2] **Moderate level of Performance Region** (between 60 to 120 per cent index value) –

Moderate Performance is observed in Bhigwan, NimgaonKetki, Kati, Bawda Revenue circles endowed with the relative development in irrigation mainly from canal, well and some part of lift irrigation in Bawda Revenue circle. Besides in this part of the Tahasil the agro-based industries like sugar industries are also playing vital role for promoting and introducing the agricultural technology. Mention may be made of recent expansion of pomegranate cultivation in NimgaonKetki which Revenue circle requires modern technology at substantial level. This has also contributed to the performance of agriculture. The farmers are well aware about the new farm technology, so result is the moderate level of performance.

3] **Low level of Performance Region** (below 60 Percent index value) –

Low level of performance region is observed in LoniDeokar Revenue circle. Southern parts of this Revenue circle having poor reliability of rainfall, seasonal nature of well irrigation, inadequate water supply, undulating topography and moderate level of agricultural technology have led low productivity of land. Beside this, Northern part of this Revenue circle located along the back water of Ujani dam have been characterized by excess use of water and high consumptions of fertilizer irrespective to requirement have led to the low level of agricultural performance. Thus, valuable irrigated land is degraded possessing low performance of agriculture.
9.3 Relationship between Levels of Agricultural Technology and Levels of Agricultural Performance:

On the basis of composite index 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. This is an attempt show to how level of agricultural technology determines the level of agricultural performance because any fluctuation in it may lead to change in agricultural performance. The region can be divided conveniently into nine categories.

Table 9.1

Relationship Between, levels of Agricultural Technology and levels of Agricultural Performance in IndapurTahasil.

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Levels of Agricultural Technology</th>
<th>Level of Agricultural Performance</th>
<th>Revenue circles</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>High</td>
<td>High</td>
<td>Sansar</td>
</tr>
<tr>
<td>2</td>
<td>High</td>
<td>Moderate</td>
<td>--</td>
</tr>
<tr>
<td>3</td>
<td>High</td>
<td>Low</td>
<td>--</td>
</tr>
<tr>
<td>4</td>
<td>Moderate</td>
<td>High</td>
<td>Indapur, Anthurne</td>
</tr>
<tr>
<td>5</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Bhigwan, Bawda</td>
</tr>
<tr>
<td>6</td>
<td>Moderate</td>
<td>Low</td>
<td>LoniDeokar</td>
</tr>
<tr>
<td>7</td>
<td>Low</td>
<td>High</td>
<td>--</td>
</tr>
<tr>
<td>8</td>
<td>Low</td>
<td>Moderate</td>
<td>NimgaonKetki</td>
</tr>
<tr>
<td>9</td>
<td>Low</td>
<td>Low</td>
<td>Kati</td>
</tr>
</tbody>
</table>

i) High level of Agricultural Technology and high level of Agricultural performance Region –
Chapter IX - Levels of Agricultural Technology, Levels of Agricultural Performance and Level of Agricultural Development.

It include Sansar Revenue circle which have index values for level of technology and level of performance are above 140 and above 120 respectively. This is due to high literacy rate, forward looking attitude of educated farmers, dominance of sugarcane cultivation and role of sugar factories leading to high level of Agricultural Technology and high level of Agricultural performance.

ii) **Moderate level of Agricultural Technology and High Level of Agricultural performance Region** -

   It includes Indapur and Anthurne Revenue circles, the index value of level of Agricultural Technology and Agricultural performance are between 70 to 140 percent and between 60 to 120 percent respectively. This Revenue circle is endowed with irrigation facilities from lift and wells. Besides this, substantial and positive role of co-operative sugar factories, co-operative banks regarding financial assistance to farmers and dominance of sugarcane, pomegranate and grapevine cultivation leading to moderate level of Agricultural Technology and high level of Agricultural performance.

iii) **Moderate level of Agricultural Technology and Moderate Level of Agricultural performance Region** -

   It’s includes Bhigwan and BawdaRevenue circles. The zone also possesses moderate level of agricultural performance which is resulted from role played by agro based industries by promoting and introducing the new technology. Different technologies at subsidies rates have been provided to farmers by sugar factories. Viz. Drip sets, Tractors, fertilizers, Hyv of seeds so farmers are well aware about the use of new farm technology leading to moderate level of technology and performance.

iv) **Moderate level of Agricultural Technology and Low Level of Agricultural performance Region** -
It includes Lonideokar Revenue circle where the level of Agricultural Technology is moderate and low level of Agricultural performance. The southern side of this Revenue circle located in rain shadow area having variability and poor reliability of rainfall, inadequate water supply and, Beside this in north part of Revenue circle excess use of water by back water of Ujani dam heavy doses of fertilizer in deep black soil, ignorance of the farmers regarding standard requirement of crop for water and fertilizer, As a result agricultural performance is low.

