CHAPTER - 5

Research Methodology

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. Pilot Study.
C. Sampling Design.
D. Empirical Measurement of the Variables.
E. Preparation of Interview Schedule.
F. Pre-testing of Interview Schedule.
G. Techniques of Data Collection.
H. Statistical Tools used for Analysis of Data.

A. Locale of Research

Fatepur GP of the Haringhata block of Nadia district in West Bengal was purposively selected for the study. The village namely Saupara 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 and (e) The closure familiarities of the student researcher with the area, people, officials and local dialects.

B. 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, Rejection, Adoption, Reinvention and helped in the construction of reformative working tools.

C. 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 climate change 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.

Step	Items	Level	Approach
1	State	West Bengal	Purposive
2	District	Nadia	Purposive
3	Subdivision	Kalyani	Purposive
4	Block	Haringhata	Purposive
5	Gram Panchayat	Fatepur	Purposive
6	Village	Saupara	Random
7	Respondents	50	Random
Total No. of Respondents: **50**			

Sampling Technique and Sampling Design

D. Empirical Measurement of the Variables

After reviewing various literature related to the field of study and consultation with the respected chairman of Advisory Committee and other experts, a list of variables was prepared. On the basis of the selected variables, a schedule was formed.

a. Independent Variables

Sl. No.	Variables	Notation	Score
1	Age	X_1	Chronological age
2	Education	X_2	Year of Schooling
3	Family Size	X_3	Number of family members
4	Occupation	X_4	1-10scale
5	Cropping Intensity	X_5	Bigha
6	Farm Size	X_6	Total land holding/Family size

7	Annual Income	X_7	Real Value/Family size
8	Electricity Consumption	X_8	Bill/month/capita
9	Fuel Consumption	X_9	Lit/year/capita
10	Irrigation Index	X_{10}	Total Irrigated/ Total farm size
11	Independency	X_{11}	1-10 scale
12	Innovation Proneness	X_{12}	1-10 value
13	Risk Orientation	X_{13}	1-10 scale
14	Orientation Towards Competition	X_{14}	1-10 scale
15	Management	X_{15}	1-10 scale
16	Market Orientation	X_{16}	1-10 scale
17	Information Seeking Behaviour	X_{17}	1-10 scale
18	Distance Matrix	X_{18}	Real value
19	Drudgeries	X_{19}	1-10 scale

- **Age (x_1)**

In all societies, age is one of the most important determinants of social status and social role of the individual. It is said that young farmers are more inclined to the change than the aged farmer who usually stick to their traditionally bound old practices. In the present study, age of the respondent was measured on the basis of their chronological age at the time of investigation.

- **Education (x_2)**

Education is instrumental in building personality structure and helps in changing one's behavior in social life. Education may be conceptualized as the amount of formal schooling attained/ literacy acquired by the responded.

- **Family Size (x_3)**

Family size is operationalized as the members in the individual family. In the present study only those members of the family considered, who were taking the meal in one chullah.

- **Occupation (x_4)**

Occupation of a person refers to regular activity performed for payment that occupies one's time. In the present study a scale is developed on 1-10 point scale. This scale consists of as follows. Scoring was done on the basis of the preference of the individuals towards the following professions.

Sl. No.	Items	Scale (1-10)
1	Labor	
2	Artisan	
3	Business	
4	Independent	
5	Farming	
6	Services	

- **Cropping Intensity (x_5)**

Cropping intensity has been operaionalized as the proportion of total annual cropped area to the size of holding expressed in percentage. The cropping intensity is calculated by the formula

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

- **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.

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

- **Annual Income (x_7)**

Annual income is the economic measurement of farmers' status. It is operationally defined as the gross income from all the viable sources 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.

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

- **Electricity Consumption (x_8)**

Electricity consumption is calculated in the present study with the formula as follows.

$$\frac{Electricity\ consumption\ in\ a\ month\ of\ a\ farm\ family}{Size\ of\ the\ family}$$

- **Fuel Consumption (x_9)**

Fuel consumption shows that diesel, petrol and kerosene oil consumed by a farm family in a year. In the present study it has been calculated as follows

$$\frac{Consumption\ of\ diesel, petrol\ and\ kerosene\ oil\ in\ a\ year}{Size\ of\ the\ family}$$

- **Irrigation Index (x_{10})**

In the present study irrigation index is calculated in per cent as follows

$$\frac{Area\ of\ the\ land\ under\ Irrigaion}{Total\ holding\ size} \times 100$$

- **Independency (x_{11})**

In the present study independency has been operationalized as the extent of feeling of one's own ability and resourcefulness in carrying out any activity. It has been measured with the help of independence scale developed by Supe (1969) with some modification. The scale consisted of 3 statements and each statement is of 10 (1-10) point scale and asked to the farmers to give preference score out of 10 (1-10). The score of each individual in the independency has been obtained by summing the score for each statement divided by total statement (all together 3 statements).

