CHAPTER V
RATING INDICES AND CORRELATION WITH YIELD OF PADDY

a) Correlation with Azzi's Index No. (Proportionate Index No.) and yield of paddy:

The potential fertility of soil is the combined effect of all nutrient elements specially organic matter, nitrogen, phosphorus pentoxide and potassium oxide. Their combinations are, therefore, enumerated into index numbers for the chemical capacity of the soil.

Here Azzi's principle for determining the chemical capacity (potential fertility) of soils has been applied. The author has determined the index number, effective index number and proportionate index number after Azzi. The indices of all nutritive elements for each soil are added to get the effective index number (E.I.N). Taking the highest value of effective index number as 100, proportionate index number (P.I.N.) for each soil is calculated (Appendix B, pp. 240-42).

By statistical correlation it has been shown that individual soil nutritive elements, such as, organic matter, nitrogen, phosphorus pentoxide and potassium oxide have positive influence on paddy production. Now, with a view to examining the combined
effects of the nutrients, the yield data are correlated statistically with the proportionate indices of the chemical capacity of the soil.

Table No.26 : Worksheet of coefficient of correlation

<table>
<thead>
<tr>
<th>X</th>
<th>Y</th>
<th>X²</th>
<th>Y²</th>
<th>XY</th>
</tr>
</thead>
<tbody>
<tr>
<td>76</td>
<td>3913</td>
<td>1611</td>
<td>224791</td>
<td>36278.50</td>
</tr>
</tbody>
</table>

Source : Computed by the author

From these values the co-efficient of correlation between X, the P.I.N. and Y, the yield of paddy, has been calculated as follows:

\[
\rho = \frac{n \sum xy - (\sum x)(\sum y)}{\sqrt{n \sum x^2 - (\sum x)^2} \sqrt{n \sum y^2 - (\sum y)^2}}
\]

\[
= \frac{76 \times 89288.5 - 3913 \times 1611}{\sqrt{76 \times 224791 - (3913)^2} \sqrt{76 \times 36278.50 - (1611)^2}}
\]

\[
= \frac{6785926 - 6303843}{\sqrt{(17084116 - 15311569)(2757166 - 2595321)}}
\]

\[
= \frac{482083}{\sqrt{1772547 \times 161845}} = \frac{482083}{535609.74} = 0.90.
\]
Hence (r), the co-efficient of correlation is 0.90. The result shows a very strong positive correlation and this value is higher than the values obtained in correlating yield data with individual nutritive elements. Thus a preference for a combination of nutritive elements is easily established.

b) Correlation with Storie's Index No. and yield of paddy:

In the earlier chapters much has been discussed regarding the influence of individual factors on productive capacity of land.

A quantitative picture of the chemical capacity has been observed in the present chapter. Rating values of factors other than chemical capacity have been evaluated after Storie.

Now, taking all rating values together, it is possible to calculate the index of soil productivity in the following:

The Rating,

\[ R = \frac{A}{100} \times \frac{B}{100} \times \frac{C}{100} \times \frac{D}{100} \times \frac{E}{100} \times \frac{F}{100} \times \frac{G}{100} \times \frac{H}{100} \times 100 \]

Where A, B, C ..........., etc, are the percentage values of rating award to certain soil characteristics.
However, following Storie the index value for each soil is calculated (Appendix B_14, pp. 246-48) and the values are then correlated with the yield of paddy as follows.

Table No. 27: Worksheet for co-efficient of correlation

<table>
<thead>
<tr>
<th></th>
<th>X</th>
<th>Y</th>
<th>X^2</th>
<th>Y^2</th>
<th>XY</th>
</tr>
</thead>
<tbody>
<tr>
<td>76</td>
<td>1557</td>
<td>1611</td>
<td>41797</td>
<td>36278.5</td>
<td>36879</td>
</tr>
</tbody>
</table>

Source: Calculated by the author
(Appendix B_15, pp. 249-51)

The coefficient of correlation between X, the Storie's indices and Y, the yield of paddy of respective samples has been calculated as follows:

\[
\rho_{XY} = \frac{N \Sigma XY - (\Sigma X)(\Sigma Y)}{\sqrt{\left\{ N \Sigma X^2 - (\Sigma X)^2 \right\} \left\{ N \Sigma Y^2 - (\Sigma Y)^2 \right\}}
\]

\[
= \frac{76 \times 36879 - 1557 \times 1611}{\sqrt{\left\{ 76 \times 41797 - (1557)^2 \right\} \left\{ 76 \times 36278.5 - (1611)^2 \right\}}
\]

\[
= \frac{2802804 - 2508327}{\sqrt{(3176572 - 2424249)(2757166 - 2595321)}}
\]
Hence, \( r \), the coefficient of correlation = 0.84. The coefficient of correlation between Storie's indices and the yield of paddy in the respective sample shows a very strong positive correlation (0.84). Thus these index values have direct influence on crop production. The chemical capacity indices though have a dominating influence on the yield of paddy in the area, yet it has been observed from the study that physical characteristics of the land, particularly, slope, micro-relief, erosional hazards and drainage have some definite influence.

c) Correlation with Modified Index No. and yield of paddy:

G. W. Jacks\(^\text{132} \) (1954) pointed out that if any of Storie's factors be low the final rating index value is low neglecting the other high values which is a drawback in this method. For example, all factors, excepting say B, have 100 percent rating but B has 10 percent, then multiplication of the factors gives an index of productivity only 10 and the soil will be classed as poor.
Under the circumstances, a modification may be suggested as

\[ R = \sqrt[n]{A \times B \times C \times \ldots \times X} \]

where \( R \) is the rating index and \( A, B, C \ldots X \) are the factors and \( n \) is the number of factors.

The modified index values for each soil is calculated (Appendix B, pp.246-49) and the values are then correlated with the yield of paddy as follows:

**Table No.28: Worksheet for coefficient of correlation**

<table>
<thead>
<tr>
<th>N</th>
<th>( \sum X )</th>
<th>( \sum Y )</th>
<th>( \sum X^2 )</th>
<th>( \sum Y^2 )</th>
<th>( \sum XY )</th>
</tr>
</thead>
<tbody>
<tr>
<td>76</td>
<td>6091</td>
<td>1611</td>
<td>491879</td>
<td>36278.5</td>
<td>121485.5</td>
</tr>
</tbody>
</table>

Source: Calculated by the author
(Appendix B, pp.252-54)

The coefficient of correlation between \( X \), the modified indices and \( Y \), the yield of paddy of the respective field has been calculated as follows:
The coefficient of correlation between modified indices and the yield of the paddy in the respective fields shows a very strong positive correlation (0.84). In comparison to correlation value between Storie's indices and yield of paddy, the above value is almost the same suggesting a definite correlation.

This does not mean the modified indices are of little significance. The modified values are applicable to regions where diversities in respect of rating values are very great and they are often associated with the calculation of rating indices by use of Storie's formula. So by modification the divergence of rating values has been minimised to achieve better class types.