CHAPTER-5

Research Methodology

The deliberation on the methodology has been made to understand the concept, methods and techniques which are utilized to design the study, collection of information, analysis of data and interpretation of the findings for revelation of truths and formulation of theories. These chapter deals with the method and a procedure used in the study an consist 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.

Locale of Research:

Rautari GP of the Chakdaha block of Nadia district in West Bengal was purposively selected for the study. The village namely Rautari was selected by random sampling. The area has been selected for the study because of – a) There is sample scope for collecting relevant data for the present study, b) Acquaintance with the local people as well as local language, c)The concern area was very 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 closer familiarities of the student researchers with the area, people, officials and local dialects.

B. Pilot Study:

Before taking up actual field work 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 changes concept.

C. Sampling Design:

Purposive as well as simple random sampling techniques were adopted for the study.

Sampling Techniques and Sampling Design

Step	Items	Level	Approach
1	State	West Bengal	Purposive
2	District	Nadia	Purposive
3	Subdivision	Kalyani	Purposive
4	Block	Chakdaha	Purposive
5	Gram Panchayat	Rautari	Purposive

6	Village	Rautari	Random
7	Respondants	60	Random

D. Empirical Measurement of the Variabl

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

Independent Variables:

SL No	Variables	Notation
1	Age	$\mathbf{X_1}$
2	Education	$\mathbf{X_2}$
3	Exposure Unit	$\mathbf{X_3}$
4	Family Members	$\mathbf{X_4}$
5	Family Labour	$\mathbf{X_5}$
6	Size of holding	$\mathbf{X_6}$
7	No of Fragments	$\mathbf{X_7}$
8	Cropping Intensity	$\mathbf{X_8}$
9	Homested Land	$\mathbf{X_9}$
10	Marketable Surplus	$\mathbf{X_{10}}$
11	Marketed Surplus	$\mathbf{X_{11}}$
12	Distance From Market	$\mathbf{X_{12}}$
13	Cost of fuel	$\mathbf{X_{13}}$
14	Family Expenditure	$\mathbf{X_{14}}$
15	NRM Motivation	$\mathbf{X_{15}}$

- **Age(X1)**

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

respondent was measured on the basis of their chronological age at the time of investigation.

- **Education(X2)**

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

- **Exposure Unit(3)**

The frequency of interaction is critical sources of information consisting of personal-localite and cosmopolite sources.

- **Family Size(X4)**

Number of family members of an individual farmers as measured by count and gender.

- **Family labour(X5)**

Family farming is a means of organizing agricultural, forestry, fisheries, pastoral and aquaculture production which is managed and operated by a family and predominantly reliant on family labour, including both women's and men's. Here the number of family members who attach with the farming was taken as family labour.

- **Size of Holding(X6)**

The amount of land owned by a person is an important parameter to access the economic status of the person in the society.

- **No of fragments(X7)**

It's the number of fragmented lands of an individual farmer.

- **Cropping Intensity(X8)**

It has been conceptualizedas the proportion of total annual cropped area to the size of holding expressed in percentage. Its calculated as-

Cropping Intensity=Total annual cropped area/size of holding × 100

- **Home Stead Land(X9)**

The amountof land owned by a person is an important parameter to assess the economics status of the person in the society.

- **Marketable Surplus(X10)**

Marketable surplus is a term that agriculturalists use to refer to a specific type of surplus that farmers and ranchers deal with. It was taken on the per bigha basis of the individual farmer.

- **Marketed Surplus(X11)**

Marketed Surplus as compared to Marketable Surplus is a practical ex-post concept and refers tothat part of the marketable surplus which is marketed by the producer i.e., not only the part which is available for disposal but that part which is made available to the market or to the disposal of the non-farm rural and urban population.. It was taken on the per bigha basis of the individual farmer.

- **Distance from market**

It’s the distance between market and field of a farmer.

- **Cost of Fuel(X13)**

$$=\frac{consumption\ of\ diesel.Petrol.Electricity\ in\ a\ year}{Size\ of\ family}$$

- **Family Expenditure(X14)**

$$= \frac{Family\ income\ in\ a\ year}{Family\ size}$$

- **NRM Motivation(X15)**

It is the attitude of a farmer towards Natural Resource Management as measured on 100 point scale and calibrated accordingly.

Dependent Variabless:

1.Y_{cd}- No. of crops grown per unit area.

2.Y_R(Y rice)

- Y_{p1} - Disease pest incident in pulse crop
- Y_{p2} – DPM in pulse crop.
- Y_{p3} – Soil health maintained in pulse.
- Y_{p4} – Irrigation in pulse.
- Y_{p5} – Pollution due to application of agro-chemical in pulse.
- Y_{p6} – Combating climate change in pulse.
- Y_{p7} – Return from market in pulse.
- Y_{p8} – Marketability in pulse.