v) **Low level of Agricultural Technology and Moderate Level of Agricultural performance Region**

It includes NimgaonKetkiRevenue circle which have index values for level of Technology is below 70 percent and below 60 percent for the level of performance. This region is depending on inadequate irrigation facilities from wells and tub wells. Beside this, recently, government gives subsidies for pomegranate cultivation and positive role of co-operative regarding financial assistance to farmers have led to moderate level of agricultural performance.

vi) **Low level of Agricultural Technology and Low Level of Agricultural performance Region**

It includes Kati Revenue circle, due to the rain shadow area, seasonal nature of well irrigation; inadequate water supply, poor financial condition of subsistence farmers and too much dependence of agriculture on rainfall have discouraged large scale application of agricultural technology as a result low level of Agricultural performance.

### 9.4 LEVELS OF AGRICULTURAL DEVELOPMENT

#### 9.4.1 Introduction:
Chapter IX - Levels of Agricultural Technology, Levels of Agricultural Performance and Level of Agricultural Development.

Agricultural change cannot be understood separately from general process of development. However, agro-technical determinants like irrigation, fertilizers, high yielding varieties of seeds, agricultural mechanization and others together from a developed kind of agricultural landscape and provide a frame of parameters to measure the level of agricultural development of a region. (Rajapati Ram, 1989). There are different technologies used with varied intensities leading to variations in agricultural efficiency per unit of time and space. It is of a crucial importance in order to delineate agriculturally development implies maximum economic utilization of land and this means land has to be provided with adequate water and fertilizer which in conjunction with multi cropping land to increased yield and income from the land (Shinde, S.D., 1980). Therefore, the need arises for measuring and mapping the regional inequalities and further to identify backward and advanced areas in terms of agricultural developments.

In the succeeding analysis an attempt has been made to bring out the level of agricultural development in Indapur Tahasil at Revenue circle level.

9.4.2 Methodology –

The development of a region can be assessed in many ways. One of the approaches is to assess the annual rate of growth of national income in relation to growth rates of other economies. The development of various input output technical coefficients is another approach which followed by the dealing with the growth pattern of certain physical indicators. This is considered sensitive enough to reflect the growth and development of economy of these various approaches, for a developing economy where agriculture is dominant the selected indicators approach appears to be of special relevance. This approach has been used by Dutta and Sen Gupta (1969) for assessing the agricultural development of west Bengal. Sharma P.S. (1973) has also used this method for agricultural regionalization of India. Further this approach has been also used by Jasbir Singh (1994) for assessing the level of agricultural Modernization.
In order to find out the levels of development in the study region selected indices were measured for each Revenue circle. The following variables are considered for determining the levels of development.

1) Percentage of net irrigated area to net sown area.
2) Percentage of cultivated area to total geographical area.
3) Number of tractors available per 1000 hectares of cultivated area.
4) Number of electrical pumps available per 1000 hectares of cultivated area.
5) Number of oil Pumps available per 1000 hectares of cultivated area.
6) Fertilizer consumption per 1000 hectares of cultivated area.
7) Pesticides consumption per 1000 hectares of cultivated area.
8) Tractor operated implements per 1000 hectares of cultivated area.
9) Power operated implements per 1000 hectares of cultivated area.
10) Percentage of literate population.

The method adopted to determine the levels of development involves two stages. First, the determination of level of each Revenue circle in terms of discrete variable and second the integration of values obtained to give a complete index of development taking all indices into account. The coefficient of development of each Revenue circle in terms of single variables is expressed as follows:

\[ CDVI = \frac{PV \times 100}{MPV} \]

Where,

\( CDVI \) = The co-efficient of development of variable ‘I’
\( PV = \) Value of Variable ‘I’
\( MPV = \) Means value of variable ‘I’ in the whole region.
In order to develop a composite index which reflects the composite effects of indicators enumerated above the following equation is applied.

\[ CD = \frac{CDv_1 + CDv_2 + CDv_3 + \text{CDV in}}{N} \]

Where

- CD = Composite index of development
- N = Number of variables.

The composite index values of each Revenue circle were further arranged in descending order and classes were considered as high, moderate and low level of development.
Chapter IX - Levels of Agricultural Technology, Levels of Agricultural Performance and Level of Agricultural Development.
Fig.9.3

9.4.3 Spatial pattern in the level of Agricultural Development

The composite index values classified with the help of standard deviation method, there are three different regions described as under-

1) Region Of High Level Of Agricultural Development – (Above 130)

It includes Sansar Revenue circle located in western parts of the region. This zone has been characterized by assured irrigation facilities, conversant nature of farmers, substantial income from grapevine and sugarcane farming, Positive role of co-operative society’s banks, sugar industries and awareness among the farmers to adopt new technology have all made greater favorable impact on the levels of agricultural development.

