CHAPTER - V

RESEARCH METHODOLOGY
METHODOLOGY

The chapter "methodology" presents a precise method and procedure followed during the course of investigation and preparation of manuscript. The methodology used in carrying out the investigation have been outlined in eight sections as mentioned below.

1. Selection of problem
2. Research design
3. Plan of work
4. Location of the study
5. Sampling procedure
   (a) Selection of districts
   (b) Selection of blocks
   (c) Selection of watersheds
   (d) Selection of respondents
6. Tools & techniques used for data collection
   (a) Pilot study
   (b) Preparation of the interview schedule
   (c) Pre-testing of the schedule
   (d) Collection of data
7. Operationalization & measurement of variables.
8. Data processing & use of statistical methods.
1. **Selection of Problem:**

The important consideration in behavioral research is the selection, delineation and conceptualization of the problem. A good investigation gives priority on formation of a clear cut, realistic and unambiguous problem since delineation of the problem is more important and essential than finding out its solutions.

At present watershed development approach is in operation throughout the country. It underlines active involvement of the people, emphasizing bottom-up planning and top-down approach. A new set of guideline "National Watershed Development Programme" has been developed by the Ministry of Rural Development, Govt. Of India and circulated to all concerned for implementing the programme. The guideline very well spelled out the involvement of people in planning, implementing, utilizing of funds and maintaining assets created through watershed project. Sufficient exposures have been made by MANAGE HYDERABAD orienting Govt. Functionaries, NGO. Personnels and Scientists of the Agricultural University to made clear understanding of the operational procedures who in train the watershed people. The people staying in the watershed area has to prepare consolidated watershed plan with the guidance of Watershed Development Team duly recommended by the project Implementation Agency being scrutinized and approved by the District Watershed Advisory Committee according to which funds released directly to the watershed and utilized by the people as per the approved programme. It is therefore apprehended that feasible programme being developed and implemented with transparency in fund utilization. Technical personnel designated as watershed development team members were also employed at the watershed level for technical guidance. Adequate
funds are also provided for developing competency of the Watershed people. It is therefore apprehended that significant development might have occurred to the watershed people. Further no such investigation has been carried out by any agency to assess the extent of developments occurred through implementation of the project. The investigation therefore directed to take up various developments of the watershed people through the implementation of the project which perhaps the first of its kind in the state of Orissa.

While selecting the problem, “Impact of National Watershed Development Programme on Socio-Economic Development of the watershed people in Dhenkanal and Kandhamala District of Orissa”, due attention has been given to the factors like knowledge of the people about the crucial factors emphasized in the guideline, their involvement in formulation and execution of the programmes, attitude towards implementation of the project, extent of development occurs on different aspects and the constraints experienced in successful implementation of the programme.

2. Research Design:

According to Kerlinger (1963) research design is the plan, structure and strategy of the investigation conceived so as to obtain answer to the research questions and to control variance. The research design of the study was considered in the line of case studies and direct observation methods. It was planned to focus the study on the beneficiaries exclusively involved in implementation of watershed development programmes so that their experiences, difficulties, suggestions etc. could be collected to make the study realistic and recommendable. The present study comes within the preview of ex-post-facto research approach. Accordingly, specific objectives were
formulated to promote inquiry. In the light of objectives, the scope of the study was determined, techniques of investigation decided and tools selected for use were formulated along with pattern of statistical analysis.

3. **Plan of Work:**

Before actual investigation, efforts were made to conduct a detail survey of all related aspects of the study. A good number of interaction sessions were made by the investigator in seminars, trainings, workshops, visit to watershed areas and discussion with the district level officials for first hand information level. In spite of time constraints, adequate attention was made by the investigator to make the study as realistic as possible.

4. **Location of the Study:**

The study was undertaken in tribal district "Kandhamal" and non-tribal district "Dhenkanal" of Orissa considering the potentialities of the watershed programme. Both the districts are purely under rainfed agriculture.

Kandhamal is a tribal district of the state with 43.37% of tribal. Besides, out of 1433 watershed programmes operated in 30 district of Orissa state, Kandhamal district is having the highest number of watersheds (170). Further DPAP and NWDPRA project were also operating in the district since its inception. Operational research project on dry land agriculture were also operated in the district during nineties. All India Coordinated Project on dry land agriculture is also operating in the district. The district is also having a maximum area 92,442 ha. (89.62%) under rainfed agriculture. Besides, DPAP, NWDPRA, IWDP projects were also implemented in the district.
Similarly, Dhenkanal district though a non-tribal district of Orissa, there is tremendous potentialities of the watershed programmes. The district also purely under rainfed agriculture. The district has the highest number of watershed i.e. (42 nos.) among all the coastal district with 25105 ha. treatable area. The district has 51.59% un-irrigated area with cropping intensity only 125%. NWDPRA programme was in operation since inception. The Regional Research Station is also established in the district and conducting research exclusively on dry land agriculture. Rainfed farming system programmes were also undertaken by the State Agriculture University along with Agriculture Production Programme, National Demonstration, Experiment in the Cultivator’s Field were also operated.

It is therefore apprehended that the people of both the district are better exposed to the watershed activities and more experienced. Further; good comparison could be made between tribal and non-tribal district for assessing the developments as well as constraints for developing specific strategy towards better functioning of the watershed development programmes in both the districts. Therefore the district Dhenkanal and Kandhamala were selected purposively for getting better responses which would be usefull for the study as well as recommendations.