CROP DIVERSITY (Y_{cd})

NO OF CROPS GROWN/UNIT AREA		
	PULSE(Y_p)	**RICE(Y_r)**
DISEASE PEST INCIDENT(Y_1)		
DISEASE PEST MANAGEMENT(Y_2)		
SOIL HEALTH MAINTAINED(Y_3)		
NO OF IRRIGATION(Y_4)		
POLLUTION DUE TO AGRO CHEM(Y_5)		
Combating climate change(Y_6)		
RETURN from pulse(Y_7)		
MARKETABILITY(Y_8)		

E. Preparation of Interview Schedule

On the basis of finding pilot study a preliminary 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 objective of the study.

F. Pre-testing of Interview Schedule

It's the process of advance testing of the study design after the schedule 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. 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 durga puja vacation and summer vacation. The items were asked in local language, Bengali .The entire 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 for analysis and interpretation of raw data were.

a) Mean.

b) Standard deviation.

c) Coefficient of Variance.

d) Correlation of coefficient.

e) Multiple regression analysis.

f) Canonical covariate analysis.

a) Mean:

The mean is the arithmetic average and is the result obtained when the sum of the of value of individual in the data is divided by the number of individuals in the data. Mean is and relatively stable measure of central tendency. The mean reflects and is by every score in the distribution.

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

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

Where,

x = Mean of the observation.

fi = Frequency ofthe class.

xi = Mid value of the class.

N = Total number of observation

b) 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. lt is commonly denoted by the symbol (Sigma). To measure the average deviation from the standard value of the data standard deviation is used. It is less affected by sampling en-ors 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 –

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

When,

d = Standard deviation

N = total No of observation in a particular coll.

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

c) Coefficient of Variance:

A measure of variation which is independent of the unit of measurement is proved by the coefficient of variation. Being unit free, this is useful For comparison of variability between different populations. The coefficient of variation is standard deviation expressed as percentage of the mean.

Coefficient of variation is measured by using the following formula —

$$C.V. = \frac{S.D.}{Mean} \times 100$$

d) Coefficient of correlation:

When increase or decrease in one variety is accompanied by an increase or in another variety, the two are said to be correlated and Ute 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 Person product-moment "r" is computed by the formula.

$$r_{xy} = \frac{N\sum XY(\sum X)(\sum Y)}{\sqrt{[N\sum X^2 - (\sum X)^2][N\sum Y^2 - (\sum Y)^2]}}$$

When,

X and Y = Original scares in variables X and Y

N = Number ofpaired scores

$\sum XY$ = Each X multiplied by its comzsponding Y. then summed

$\sum X$ = Sum ol'X scores

$\sum X^2$ = Each of X squared, then summed

$(\sum X)^2$ = Sum of X score squared

$\sum Y$ = 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 perfect negative correlation +1 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.

e) Multiple regression analysis:

Generally a number of antecedent variable 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. lf Y is the consequent variable and X], X2, X3...are the antecedent variables; the multiple regression equation is given by the following formulas –

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

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 (I963), with (n-p-1) degree of freedom (where, n = number respondents and p = number of antecedent variables) at 5% a|1d 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 R2 is called the multiple coefficient of determination and represents the applications the fraction of the variation of Y accounted for by its joint association with the variables X1, X2, X3 …

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-l) degree of freedom (where, P = number antecedent variables and n = number of respondents) at 5% and 1% levels.

f) Stepwise multiple regression : Stepwise regression is a which provides a means of choosing independent variables that yield the best possible with the fewest independent variables. It permts the user to solve a sequence of one 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 I975).

g) Canonical correlation analysis:

In statistics, canonical-correlation analysis (CCA) is a way of making sense of cross-covariance matrices. If we have two vectors X = (Xi, ..Xa) and Y = (Yl, … Ym) of random variables, and there are variables, then canonical-correlation analysis will find linear combinations of the Xi and Yj whish have maximum correlation with each other. Virtually all of the commonly encountered parametric tests of significance can be treated as special cases of canonical-correlation analysis, which is the general procedure for investigating the relationships between two sets of variables. The method was first introduced by Harold Hotelling in I936.

Given two column vectors X = $(x_1 \ldots x_a)^1$ and Y = $(y_1 \ldots y_m)^1$ of random variables with finite second moments, one may define the cross-covariance $\Sigma_{xy} = CN(X.Y)$ to be the $n \times m$ matrix whose (i.j) entry is the convarience$^{CON(r,y)}$. In the covariance $^{CON(r,y)}$. In practice, we would estimate

the covariance matrix based on sampled data from X and Y (i.e. from a pair of data matrices).

Canonical-correlation analysis seeks vectors a' and b' such that the random variables a^1X and b'Y maximize the correlation $p = corr(a'X,b'Y)$. The random variables $U = a'X$ and $V = b'Y$ are the first pair of canonical variables. Then one seeks vectors maximizing the same correlation subject to the constraint that they are to be uncorrelated with the first pair of canonical variables; this gives the second pair of canonical variables. This procedure may be continued up to minimum m to n times.