2) Region Of Moderate Level Of Agricultural Development- (Between 65 To 130)

It includes Indapur, Loni-deokar, Bawda, Anthurne and Kati Revenue circles. These Revenue circles are endowed with the substantial developments in irrigation. The agro-based industries have played vital role for promoting and introducing the new technology. The farmers are aware about the new farm technology.

3) Region Of Low Level Of Agricultural Development - (Below 65)

In includes two Revenue circles namely Bhigwan and Nimgaon-Ketki. The Seasonal nature of well irrigation, coarse soils, unfavorable topography inadequate water supply has led to moderate productivity of land. The poor financial conditions of subsistence farmers and too much dependence of agriculture on uncertain rainfall have discouraged large scale application of technological inputs. All these have led to low level of development.
9.5 Summary –

The overhead discussion reveals that the region marks regional variations in level of Agriculture performance and Level of agriculture development. The study also point out that these aspects are closely related to each other.

Agricultural technology plays a vital role to increasing the crop yield, there are marked regional variations in the adoption of agricultural technology. The discussion of the level of agricultural technology reveals that its high and moderate proportion is confined to the areas having high & moderate intensity of irrigation, substantial income from sugarcane and grapevine farming with forward looking attitude of farmers where less of important role of co-operative societies, sugar factories etc. Beside this, Low technology are confined where the less intensity of irrigation. Poor economic conditions of farmers, less rainfall, rigid topography etc. observed.

The discussion of the levels of agricultural performance reveals that the high level of Agricultural Performance i.e. above 120 percent are confined in Indapur, Sansar and Anthurme Revenue circles; having assured supply of water, dominance of sugarcane, grapevine and pomegranate cultivation. The Moderate Performance i.e. 60 to 120 percentages is observed in Bhigwan, NimgaonKetki, Kati and Bawda Revenue circles due to endowed with the relative development in irrigation, role of agro based industries, expansion of pomegranate cultivation, awareness about the new farm technology has leads to the observed moderate technology of this region. low level of performance is observed in Lonideokar Revenue circle, due to poor reliability of rainfall, seasonal nature of wells, inadequate water supply, undulating topography moderate agricultural technology have led low productivity of land.

The study also indicates the level of agricultural technology and level of agricultural performances related to each other. The relations between to such aspects
reveal that, there are nine zones observed in the region. The Revenue circle a namely Sansar has shown high level of agricultural technology and high level of agricultural performances due to the more proportion of sugarcane and role of sugar factory. The farmers in this Revenue circle have tried to enhance the agricultural production with the use of modern technology. The moderate technology and performance observed in Bhigwan and Bawda Revenue circles due to sugar factories provides different technologies at subsidized rates viz. Drip sets, tractors, fertilizers Hyv of seeds etc. So farmers are well aware about the use of new farm technology leading moderate level of technology and performance. Low level of technology and performance observed in Kati Revenue circle due to the less amount of rainfall seasonal nature of well irrigation, inadequate water sources and poor financial condition of subsistence farmer’s as a result low level of agricultural technology and performance.

The study of the levels of agricultural development reveals that the high and moderate level of agricultural development is confined to the areas having assured supply of water. The dominance of grapevine, Pomegranate and sugarcane farming, social awareness among the farmers, Co-operative movement, role of sugar industries have played significant role for the development of agricultural level, which is observed in the Revenue circles of Sansar, Indapur, Anthurne, Bawda, LoniDeokar and Kati. The remaining Revenue circles have low development of agriculture due to frequent drought conditions, meager water supply, dependence on rainfall etc.

The spatial analysis of agricultural technology reveals the fact that there is an extensive tract of ‘Weaker Zone’ of unfavorable environmental conditions in the central part of the region. This region has been deprived of the advantages of agricultural technology. The attention has to be paid to overcome the problems by adopting favorable measures in planning during the years to come especially through the development of irrigation facilities.
Chapter IX - Levels of Agricultural Technology, Levels of Agricultural Performance and Level of Agricultural Development.

References


Chapter IX - Levels of Agricultural Technology, Levels of Agricultural Performance and Level of Agricultural Development.


Chapter IX - Levels of Agricultural Technology, Levels of Agricultural Performance and Level of Agricultural Development.

Stamp L.D. (1952): The Measurement of Agricultural Efficiency with Special Reference to India. Silver Jubilee Souvenir, Indian Geographical Society, Pp.177-178