- **Innovation Proneness (x_{12})**

Innovation proneness indicates the behavior pattern of individual who have interest in and desire to seek change in farming techniques and to introduce such change into their operations wherever practical and feasible.

In the present study, Maulik's (1965) with modification self-rating innovation proneness scale has been used to measure the innovation proneness of the farmers. This scale consisted of three set of statements. Each set of statement contained three short statements with weightage of 10 (1-10) point each in every set of statement of innovation proneness and farmers preference has been asked to give score out of 10 (1-10) for every statement in each section. The forced choice method has been followed to

overcome the familiar problems of personal bias and lack of objectivity in self-evaluation. This method forced the respondents to choose from the group of three short statements describing a particular personality characteristic; the one most accurately portrayed the respondent himself. After obtaining the respondent's score out of 10 (1-10) choices for each of the three sets of the statements, the scoring has been done by summing up score of all statement divided by total no. of statement (all together 9 statements). As there were three sets of statements, for innovation proneness scale, the sum of score of all statements divided by total no. of statement is a respondents' self-rating score for innovation proneness.

- **Risk Orientation (x_{13})**

In the present study, the risk orientation of farmers has been 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 problems in farming. The scale consisted of 3 items. The items are rated in out of 10 point scale and farmers preferences have been asked to give score out of 10.

- **Orientation Towards Competition(x_{14})**

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.

Sing (1981) with modification scale has been used to get the score for the orientation towards competition in out of 10 (1-10) point for each of the

statements. The score for each individual in the orientation towards competition have been obtained by summing up the scores of all statement divided by total no. of statement (All together 3 statements).

- **Management(x_{15})**

Management orientation is operationalized as the degree to which the individuals are oriented towards managing their income generating activities regarding planning, production and marketing function.

The management orientation scale developed by Samanta (1977) with modification was adopted for this study, consisted of 4 statements. The statements have been rated in out of 10 (1-10) point scale. The scoring has been done by summing up score of all statements divided by total no. of statements (All together 4 statements).

- **Market Orientation (x_{16})**

The Market Orientation scale developed by Samanta (1977) with modification was adopted for this study, consisted of 3 statements. The statements have been rated in out of 10 (1-10) point scale. The scoring has been done by summing up score of all statements divided by total no. of statements (All together 3 statements).

- **Information Seeking Behaviour (x_{17})**

Information seeking is a kind of behavior of respondent. International Encyclopedia of Information and Library Science defines Information seeking behavior as "The complicated form of actions, which people slot in,

when seeking information of whatever kind for whatever reason". (David Ellis, 2003).

In the present study a suitable scale has been developed which consisted of total 5 statements. The statements has been rated in out of 10 (1-10) point scale response categories and farmers' preference has been asked to give score out of 10 (1-10). The score of the individual has been obtained by summing up the scores of the 5 statements divided by total no. of items (All together 5 statements).

- **Distance Matrix (x_{18})**

In the present study distance matrix is the mean distance covered by the respondents for selling their crop, for getting credit from the bank, for getting treatment of their ailments or diseases and for sending their children to school and colleges for education.

- **Drudgeries (x_{19})**

Use of human power is extensive in several farm operations such as handling of farm machinery and tools, various agricultural activities *viz*. ploughing, sowing, irrigating, spraying of pesticides, fertilizer application, monitoring. In the present study Drudgeries is the work load faced by the farmers in hours. It has been operationalized as the total number of hours spent in major agricultural activities or livelihood activities divided by number of items.

E. 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.

F. 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.

G. 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.

H. Statistical Tools used for Analysis of Data

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

1. Mean
2. Standard deviation
3. Coefficient of Variation
4. Correlation of Coefficient
5. Multiple Regression Analysis (Step down)
6. Path Analysis
7. Factor Analysis

1. 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.

When the data are expressed in a frequency distribution (grouped), the mean is calculated by using the following formula–

$$X = \frac{\sum_{i=1}^{N} fixi}{N}$$

Where,

x = Mean of the observation.

fi = Frequency of the class.

xi = Mid value of the class.

