Chapter-IV

RESEARCH METHODOLOGY

Keeping in mind, the objectives of the study, a systematic procedure was laid down for the investigation, analysis of the data and the interpretation of the results obtained. This chapter highlights the specific procedure followed for carrying out the study.

4.1 LOCALE OF THE STUDY

The study was conducted on the respondents spread over the whole Punjab state. The respondents of the study were equally distributed over all the districts of the state.

4.2 SELECTION OF THE RESPONDENTS

The respondents of the study were Agricultural Development Officers of the Punjab state. The training programme on hybrid seed production technology in sunflower was conducted. Two Agricultural Development Officers from each district were invited through proper channel to attend the training programme. A group of 20 Agricultural
Development Officers were selected for each training programme for two consecutive years 1995-96 and 1996-97. Thus, in total, 120 Agricultural Development Officers were selected for six training programmes for the study as under:

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Year</th>
<th>No. of training programmes</th>
<th>Extension teaching method</th>
<th>No. of respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>1995-96</td>
<td>1</td>
<td>Method demonstration</td>
<td>20</td>
</tr>
<tr>
<td>2.</td>
<td>1995-96</td>
<td>1</td>
<td>Video</td>
<td>20</td>
</tr>
<tr>
<td>3.</td>
<td>1995-96</td>
<td>1</td>
<td>Slide-tape synchronisation</td>
<td>20</td>
</tr>
<tr>
<td>4.</td>
<td>1996-97</td>
<td>1</td>
<td>Method demonstration</td>
<td>20</td>
</tr>
<tr>
<td>5.</td>
<td>1996-97</td>
<td>1</td>
<td>Video</td>
<td>20</td>
</tr>
<tr>
<td>6.</td>
<td>1996-97</td>
<td>1</td>
<td>Slide-tape synchronisation</td>
<td>20</td>
</tr>
<tr>
<td>Total:</td>
<td></td>
<td>6</td>
<td></td>
<td>120</td>
</tr>
</tbody>
</table>

4.3 SELECTION OF THE TOPIC

The topic selected for the study was hybrid seed production technology. After consulting the experts the text was modified as per their suggestions. Then the contents for different extension teaching methods were prepared.
4.4 SELECTION OF EXTENSION TEACHING METHODS

The following three extension teaching methods were selected for the present study:
- Method demonstration
- Video
- Slide tape synchronisation

No video tape was available on sunflower cultivation. Thus, video was developed for the subject with the help of subject matter experts. Similarly, 30 slides were prepared by using the same text and same topic along with the taped message. The same text was used for method demonstration.

4.5 RESEARCH DESIGN

The study was experimental in nature and was designed to study the relative effectiveness of the selected extension teaching methods in imparting knowledge about hybrid seed production technology of sunflower to the Agriculture Development Officers. The gain in knowledge was the measure used to study the effectiveness of selected extension teaching methods. For carrying out the study pre-test-post-test group design was used:

R O₁ X₁ O₂
R O₃ X₂ O₄
R O₅ X₃ O₆
Where,

- **R** - Randomized Respondent group
- **O_{1,3} and 5** - Pre-test scores
- **O_{2,4} and 6** - Post-test scores
- **X_{1,2} and 3** - Treatments (Method demonstration, video and slide tape synchronisation)

### 4.6 SELECTION OF VARIABLES

The variables selected for the purpose of this study were based on the review of literature. It was very difficult to study all the variables affecting the gain in knowledge of the respondents. Thus, the following most suitable variables were selected:

- Age
- Level of education
- Mass media exposure
- Job experience
- Marital status
- Family background

### 4.7 OPERATIONAL DEFINITIONS OF THE VARIABLES

(a) Independent Variables

#### 4.7.1 Age

It was the chronological age of the respondent at the time of treatment and was expressed in terms of years
completed and number of completed years was taken as the score of the variable.

4.7.2 Level of education

The respondents were not expected to differ widely with respect to their education as all of them were Agricultural Development Officers. Their educational level was categorized as under:

- Diploma holders in Agriculture
- Graduates in Agriculture
- Post-graduates in Agriculture

4.7.3 Mass media exposure

It referred to the extent to which the respondents were exposed to radio, television and farm literature. The exposure was classified as under:

- Regular
- Sometimes
- Never

4.7.4 Job experience

It referred to the number of years, spent by the respondent on the post of Agricultural Development Officer. Thus, for those ADOs who were promoted from the post of Agricultural Sub-Inspector, the period of previous post was
not included. The number of years were interpreted as the service experience of an individual.

4.7.5 Marital status

It was defined as the status of respondent in terms of their being married or unmarried.

4.7.6 Family background

It was intended to know whether the respondents were having rural or urban background.

(b) Dependent Variables

4.7.7 Gain in knowledge

It referred to the increase in learning after receiving information through the selected extension teaching methods as reflected by the difference in the pre-and post-test scores.

4.8 CONSTRUCTION OF KNOWLEDGE TEST

4.8.1 Selection of Items

For constructing knowledge test, a comprehensive list of items pertaining to hybrid seed production technology in sunflower was prepared by consulting the relevant literature and the experts on the subject. The five areas so recognised were: general hybridization of sunflower, development of
inbred lines, evaluation and conversion of inbred lines, procedure for hybrid seed production and crossing techniques. Originally, there were in all 50 such items in the knowledge test.

