Chapter 5

Field Research: Techniques and Approaches

The deliberation on the methodology has been made to understand the concept, methods and techniques which were utilized to design the study, collection of information, analysis of the data and interpretation of the findings for revelation of truths and formulation of theories. This chapter deals with the method and a procedure used in the study and consists of eight main parts-

A. Locale of Research.

B. Sampling Design.

C. Pilot Study.

D. Variables and their measurement.

E. Preparation of Interview Schedule.

F. Pre-testing of Interview Schedule.

G. Techniques of Data Collection.

H. Statistical Tools used for Analysis of Data

Locale of research

JAMNA Gram Panchayat of the LABPUR block of BIRBHUM district in West Bengal was purposively selected for the study. The village namely FINGTORE was selected by random sampling. The area had been selected for the study because of-

(a) There is ample scope for collecting relevant data for the present study.

(b) Acquaintance with the local people as well as the local language.

(c) The concern area was easily accessible to the researcher in terms of place of residence.

(d) The area was very easily accessible to the researcher in terms of transportation

(e) The closure familiarities of the student researcher with the area, people, officials and local dialects.

Sampling Design

Purposive as well as simple random sampling techniques were adopted for the study. For selection of state, district, block and gram Panchayat purposive sampling techniques was adopted because the area was ideal for Energy Management study, convenient for researcher and having the infrastructural facilities and in case of selection of villages and respondents simple random sampling technique was taken up.

Table 10 Sampling Technique and Sampling Design

Step	Items	Level	Approach
1	State	West Bengal	Purposive
2	District	BIRBHUM	Purposive
3	Subdivision	BOLPUR	Purposive
4	Block	LABPUR	Purposive
5	Gram Panchayat	JAMNA	Purposive
6	Village	FINGTORE	Purposive
7	Respondents	60	Random
Total No. of Respondents: 60			

Pilot study

Before taking up actual fieldwork a pilot study was conducted to understand the area, its people, institution, communication and extension system and the knowledge, perception and attitude of the people towards climate change concept. An outline of the socio-economic background of the farmers of the concerned villages, their opinion towards different types of technology socialization process, innovation-decision process, discontinuance, disagreement, conflict, rejection, dissonance, reinvention

and confusion helped in the construction of reformative working tools. The components of pilot study are:

- General information;
- Specific information;
- Prevalence of variables;
- Body languages of the prospective respondents;
- Access to physical location;
- The type, level and intensity of responsiveness;
- Related information including Agriculture.

Variables and their measurements

Several researchers pointed out that the behaviour of an individual was understood more in depth if one has the knowledge of some variables, which comprised the constructed world of reality within which an individual received the stimuli and acts. The socio personal, agro economic, socio-psychological and communication variables are such type of variables, which determine the behaviour of an individual. Appropriate operationalization and measurement of the variables help the researcher to land upon the accurate conclusion. Therefore, the selected variables for this study had been operationalized and measured in following manner.

Variables in the present study have been categorized into two main categories.

1) Independent variables.

2) Dependent variables.

Independent variables :-

The variables and empirical measurements.

1. Age (X_1)

In all societies, age is one of the most important determinants of social status and social role of the individual. In the present study, the number of

years rounded in the nearest whole number the respondent lived since birth at the time of interview, was taken as a measure of age of the respondent.

2. Education(X_2)

Education may be operationalized as the amount of formal schooling attained/literacy acquired by the respondent at the time of interview. Education is is instrumental in building personality structure and helps in changing one's behaviour in social life.

3. Family Size (X_3)

The influence of family members on the decision-making process of farm operation is inevi Table Although the head of the households generally make the final decision on farming operations, the members of his family often act as consultants in reaching such decisions. It refers to the number of members present in the family of farmers. Generally up to five members are regarded as a small size and more than 5 members are regarded as a large size family. Large size family, which has more work forces, may be more conducive to better management of farm enterprises. Haque (1981), Pandey (1991) and Jana (1991) discussed about the significant relationship between adoption and family size of farmers. Some kind of relationship is expected in case of family size and adoption, rejection, discontinuance of agricultural innovation.

4. Gender Ratio (X_4)

The sexual division of work, power and access rights create different responsibilities and knowledge according to gender and make women and men perceive differently market intrusion and natural resources depletion, therefore creating mobilization structured according to gender (Rocheleau, D et al., 1996). Important from the feminist perspective are the concept of time, local economies, valuation and the institutions that govern access to resources. Main-stream economic thinking has neglected both women's work and ecosystems services (Perkins, 1997, 2007; O'hara, 2009; Zein Elabden, 1996). When women mobilize against damaging activities and when they build up alternatives they also challenge patriarchy in their own culture, which often lead to an empowerment process. Mehta,-M, (1991) found that Gender inequalities are seen as a deterrent to rural development and are addressed by implementing projects specifically for

the development of women. It is argued that sex discrimination in India is acknowledged among traditional societies but it is never dealt with, for fear that it may fuel social conflict and change. NGOs are encouraged to tackle the problem as all individuals in society have a right to make informed choices and pursue their self-development.