N = Total number of observation

2. Standard Deviation

Standard deviation (SD) of a set of observation is the square root of the arithmetic mean of the squares of the deviations. The deviations being measured from the arithmetic mean of the distributions. It is commonly denoted by the symbol σ (Sigma). To measure the average deviation from the standard value of the data standard deviation is used. It is less affected by sampling errors and is a more stable measure of dispersion.

The standard deviation of the data grouped in the form of frequency distribution is computed by using the following formula–

$$S.D. = \sqrt{\frac{\sum_{i=1}^{N} fixi^2}{N}} - \left[\frac{\sum_{i=1}^{N} fixi}{N}\right]^2$$

Where,

σ = Standard deviation

N = total No of observation in a particular cell.

X = value of observation in a particular cell

F = Frequency of observation

$\overline{X}$ = mean number of observation

i = any number (e.g. 1, 2, 3) denoting position

3. 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.

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

4. Correlation of coefficient

When an increase or decrease in one variety is accompanied by an increase or decrease in another variety, 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 rational level of measurement and are linearly related. A Pearson 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 scares in variables X and Y
N	=	Number of paired scores
∑XY	=	Each X multiplied by its corresponding Y, then summed
∑X	=	Sum of X scores
$\sum X^2$	=	Each of X squared, then summed
$(\sum X)^2$	=	Sum of X score squared
∑Y	=	Sum of Y scores
$\sum Y^2$	=	Each of Y squared, than summed
$(\sum Y)^2$	=	Sum of Y score squared

The range of correlation coefficient is between -1 to +1. This means that -1 is perfect negative correlation and +1 is perfect positive correlation. A perfect correlation is, however, seldom achieved. A correlation coefficient

to be acceptable should be statistically significant. Otherwise, we say that no significant relationship exist between the variables.

5. Multiple regression analysis

Generally a number of antecedent variables simultaneously contribute to influence the consequent variables, as in the case under study. It is of immense practical value to know the extent to which the antecedent variables, individually or jointly, could predict or contribute towards the consequent variable. This was done by computing multiple regression analysis. If Y is the consequent variable and X_1, X_2, X_3…are the antecedent variables; the multiple regression equation is given by the following formula-

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 \ldots\ldots$$

Or, $Y = a + \sum bx$

The significance of the b- value was judged by calculating their respective t-values and comparing them to the table, given by Fisher and Yates (1963), with (n-p-1) degree of freedom (where, n = number respondents and p = number of antecedent variables) at 5% and 1% level of significance.

The square root of the ratio of the regression sum of squares to the total sum of squares is known as multiple correlation coefficients and is denoted by R. The square of the multiple correlation coefficients R^2 is called the multiple coefficient of determination and represents the fraction of the variation of Y accounted for by its joint association with the variables X_1, X_2, X_3…

Central to the application of multiple regression analysis is the interpretation of the final fitted model. A significant F- value for R means

that the fitted model is adequate. The significance of the F- value was judged by comparing it to the table value, given by Fisher and Yates (1963) with P and (n-p-1) degrees of freedom (where, P = number of antecedent variables and n = number of respondents) at 5% and 1% levels.

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).

6. Path Analysis

The objective of doing Path Analysis is to get a clear picture of the direct and indirect effects of the independent variables on the dependent variable. Variables, through which substantial indirect effects are channeled, are also found out.

Singh and Chaudhary (1977), defined path coefficient as the ratio of the standard deviation of the effect due to a given cause to the total standard deviation of the effect i.e. if Y is the effect and x1 is the cause, the path coefficient for the path from cause x1 to the effect Y is $\frac{\sigma x1}{\sigma y}$

It is advisable to do path analysis with only those variables which have significant effects on the dependent variable. This may be done by restoring

to multiple regression analysis, and selecting those independent variables whose partial b value are significant. This shall enhance clarity of the path analysis.

7. Factor Analysis

Factor analysis is a very useful and popular method of multivariate research technique, mostly used in social and behavioral sciences. 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); the factors so derived may be treated as new variables (often termed as latent variables) and their value derived by summing the values of the original variables, which had been 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 variable is measured to obtain what are factor loadings. Such factor loading represent the correlation between the variable and the factor and are usually placed in a matrix of correlations of the variables and the factors. In the Factor Analysis the "Principle Component Method" was followed.

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).