CHAPTER 2

OBJECTIVES AND METHODOLOGY

The HYV programme has been one of the few programmes heavily relied upon to obtain additional foodgrain production both at the all India and individual State level. In Gujarat during the Seventh Plan HYVs were next to fertilisers in importance to obtain the additional production of 11.76 lakh tonnes of foodgrains (vide Appendix 2.1). During the past several years the development in the field of HYVs has been noted as impressive. The State Government has introduced various measures during the different plans to improve the production, distribution and promotion of HYVs seeds. However, despite concerted efforts the programme was not without any drawbacks.

2.1 Statement of the Problem:

A number of studies completed in respect of HYVs reveal specific regional pattern and lags in adoption of innovations which have caused long run regional imbalances in the level of income adding to the already prevailing problems of income distribution. These differences need to be removed through suitable research inputs and policy measures.

In the field of agriculture the basic input of 'seed' needs frequent adjustments with changes in soil composition and environment. It is a continuous chain of innovations required to raise or maintain a high yield level already attained so far.
Fortunately, the Indian agricultural scientists have been able to maintain a continuous chain of new seeds over the period. However, the performance in this respect has not been impressive as expected. Recently, Sidhu D.S. (1990) noted that of the gross cultivated area under HYV, only 10 per cent area was under the new HYV seeds found during the 1980s in India. In other words, at present 90 per cent of HYV area is under those seeds which were found prior to 1980. Thus, there are number of aspects which need to be looked into through an appropriate study at the regional level. The present study examines the different aspects of development of HYVs in Gujarat.

2.2 The Objectives:

The present study attempts to examine the nature of progress in the HYV programme at the State level of Gujarat with further disaggregate analysis at its districts. Major objectives of the study are stated herebelow:

1. To study the policy approach to HYVs development during the different plan periods.

2. To critically examine the various studies completed in respect of the adoption of HYVs for various crops.

3. To examine the growth and factors influencing the adoption of HYVs in respect of the five major crops viz., paddy, wheat, jowar, bajra and maize among the districts of Gujarat.
4. To highlight the policy measures for future development of HYVs of various crops in Gujarat.

2.3 Methodology

To attain the above objectives a detailed analytical framework is developed which is given here.

2.4 Analytical Framework

The period selected for the detailed analysis is 1966-67 to 1990-91. The necessary justification for the so selected period and other details are as under:

1) The period under study (1966-67 to 1990-91) significantly differs from the period prior to 1966-67. The earlier period was characterised by almost traditional agriculture with indigenous varieties of seeds along with the lower level of use of the strategic inputs like fertilisers, pesticides etc.

2) With the introduction of HYVs on some what noteworthy scale in 1966-67 a land-mark came in the Indian agricultural sector.

3) It may be noted here that once a sudden jump in the use of strategic inputs is established on a fairly sound base, a further increase in them cannot be expected to be as rapid afterwards as is usually observed in the initial period of their growth (Desai, 1986). Hence, the period of analysis needs to be
further divided between a distant and a recent past. For this, the period of study is divided into two parts, viz., (i) A distant past, and (ii) A recent past. The period from 1966-67 to 1978-79 would serve as the period of a distant past, while a period from 1979-80 to 1990-91 would serve as a period of recent past.

Details of the study period can be laid down as under:

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Time period</th>
<th>Name of period</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1966-67 to 1978-79</td>
<td>First period</td>
</tr>
<tr>
<td>2</td>
<td>1979-80 to 1990-91</td>
<td>Second &quot;</td>
</tr>
<tr>
<td>3</td>
<td>1966-67 to 1990-91</td>
<td>Whole &quot;</td>
</tr>
</tbody>
</table>

The tools and techniques used in the analysis for the present study are as under:

The analysis is largely based on the five statistical and mathematical measures viz., average, standard deviation, percentage, growth rate and regression analysis.

1. The average figures of (i) cropped area, (ii) HYV area under crop, (iii) percentage of area under HYV crop in total cropped area, (iv) percentage share of district's area under HYV crop in total HYV area of the State etc., for all the above-mentioned three periods were separately worked out for five major crops under study viz., paddy, wheat, jowar, bajra and maize.
In order to work out the average figure of above variables for the three periods under study, following formulae is used:

**Annual Average Area Under HYV Crop**

\[
\bar{A}_{ijk} = \frac{\sum_{K=1}^{N} A_{ijk}}{N}
\]

where, \( \bar{A}_{ijk} \) = Annual average area under \( j \)th HYV crop in \( i \)th district during \( K \)th period.