5. Educational Aspiration(X5)

It refers to upto what level the farmer wants his children to study. It has been divided into six categories and given weightage according to the scale of Pareek and trivedi (1964). It has been categorized as Primary level (1), Secondary or Middle school level (2), Higher Secondary or High school level (3), Graduate level (4), University or post graduate level (5) and Technical level (6).

6. Farm size (X_6)

Farm size is a measure of farm business. Operationally farm size may be defined as a tract of land possessed by an individual for the purpose of growing crops. Different research workers had tried to measure farms size in different ways. In the present study, actual area under cultivation in bigha is divided by size of the family taken as measure of farm size.

$$\frac{Actual\ farm\ holding}{size\ of\ the\ family}$$

7. Cropping intensity (X_7)

Cropping intensity refers to the proportion of acreage annually put under the different crops to the total cropped area expressed in percentage since a large number of short duration crop varieties are now available, farmers are in a better position to take more number of crops per acre annually from the same piece of land for obtaining higher production. A relationship between the adoption, rejection, discontinuance of agricultural innovation and cropping intensity is expected. The cropping intensity is calculated by the formula-

$$\frac{Total\ annual\ cropped\ area}{size\ of\ holding} \times 100\ \%$$

8. Total no. of livestock(X_8)

Total count of livestock (only cattle are consider under the same family ownership).

9. Annual income(X_9)

Annual income is the economic measurement of farmers' status. It was operationally defined as the gross income from all the viable sources of income in a single year. It was measured in terms of rounded of rupees. The gross income was constituted by the total income generated from agriculture, dairy, poultry, fishery, enterprise, business and services. It is calculated by the following formula:

Total income in a year = Agricultural + Non agricultural

10. Per capita annual income(X_{10})

The Annual Income of a person is an important parameter to assess the economic status of the person in the society. It was operationally defined as the gross income from all the viable source of income in a single year. It is measured in terms of rounded of rupees. The gross income is constituted by the total income generated from agriculture, dairy, poultry, fishery enterprises, business and services. In the present study it has been calculated with the formula as follows.

$$\frac{Total\ Income\ in\ a\ year}{Family\ size}$$

11. Income ratio(X_{11})

It is the ratio of non-agricultural and agricultural income in percentage form.

$$IR = (Non\ agricultural/agricultural)*100$$

12. Capital intensity(X_{12})

It is the total cost incurred per bigha of land for production of a crop.

13. Scientific orientation(X_{13})

In the present study scientific orientation was operationalised as the characteristic of individual, which made him to trust and rely on ideas and practices developed through scientific research. This variable was measured with the help of scale, developed by Supe(1969) with modification. The scale consisted of six statements and each statement was of 10 point scale and asked to the farmer to give preference score out of 10. The score for each respondent in scientific orientation scale was obtained by summating the score for each statement divided by total statement (Altogether 6 statement).

14. Self efficacy(X_{14})

Wood and Bandura(1989) defined self efficacy as " beliefs in one's capabilities to mobilize the motivation, cognitive responses, and courses of action needed to meet given situation demands".

15. Risk orientation(X_{15})

In the present study, the risk orientation of farmers was measured with the help of risk preference scale developed by Supe (1969) with modification. Supe defined risk preference as the degree to which a farmer was oriented towards risk and uncertainty and had the courage to face the problem in farming. The scale consisted of FOUR items.

The items were rated in out of 5 point scale farmers preference was asked to give score out of 5.

16. Economic motivation(X_{16})

Economic motivation has been conceptualised as the values or attitudes, which attach greater importance to profit maximisation as the ends and means. In this study, economic motivation of the farmers was measured with the help of the self-rating economic motivation scale developed by Maulik (1965) with modification. The scale consisted of three sets of statements, each set having three short statements with weightage of 5 points scale each in every set of statement for economic motivation. The respondents out of 5 point scale choices for each of the three sets of statements were recorded.

17. Competition(X_{17})

Singh (1981) defined the variable as the degree to which a farmer is oriented to place himself in a competitive situation in relation to other farmers for projecting his excellence in farming.

