

Chapter-5

Research Methodology

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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-

- i. Locale of Research.
- ii. Pilot Study.
- iii. Sampling Design.
- iv. Empirical Measurement of the Variables.
- v. Preparation of Interview Schedule.
- vi. Pre-testing of Interview Schedule.
- vii. Techniques of Data Collection.
- viii. Statistical Tools used for Analysis of Data.

Locale of research

Saguna Gram Panchayat of the Chakadh block of Nadia district in West Bengal was purposively selected for the study. The village namely Ghoragacha was selected by random sampling. The area had been selected for the study because of-

1. There is ample scope for collecting relevant data for the present study.
2. Acquaintance with the local people as well as the local language.
3. The concern area was easily accessible to the researcher in terms of place of residence.
4. The area was very easily accessible to the researcher in terms of transportation
5. The closure familiarities of the student researcher with the area, people, officials and local dialects.

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.

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.

Table 8: Sampling Technique and Sampling Design

Step	Item	Level	Approach
1	State	West Bengal	Purposive
2	District	Nadia	Purposive
3	Sub-division	Kalyani	Purposive
4	Block	Chakadah	Purposive
5	Gram Panchayat	Saguna	Purposive
6	Village	Ghoragachha	Random
7	Respondent	50	Random

Variables and Their Measurement

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 operationalised and measured in following manner.

Predictor variables

The variables and empirical measurements.

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, 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.

Education(X2)

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

Family size(X3)

The influence of family members on the decision-making process of farm operation is inevitable. 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.

Male-Female ratio(X4)

It is defined as the ratio of female members of the family which has been calculated by total female members of the family/total male members of the family

Occupation(X5)

Ahmad, D. *et.al.*, (2011). Presented the work of development of a test rig (tractor pulled) for measurement of motions resistance of towed narrow wheels with a view to obtaining new design information to enhance the use of narrow wheels as tractions members for low income earners or rural populace whose occupation is predominantly farming. Kishore Goswami; Choudhary, H.K; Jitu Saikia, (2012) studied farmers adoption of slash and burn agriculture possess a significant ecological threat to the societies and is acute in hilly areas of North East India. This practice is influenced by host of factors such as personal, social, economic, institutional and physical. Age of the respondents, primary occupation, annual per capita income, present area under cultivation, common practice of slash and burn agriculture in the locality, farmers' perception and access to credit are found to have statistically significant impact on the adoption of splash and burn agriculture.

Vlad, I. *et.al.*, (2011) analyzed the traditional occupational impact requested the application of a sociological research, effected on the field, in order to gain statistical decision support, adjusted to the specific of animal breeding activities and especially to sheep. The most important risk is that traditional sheep breeders tend to become mere historic references and are not replaced by other profession or occupations in rural areas, which seem to disintegrate due to lack of support, to much too high burden. The final remark underlines that profitability of sheep breeding occupation was never limited to its specific food products, and covered, instead, sometimes unimaginable, in terms of social and even cultural forms.

Cropping Intensity(X6)

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.

Farm Size(X7)

Farm size is a measure of farm business. It is the amount of land possessed by an individual peasant. Farm size is also an indicator of economic status in rural India. Studies on adoption and diffusion have indicated that farm size in most cases was positively and significantly related with the adoption of farm practices. Farm size can offered an opportunity to take the risk involved in trying out a new idea or practice (Singh and Sohal, 1967; Thorat, 1969; Choukidar and George, 1972; Sharma and Nair, 1974; Kumar, 1976; Mishra, 1979; Singh, 1979 and Singh, 1990). A relationship between the farm size or size of holding with the adoptive behaviour of the farmers is predicted.

Homestead Land(X8)

It is the area which covers the home and the surrounding; particularly area which is not included in the production process of the crops. It is calculated by dividing the area under house by the farm size.

Expenditure Allotment(X9)

Expenditure allotment is conceptualized to denote total expenditure are done in different heads by the farmers viz. Food, Clothes, Education, Farming (Fertilizer + Fungicide+ Insecticide + Herbicide + Seed + Ploughing of land + Irrigation + weeding) and Health in a year. In the present study expenditure occurred in farming divided by the total income of the farmer in a year has been considered.

Annual Income(X11)

The Annual Income of a person is an important parameter to assess the economic status of the person in the society. Annual income has been scored as family income/ year/ family size.

Irrigation Index(X12)

The amount of Irrigated Land owned by a person is an important parameter to assess the economic status of the person in the society. The attribute irrigation index had been measured by (land under full irrigation/ size of holding) Bigha.

Economic Motivation(X13)

Economic motivation may be conceptualized as the values or attitudes, which attach greater importance to profit maximization as the ends and means. In farming system economic motivation may be regarded as the identification of the degree of willingness for investment of available potential resources in adopting farm innovations. Past studies indicated that individual economic motivation was positively and significantly correlated with adoption of innovations (Nair, 1969; Singh, 1969; Singh, 1975; Haque, 1981 and Bandopadhyay, 1986).