4.8.2 Estimating Item Difficulty

The difficulty of the test was indicated by the percentage of respondents who got the item right. Hence, the item difficulty was estimated by means of the following formula:

\[
\text{Difficulty Index} = \frac{R}{T} \times 100
\]

- \( R \) = Number of the respondents who got the item right
- \( T \) = Total number of the respondents

Table 4.2. Item difficulty

<table>
<thead>
<tr>
<th>Difficulty Index</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-20</td>
<td>6</td>
</tr>
<tr>
<td>20-30</td>
<td>4</td>
</tr>
<tr>
<td>30-40</td>
<td>8</td>
</tr>
<tr>
<td>40-50</td>
<td>9</td>
</tr>
<tr>
<td>50-60</td>
<td>11</td>
</tr>
<tr>
<td>60-70</td>
<td>5</td>
</tr>
<tr>
<td>70-80</td>
<td>4</td>
</tr>
<tr>
<td>80-90</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>50</td>
</tr>
</tbody>
</table>
It is clear from Table 4.2 that the difficulty level of the test ranged from 10-90. The items with 20-70 difficulty range were kept and others were discarded.

4.9 RELIABILITY AND VALIDITY OF TEST

A measuring device must be reliable and valid. The reliability of a measuring scale pertains to the degree to which it yields consistent scores when it is measured a number of times validity refers to the degree to which test scores or other measures predict some practical criterion measures (Guilford, 1954). The reliability and validity coefficients were calculated as follows:

4.9.1 Reliability of the Test

Reliability refers to the consistency of measurement, i.e. how consistent the test scores are from one measurement to other. The "test-retest" method was employed to measure the reliability of the test. The test was administered to the same group of 20 respondents at the weekly interval. The coefficients of correlation were worked out for the two tests by using the Pearson-Product Moment Coefficient of Correlation. The reliability coefficient was determined by using the Spearman Brown formula as given below:
\[ r_{tt} = \frac{2r_{xy}}{1+r_{xy}} \]

Where,

\[ r_{tt} = \text{Reliability coefficient} \]
\[ r_{xy} = \text{Coefficient of correlation} \]

### 4.9.2 Validity of the Test

The empirical type of validity which Guilford (1954) called the intrinsic validity was determined by taking the square root of the corrected reliability coefficient.

\[ \text{Validity} = \sqrt{r_{tt}} \]

The reliability and validity estimates of the knowledge test as obtained above are given in Table 4.3.

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Scale</th>
<th>Coefficient of reliability</th>
<th>Intrinsic validity score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Knowledge test</td>
<td>0.87</td>
<td>0.93</td>
</tr>
</tbody>
</table>

Validity refers to the extent to which results of an evaluation procedure serve the particular uses for which
they are intended. It was assumed that the scores obtained by administering the knowledge test of this study measured what was intended to measure. The validity of the test was also ensured through the experts in the field of hybrid seed production of sunflower. Therefore, reasonably enough, the test was taken as a valid measure of the desired dimension. This validity was termed as content validity.

4.10 CONSTRUCTION OF RESEARCH INSTRUMENT

The instrument for data collection was divided into two parts. The first part dealt with socio-personal characteristics of the ADOs. The second part was the knowledge test based on the contents of hybrid seed production technology.

4.11 PRE-TESTING

The schedule so prepared was pre-tested on 20 non-sampled respondents. On the basis of information obtained through pre-testing, necessary modifications were made.

4.12 FINAL FORM OF THE SCHEDULE

A schedule as given in Appendix-I was constructed for collecting the data consisted of two parts. The first part of the schedule included questions on personal characteristics of respondents like age, education, service
experience, place of posting, family background and marital status.

The second part of the schedule contained knowledge test.

4.13 STANDARDIZATION OF SCORING PROCEDURE

Scoring of each reply was done by the investigator himself. The scoring was based on the marks obtained at different times under knowledge test. The maximum number of possible marks for any knowledge test were equal to the total number of statements or items framed in the knowledge test. Each item carried equal weightage.

4.14 COLLECTION OF DATA

The data were collected by administering the questionnaire to the respondents before and after the treatment. The whole process took place in the following three steps:

1. Pre-knowledge test just before the treatment.
2. Exposure to method demonstration/video/slide-tape synchronisation to impart knowledge about hybrid seed production technology (Treatment).
3. Post-knowledge test immediately after the exposure to particular extension teaching method.
For each treatment, two training programmes were organised during the course of study. So, six training programmes were organised in all.

4.15 ANALYSIS OF THE DATA

The data were analyzed in the following parts:

4.15.1 Gain in knowledge of the respondents through the selected extension teaching methods, viz. method demonstration, video and slide-tape synchronization.

4.15.2 Relationship between various socio-personal characteristics of the respondents and gain in knowledge through the selected extension teaching methods.