Singh (1981) with modification scale was used to get the score for the orientation towards competition in out of 10 point scale for each of the statement. The score for each individual in the orientation towards competition was obtained by summng up the scores of all statement divided by total no. of statement (Altogether 6 statement).

18. Information index (X_{18})

It is the ratio of interaction with human being and interaction with mass media, which is measured by 10 point scale and converted into percentage.

19. Distance matrix (X_{19})

It is the mean distance covered by the farmer for selling their crop.

Predicted Variables

1. DISILLUSIONMENT (Y_1)

Literally "Disillusionment" means a feeling of disappointment resulting from the discovery that something is not as good as one believed it to be.

2. CHAOS (Y_2)

Literally chaos means complete confusion and disorder: a state in which behavior and events are not controlled by anything.

3. DISORDER (Y_3)

A state of unrest or randomness.

Preparation of interview schedule

On the basis of the findings of pilot study a preliminary interview schedule was formed with the help of literature and by the assistance of Chairman of Advisory Committee. The interview schedule consisted of three major parts according to the specific objectives of the study.

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Pre-testing of Interview Schedule

Pretesting or preliminary testing is the process of an advance testing of the study design after the schedule/questionnaire has been prepared. The object of pretesting is to detect the discrepancies that have emerged and to remove them after necessary modification in the schedule. It also helps to identify whether the questions are logically organized, the replies could properly recorded in the space provided for or there is any scope for further improvement. After conducting pretesting appropriate changes and modification of the interview schedule have been made. The individuals who responded in pretesting have been excluded in the final sample selected for the study.

Techniques of field data collection

The respondents were personally interviewed during puja vacation and summer vacation. The items were asked in Bengali as well as English version in a simple term so that the members could understand easily. The entries were done in the schedule by student investigator himself at the time of interview.

Statistical tools for Analysis and Interpretation of Data

The statistical methods used for analysis and interpretation of raw data were –

1. Mean
2. Standard deviation
3. Coefficient of Variance
4. Correlation of coefficient
5. Multiple regression analysis
6. Path analysis
7. Factor analysis

Mean

The mean is the arithmetic average and is the result obtained when the sum of the value of individual in the data is divided by the number of individuals in the data. Mean is simplest and relatively stable measure of

central tendency. The mean reflects and is affected by every score in the distribution. We can work it out as follows

Mean or $\bar{x}$ = $\frac{\sum x_i}{N} = \frac{x_1+x_2+x_3+ \ldots\ldots\ldots\ldots\ldots\ldots x_n}{N}$

Where,

($\bar{x}$) = The symbol we use for mean (pronounced as x bar)

$\sum$ = Symbol for summation

x_i = Value of the i^{th} item X , I = 1, 2, ……n

N = Total number of items.

Mean is the simplest measurement of central tendency and is a widely used measure. Its chief use consists in summarizing the essential features of a series and in enabling data to be compared. It is a relatively stable measure of central tendency. But it suffers from some limitations *viz.* it is unduly affected by extreme; it may not coincide with actual value of an item in a series, and it may lead to strong impressions, particularly when the item values are not given with the average. However, mean is better than other average, especially in economic and social studies where direct quantitative measurements are possible.

Standard Deviation

Standard deviation is the most widely used measure of dispersion of a series and is commonly denoted by the symbol **σ** (pronounced as sigma) Standard deviation is the square root of the arithmetic mean of the square of the deviations, the deviations being measured from the arithmetic mean of distribution.

It is less affected by sampling errors and is more stable measure of dispersion. It is worked out as follows,

Standard deviation (**σ**) = $\sqrt{\frac{\sum(x_i - x)^2}{n}}$

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Coefficient of Variation

A measure of variation which is independent of the unit of measurement is provided by Coefficient of variation. Being unit free, this is useful for computation of variability between different populations. The Coefficient of variation is standard deviation expressed as percentage of the mean and is measured by the formula.

$$CV = \frac{Standard\ Deviation\ (\sigma)}{Mean} \times 100$$

Coefficient of Correlation

When an increase or decrease in one variable is accompanied by an increase or decrease in other variable, the two are said to be correlated and the phenomenon is known as correlation. Correlation coefficient (r) is a measure of the relationship between two variables, which are at the interval or ratio level or measurement and are linearly related. A Karl Pearson's coefficient of correlation also known as product moment 'r' is computed by the formula.

$$r_{xy} = \frac{N\sum xy - (\sum x)(\sum y)}{\sqrt{[N\sum x^2 - (\sum x)2][N\sum y^2 - (\sum y)2]}}$$

Where,

x and y = Original scores in variables x and y

N = Number of paired scores

$\sum xy$ = Each x multiplied by its corresponding y, then summed

$\sum x$ = Sum of x scores

$\sum x^2$ = Each x squared, then summed

$(\sum x)^2$ = Sum of x scores, squared

$\sum y$ = Sum of y scores

$\sum y^2$ = each y squared, then summed

$(\sum y)^2$ = Sum of y scores, squared

This coefficient assumes the following;

That there is linear relationship between the two variables;

That the two variables are causally related which means that one of the variable is independent and other is dependent and;

- A large number of independent causes are operating in both variables so as to produce a normal distribution.