where, \( i = 1, 2, 3 \ldots \) 19th district

\( j = 1, 2, 3, 4, 5 \) i.e. paddy, wheat, jowar, bajra and maize crops respectively

\( N = \) No. of years in the period which is 13, 12, and 25 respectively for the first, second and the whole period

\( K = \) I, II and III =

I (first period) = 1966-67 to 1978-79, i.e. 1, 2, 3 \ldots \) 13 years

II (second period) = 1979-80 to 1990-91, i.e. 1, 2, 3 \ldots \) 12 years

III (whole period) = 1966-67 to 1990-91, i.e. 1, 2, 3 \ldots \) 25 years

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2) Annual average percentage share of district's HYV crops in the State:

\[ P_{ijk} = \frac{\sum A_{ijk}}{19} \times 100 \] (2)

where, \( P_{ijk} \) = Annual average percentage share of \( i \)th district for \( j \)th HYV crop in the State's \( k \)th period.

\( A_{ijk} \) = Area under HYV crops in \( i \)th year in the plan period.

\( i, j, k \) = Years in the plan period, i.e., 0,1,2,3,4.

Other notations are similar as indicated for formula ... (1)

3) Plan period-wise average annual rate of change:

\[ \frac{\sum A_{it} - n.\bar{A}_t}{2} \]

\[ R = \frac{\sum^2 A_{it} - n.\bar{A}_t^2}{2 \sum t^2 - (\sum t)^2} \]

where, \( R \) = Rate of change in area in absolute term, i.e. in hectares in a plan period.

\( A_i \) = Area under HYV crops in \( i \)th year in the plan period.

\( t \) = Years in the plan period, i.e. 0,1,2 and 0,1,2,3,4.
and, \[ R = \frac{R}{A} \times 100 \]

where, \( R \) = percentage rate of change

\( A \) = Average annual area under HYV crop during the plan period.

This formulae is used to estimate the rate of change in area under HYV crops during different plan period for the Gujarat State as a whole and India.

4) Simple Regression:

In order to examine the rate of adoption of HYV crops and trend or growth rate in it, a technique of regression analysis is used. To examine the rate of adoption of HYVs crop in the different 19 districts of the Gujarat State, semi-log or exponential equations were estimated for the crops under study. The form of the equations used is as follows:

Semi-log equation:

\[ Y_t = a \cdot b^t \]

or

\[ \log Y_t = \log a + (\log b) t \]

or

\[ Y_t = A + Bt \]

where, \( Y_t = \log Y_t \) and \( Y_t \) = percentage of HYV area to total area under a crop
\[ A = \log a = \text{intercept} \]
\[ B = \log b = \text{regression co-efficient} \]
\[ t = \text{time variable 1, 2,} \ldots \ldots n \]

The semi-log equation gives the compound growth rate \( r \) of the dependent variable, i.e., \( r = (\text{anti log } B - 1) \times 100 \) provides us the estimate for compound growth rate.

In order to estimate the regression co-efficient in the above equation 'least square' methods were used, further; the statistical 't' test is used to test the reliability of estimated regression co-efficients, and \( R \) i.e., co-efficient of determination is used to examine the reliability of the estimated equation.

2.5 Data Base:

The analysis of the thesis is based on the various types of data available in the different published sources principally of the Government of Gujarat.

The source of data are as under:

1. Fertiliser Association of India, Annual Reviews Fertiliser Statistics various volumes.
2. Directorate of Economics and Statistics, Govt. of India, New Delhi.
3. Directorate of Agriculture Department, Govt. of Gujarat, Gandhinagar.

Various government offices relating the study viz., Ministry of Agriculture, Panchayat offices, Districts Agricultural offices, etc.

4. Agricultural Research Stations at Junagadh and Anand campus etc.

5. Published books and various articles from different journals.

On the basis of a rate of adoption, districts are classified into three groups viz., districts with better prospects, districts with moderate prospects and districts with poor prospects. The details are shown in Table 2.1.
<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Nature of prospect</th>
<th>Types of status</th>
<th>Rate of Adoption</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>First 1966-78</td>
</tr>
<tr>
<td>1</td>
<td>Better prospective districts</td>
<td>A</td>
<td>High</td>
</tr>
<tr>
<td>2</td>
<td>Moderate prospective districts</td>
<td>B</td>
<td>Low</td>
</tr>
<tr>
<td>3</td>
<td>Poor prospective districts</td>
<td>C</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td></td>
<td>D</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td></td>
<td>E</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F</td>
<td>Low</td>
</tr>
</tbody>
</table>

Note: High - Rate of adoption above the State average
      Low - Rate of adoption below the State average.