It is expected that farmers economic motivation related with adoption, rejection and discontinuance of agricultural innovations.

Market Orientation(X14)

According to Encyclopaedia of Social sciences, management may be defined as the process by which the execution of a given purpose is put into operation and supervised. The combined output of various types and grades of human effort by which the process is affected is again known as management.

Niles (1956) opined good management or scientific management achieved a social objective with the best use of human material energy and time, and with satisfaction for the participation and the public.

Bradford and Johnson (1964) defined management in functional terms, as the performance of observation, analysis, decision-making, action and acceptance of responsibility. Management in farming situation, according to Yang (1962) means how well the farmer organizes and utilities the resources at his disposal to obtain a good produce and good price by intelligent marketing.

Management is the creation and control of technological and human environment of an organization in which human skill and capabilities of individual and groups find full scope for their effective use in order to accomplish the objective for which all enterprises have been set up. It is involved in the relationships of the individual, group, the organizations and environment (Das Gupta, 1968).

Wilken (1979) explained the management as the ongoing coordinating of the production process.

According to Akhouri (1996) the enterprise may be small or big but it demands management abilities in its owner or manager. The various facts of management such as production, marketing, planning, financial management etc. are crucial.

Thus, the management is defined differently with varying emphasis as per ones special learning. It would be worthwhile to point out that the very success or failure, or survival of an enterprise will depend on its management orientation.

Therefore, it is expected that the relationship between the management orientation and adoption, rejection and discontinuance of an agricultural innovation may exist.

Labour engaged(X15)

It is defined as the energy equivalence of the total labour engaged by different farm operation including male and female labour.

Labour engaged per operation(x16)

It is defined as the energy equivalence of the total labour engaged divided by number of farm operation.

Electricity consumption(x17 & x18)

Electricity is the important parameter to assess the energy consumption at farm level in the forms of pump operation and domestic level as well in form of power consumption.

Diesel consumption (x19)

Diesel is a vital source of energy to assess the pump and tillage operation at farm level, which ultimately leads the main role in cultivating process in agriculture

Consumption of LPG(x20)

LPG is most important element to cooking in modern season, which farther carried out a big amount of energy at farms huuseholds.

Consumption of kerosene(x21)

Kerosene is the important parameter to assess the energy consumption at farm level in the forms of pump operation and domestic level as well.

Media responsiveness(x22)

Different method of communications is use to peoples alert and makes them aware. Mass media like watching TV, listening radio are very useful to farmers to getting information about farm related activities.

Decision matrix(x23)

It is the important parameter to assess to status of respondent in respect to their decision making power including social, entrepreneurship and economical decision.

Predicted variables

Crop Energy Balance

It is defined as the difference between the energy equivalents of energy consumed by crop in the form of fertilizer, irrigation, ploughing, plant protection chemicals and the energy equivalents of the energy produced from the crop in the form of biological productivity per crop.

Domestic Energy Consumption

It is defined as the energy equivalents of the energy consumed by a household in different activities in the forms of electricity, dung cakes, fuel wood, kerosene, diesel, petrol, LPG per day per member.

Total Energy Balance

It is defined as the difference between energy equivalents of inputs in crop and domestic sector and the energy equivalents of out in crop and domestic sector.

Energy Consumption Pattern Impact

It is defined as the impact of the energy consumption in the form of electricity, kerosene, petrol, diesel, dung cakes etc on the economy, society, occupation and ecology. It is calculated on 10 point scale.

Total Farm Residue

It is defined as the total residue from farm in the form of straw, stubble, biomass etc. In this present study total equivalent of farm residues are divided by holding size of this farm family.

Note: The energy equivalents(calorific value) for different fuels,crop productivity has been taken from following websites.

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.

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 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 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 Variance
4. Correlation of coefficient
5. Multiple regression analysis
6. Path analysis
7. Factor analysis
8. Canonical Coefficient

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–

Where,

\bar{x} = Mean of the observation. f_i = Frequency of the class. x_i = Mid value of the class.

N = Total number of observation

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–

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

mean number of observation

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

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 –

A. Coefficient of Correlation

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.

Where,

X and Y = Original scores in variables X and Y

N = Number of paired scores

ΣXY = Each X multiplied by its corresponding Y, then summed ΣX = Sum of X scores

ΣX^2 = Each of X squared, then summed $(\Sigma X)^2$ = Sum of X score squared

ΣY = Sum of Y scores

ΣY^2 = Each of Y squared, than summed

$(\Sigma Y)^2$ = 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.

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 X1, X2, X3...are the antecedent variables; the multiple regression equation is given by the following formula-

Y=

Or, Y=a+

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 $X_1, X_2, X_3 \dots$

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).

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 channelled, 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 x_1 is the cause, the path coefficient for the path from cause

x_1 to the effect Y is

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.

Factor Analysis

Factor analysis is a very useful and popular method of multivariate research technique, mostly used in social and behavioural 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

██ number of variables to a fewer number of factors.

██ 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).