The value of 'r' lies between +1 to -1. Positive values of r indicate that positive correlation between the two variables (i.e. changes in both variables take place in the same direction), whereas negative values of 'r' indicate negative correlation i.e. changes in the two variables taking place in opposite direction. A zero value of 'r' indicates that there is no association between the two variables. When r (+) 1, it indicates perfect positive correlation and when it is (-) 1, it indicates perfect negative correlation, meaning thereby that variations in independent variable (x) explain 100 per cent of the variations in the dependent variable (y). We can also say that for a unit change in independent variable, if there happens to be constant change in the dependent variable in the same direction, the correlation will be termed as perfect positive. But if such change occurs in the opposite direction, the correlation will be termed as perfect negative. The value of 'r' nearer to +1 or -1 indicates high degree of correlation between the two variables.

Regression

The correlation coefficient only expresses association and by itself tells nothing about the causal relationships of the variables. Thus, purely from the knowledge that two variables x and y are correlated, we cannot say whether variation in x is the cause or the results from mutual dependence of the two variables or from common causes affecting both of them. Similarly, the mere existence of a high value of correlation coefficient is not necessarily of an underlying relationship between the two variables.

The underlying relation between y and x in a bivariate population can be expressed in the form of a mathematical equation known as regression equation and is said to represent the regression of the variable y on the variable x. (Panse and Sukhatme, 1967)

If y is the dependent variable and x is the independent variable, then the linear regression equation can be written as

$$y = a + bx$$

The values of a and b can be obtained by the method of least squares which consists of minimizing the expression

$$\sum(y_i - a - bx_i)^2 \text{ with respect to a and b.}$$

The values of a and b are

$$a = \bar{y} - b\bar{x}$$

$$b = \frac{\sum xy - \frac{(\sum x)(\sum y)}{n}}{\sum x^2 - \frac{(\sum x)^2}{n}}$$

The regression equation can now be written as

$$y = \bar{y} - b\bar{x} + bx$$

$$y - \bar{y} = b(x - \bar{x})$$

Where b is the regression coefficient

Stepwise Multiple Regression

Stepwise regression is a variation of multiple regressions which provides a means of choosing independent variables that yield the best prediction possible with the fewest independent variables. It permits the user to solve a sequence of one or more multiple linear regression problems by stepwise application of the least square method.

At each step in the analysis, a variable is added or removed which results in the greatest production in the error sum of squares (Burroughs Corporation, 1975).

According to Drapper and Smith (1981), the method of stepwise multiple regression analysis is to insert variables in turn until the regression equation in satisfactory. The order of insertion is determined by suing the partial correlation coefficient as a measure of the importance of variables not yet in the equation.

The program, according to Burroughs Corporation (1975), first forms a correlation matrix, finds the best predictor (the independent variable having the highest correlation with criterion variable) and performs a regression

analysis with this predictor. Then, the second best predictor (independent), and so on. At any given step, the group of predictors being used is not necessarily the best group of that size (i.e. the particular group of independent variables does not necessarily have the highest multiple correlation with the criterion that any group of this size does). Rather, this group contains the variables that have the highest individual correlation with the criterion.

Significance of variable that is being considered for entrance into the regression equation is measured by the F-statistic. If F is too small (less than F 'include'), the variable is not added to the regression equation. Include statement establishes the minimum value of the F-statistic required for the inclusion of a variable in the regression equation. In the example which follows, the F-value for inclusion was 0.01.

Significance of variables already in the regression equation may change as new variables are entered. This significance of the variables currently in the equation is also measured by the F-statistic. If F is too small (less than F 'delete'), the variable is not added to the equation. Delete establishes the value of the F-statistic below which the variable is deleted from the regression equation. Here, the F-value for deletion was 0.005.

The 'tolerance' level specified is used as control of degeneracy occurs when a variable entered into the equation is a linear combination of variables already present in the equation. Tolerance statement establishes the maximum value a pivoted element may attain while still allowing its associated variable to be brought into equation. A variable is not brought into the regression equation if its associated pivoted element is below the specified tolerance level, which was 0.001 in the present example.