4.15.3 Statistical analysis of the data

4.15.1 Gain in Knowledge of the Respondents Through the Selected Extension Teaching Methods

The gain in knowledge of the respondents was measured by determining the difference between the post and pre-knowledge test scores. The knowledge scores were quantified by giving one score for each correct answer and zero for each incorrect or no answer.

Mean gain score was used to see the central tendency of the data.

The data were tested through paired 't-test' to determine the significance of difference (if any) amongst the gain in knowledge scores of ADOs exposed to three selected extension teaching methods.

Analysis of variance was worked out for the knowledge
test in order to see whether the variations of gain in knowledge scores of each of the treatment group were significant or not.

Critical differences were worked out to see whether the difference in gain in knowledge between two means were significant or not.

4.15.2 Relationship Between Various Socio-Personal Characteristics of the Respondents and Gain in Knowledge Through Selected Extension Teaching Methods

The socio-personal characteristics selected were age, education, mass media exposure, job experience, marital status and family background.

Relationship of socio-personal characteristics like age, mass media exposure and job experience with gain in knowledge were obtained for each selected extension teaching method separately.

4.15.3 Statistical Analysis of the Data

4.15.3.1 Mean score

on the basis of quantified data the mean scores for each treatment were worked out to see the central tendency of the data. The mean gain score is given by:

$$\bar{d} = \frac{x}{N}$$
Where,
\[ \bar{d} = \text{Mean gain score} \]
\[ x = \text{Sum of each of the individual measurement of scores.} \]
\[ N = \text{Total number of respondents in the treatment group.} \]

4.15.3.2 Paired t-test

To determine the significant difference (if any) between the gain in knowledge scores of the three selected extension teaching methods, paired t-test was employed.

The formula used for paired t-test was:

\[ t_{n-1} = \frac{\bar{d}}{S} \times \sqrt{n} \]

Where,
\[ S = \frac{\sum d_i^2 - (\bar{d})^2 \times n}{n-1} \]

\[ n = \text{Total number of respondents} \]
\[ d_i = \text{Gain in score for the } i^{th} \text{ respondent} \]
\[ \bar{d} = \text{Mean gain score} \]

4.15.3.3 Karl Pearson's Coefficient of Correlation

To measure the relationship between two variables, coefficient of correlation was used. The following formula was used to know the relationship between personal
characteristics (i.e. age, service experience and gain in knowledge through different treatments).

The formula used as:

\[ r = \frac{\sum (x-\bar{x})(y-\bar{y})}{\sqrt{\sum (x-\bar{x})^2 \sum (y-\bar{y})^2}} \]

Where,

\[ r = \text{Coefficient of correlation} \]
\[ x = \text{Independent variable} \]
\[ y = \text{Dependent variable} \]

The significance of correlation coefficient was tested by 't-test', using the formula:

\[ t_{n-2} = \frac{r}{\sqrt{1-r^2}} \times \sqrt{n-2} \]

Where,

\[ r = \text{Coefficient of correlation} \]
\[ n = \text{Number of respondents} \]

4.15.3.4 Chi-square test

Chi-square test was applied to see the association between independent variables like level of education, marital status and family background on the gain in knowledge of the respondents, Chi-square tests were applied. The formula used for calculating the Chi-square value is as under:
\[ X^2 = \frac{k \sum (O-E)^2}{E} \]

Where,

- \( i \): Number of rows
- \( j \): Number of columns
- \( O \): Observed frequency
- \( E \): Expected frequency
- \( k \): Number of cells

The calculated value of \( X^2 \) was tested against the table value of \( X^2 \).

**4.16 MEASUREMENT OF ANTECEDENT VARIABLES**

In order to make the data suitable for statistical treatment, the qualitative responses were quantified. The responses were categorised as under:

**Age:**

The respondents were asked to indicate their age in terms of completed years. The data thus obtained revealed that the age of the respondents fell between 30-56 years.

**Education**

The level of education was grouped into following three categories:
Educational level
Diploma in Agriculture
Graduation in Agriculture
Post-graduation in Agriculture

Mass Media Exposure
Exposure to media was classified into following categories and scores were assigned as under:

<table>
<thead>
<tr>
<th>Exposure to media</th>
<th>Score value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Daily</td>
</tr>
<tr>
<td>Radio</td>
<td>2</td>
</tr>
<tr>
<td>Television</td>
<td>2</td>
</tr>
<tr>
<td>Newspaper</td>
<td>2</td>
</tr>
<tr>
<td>Magazine</td>
<td>2</td>
</tr>
</tbody>
</table>

Job Experience
The number of years of the respondents spent on the post of ADO were used as job experience. However, the period spent on the post of Agricultural Sub-Inspector (if any) was not included for the purpose of analysis.
Marital Status

The following scores were given for the marital status:

<table>
<thead>
<tr>
<th>Status</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unmarried</td>
<td>0</td>
</tr>
<tr>
<td>Married</td>
<td>1</td>
</tr>
</tbody>
</table>

Family Background

The following scores were assigned to the family background:

<table>
<thead>
<tr>
<th>Background</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban</td>
<td>0</td>
</tr>
<tr>
<td>Rural</td>
<td>1</td>
</tr>
</tbody>
</table>