Factor Analysis

Factor analysis is a very useful and popular method of multivariate research technique, mostly used in social and behavioural sciences. This technique is applicable when there is a systematic interdependence among a set of observed or manifest variables, and the researcher is interested in finding out something more fundamental or latent which creates this communality (commonness).

For example, we may have data on farmers' education, occupation, land, house, farm power, material possession, social participation etc. and want to infer from these some factor relating to social status, which shall summarize the communality of all the variables.

According to Kothari (1996), Factor analysis seeks to resolve a large set of measured variables in terms of relatively few categories, known as factors. This technique allows the researcher to group variables into factors (based on correlation between variables), and the factors so derived may be treated as new variables (often termed as latent variables) and their grouped into the factor. The meaning and name of such new variable is subjectively determined by the researcher.

Since the factors happen to be linear combinations of data, the coordinates of each observation or variables is measured to obtain what are called factor loadings. Such factors loadings represent the correlation between the particular variable and the factor, and are usually placed in a matrix of correlations between the variable and the factors.

Concepts Used In Factor Analysis

Some important concepts used in factor analysis are explained, following Kothari (1996).

Factor: A factor is an underlying dimension that accounts for several observed variables. Factor is a hypothetical construct or classification. There may be one or more factors, depending upon the nature of the study and the number of variables involved in it.

Factor loadings: Factor loadings are those values which explain how closely the variables are related to each one of the factors discovered. Factor loadings work as key to understanding what the factors mean. It is the absolute size (rather the signs, plus or minus) of the loadings that is important in the interpretation of a factor.

Communality (h^2) Communality, represented by $h^{2,}$ shows how much of each variable is accounted for by the underlying factor taken together. A high value of communality means that not much of the variable is left over after whatever the factors represent is taken into consideration.

Eigenvalue (or latent root): The sum of squared values of factor loadings relating to a factor is referred to as eigenvlue or latent root. Eigenvalue

indicates the relative importance of each factor in accounting for the particular set of variables being analyzed.

Rotation: Rotation reveals different structures in the data and provides meaning to the results of factor analysis. There are different types of rotations such as orthogonal rotations, oblique rotations, Varimax rotation etc. One has to select a rotation appropriate to the study. For the present study Varimax rotation has been used.

Factor Analysis is used:

* To reduce the dimensionality of large number of variables to a fewer number of factors.

* To confirm the hypothesized factor structure by way of testing of hypothesis about the structure of variables in terms of expected number of significant factor loading.

Hence in factor analysis specific and error variables are excluded and only the common variables are taken into account. There are some steps in factor analysis:

*We have to collect data then we have to work out the correlation between the variables.

*It is to explore the possibility of data reduction i.e. initial steps of factor are to be explored. The common method of extraction of factors is Principle Component Analysis (P.C.A).

Principal Component Analysis

There are several methods of factor analysis. The method of Principal Component Analysis which is widely used is discussed here.

The principal component analysis extracts m-eigenvectors (principal component axes) and corresponding m-eigenvalues (the variance measured along the eigenvector), from m x m symmetrical matrix of correlation.

The eigenvectors obtained from this principal component analysis are all orthogonal (i.e. inter-column correlations are near zero).The eigenvalues account for all of the original data variances in decreasing order such that each has variance or eigenvalue less than the previous ones. The total of the eigenvalues

$$(\lambda_1 + \lambda_2 + \cdots \ldots \ldots \ldots + \lambda_m,)$$

This is the same as the sum of the variances constituting the diagonal or trace of the correlation matrix before transformation. The principal components are then converted into factors by multiplying each element of the principal components or eigenvectors (v) by the square – root of the corresponding eigenvalues ($\lambda^{1/2}.V$). Factors, thus, besides the direction also represent the variances.Kaiser (1958) and others have recommended retaining all those eigenvalues, which have values more than one.

Next step is to remove the noise imposed by (m - p) unnecessary axes. To accomplish this, p-orthogonal reference axes or factors are routed about the origin to positions such that the variance of the loading from each variable onto each factor axis is either extreme (±1) or zero. This maximization of the range of the loadings was performed by using Kaiser's Varimax criterion. Scanning through each factor column for large absolute values in the varimax matrix will reveal a few variables with significantly high loadings and many others with insignificantly loadings. The column showing communality ($\sum h^2_j$) is the total amount of variance of each variable retained in the factors, and is computed by summing the squares of the elements of the factors in each row of the varimax matrix. Fairly high communality of each variable implies the appropriateness of the model adopted, for the study. The last step involved interpretation of the factors.