5. **Sampling Procedure**:

A multistage sampling procedure was followed to select the sample for the study. The district was selected purposively where as, blocks, watersheds and respondents selected at random. The watershed beneficiaries were selected exclusively as the respondents. Among the beneficiaries, watershed
president, watershed secretary, watershed volunteers and members were listed. It has been decided to include the President, Secretary, Chairman and Volunteers purposively as the respondents of the study. Random sampling technique was followed to select the beneficiaries from the user groups, self Help Groups, women communities and other minor communities to have the representatives of all sections of the watershed community.

(a). Selection of District:

It was decided to concentrate the study in a tribal and non-tribal district in the State of Orissa. As emphasized earlier; Kandhamal, the tribal district and Dhenkanal as the non-tribal district were purposively selected for the purpose of the investigation. More over; both the districts are mainly depend on rainfed agriculture. Various research and developmental programmes were implemented in the district during past for which the people living in the watershed area have sufficient exposure to the watershed activities. Further, the “National Watershed Development Programme” though initiated during 1995 but implemented in the district level during later part of 1996. But; the programme started in both the district earlier to other district in the state. Besides, both districts are purely under dry land agriculture and maximum watershed activities undertaken in both the districts in past. It is therefore apprehended that the people living in the watershed area in these two districts are more exposed to watershed activities than others district of the state.

Therefore the district Kandhamala and Dhenkanal were selected purposively for the purpose of investigation.
(b) **Selection of Blocks**:

District Kandhamal is having 2 Sub-Divisions and consisting 12 blocks. Phulbani, Khajuriapada and Phiringia blocks are under Phulbani Sub-Division and rest nine blocks under Baliguda Sub-Division. The officials of the department of Agriculture, Horticulture, Animal Husbandry, Sericulture, Panchayatraj and NGOs were working as the Project Implementation Agency. Khajuriapada and Phulbani blocks under Phulbani Sub-Division as well as Raikia and G. Udayagiri blocks under Baliguda Sub-Division were randomly selected for the purpose of investigation.

Dhenkanal district is having 3 Sub-Divisions covering 8 Blocks. Hindol and Sadar Block under Dhenkanal Sub-Division, Kankadahada and Kamakshyanagar block under Kamakshyanagar Sub-Division were also randomly selected for the purpose of investigation.

(c) **Selection of Watershed**

List of watersheds where the programme undertaken were collected from the District Rural Development Agency of the concerned district implementing the programme. During the discussion, assessment was made to rank the watershed in terms of its performance, cooperation of the people and their exposure. Discussions at length were made by the investigators with DRDA, Project Implementation Agencies and district officials involved in the implementation of the project. Finally, the performance of the watershed was also assessed. Taking into considerations from all aspect and discussions with district officials, Indragarh watershed in Raikia block, Ghatasila in G. Udayagiri, Ganjuguda in Phulbani and Badagarh watershed in Khajuriapada were randomly selected for the purpose of investigation. The details about watershed reflected in table 5.1.
Table 5.1: Details of watersheds under investigation (Kandhamal District)

<table>
<thead>
<tr>
<th>Sub-Division</th>
<th>Block</th>
<th>Name of the Watershed</th>
<th>Village covered</th>
<th>Total area (ha.)</th>
<th>Name of PIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phulbani</td>
<td>Phulbani</td>
<td>Ganjuguda</td>
<td>Biraguda, Maniduba, Dalapadar, Tetkapadar</td>
<td>455.313</td>
<td>ASCO, Phulbani</td>
</tr>
<tr>
<td>Phulbani</td>
<td>Khajuriapada</td>
<td>Badghara</td>
<td>Badiguda, Badaghara</td>
<td>479.284</td>
<td>BDO, Khajuriapada</td>
</tr>
<tr>
<td>Baliguda</td>
<td>G.Udayagiri</td>
<td>Ghatsila</td>
<td>Kilakia, Katalganda, Beerpanga</td>
<td>580.230</td>
<td>PRADATA (NGO)</td>
</tr>
<tr>
<td>Baliguda</td>
<td>Raikia</td>
<td>Indragada</td>
<td>Nuagao, Dhepaguda, Landabali, Mulkumaha, Indragada, Tala Indragada</td>
<td>640.417</td>
<td>ASCO, G. Udayagiri</td>
</tr>
</tbody>
</table>

Total - 2

In Kandhamal District two watershed implemented by the Soil Conservation Department, one by the Panchayatraj Department and the other by NGO were selected randomly for the purpose of investigation in Kandhamal district.

Similarly; Bhalia bolo kateni watershed in Dhenkanal sadar, Sariapada watershed in odapada, Raiitala watershed in Gandia and Kantal watershed in Kanakshyanagar blocks were randomly selected for the study in Dhenkanal districts. The details about the selected watershed is reflected in table 5.2.
Table-5.2 : Details of watersheds under investigation (Dhenkanal District)

<table>
<thead>
<tr>
<th>Sub-Division</th>
<th>Block</th>
<th>Name of the Watershed</th>
<th>Village covered</th>
<th>Total area (ha.)</th>
<th>Name of PIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dhenkanal</td>
<td>Dhenkanal Sadar</td>
<td>Bhalia Bola Kateni</td>
<td>Bhalia Bola Kateni, Sarion, Nimachira, Gohirakhal</td>
<td>600.00</td>
<td>ADF, Dhenkanal</td>
</tr>
<tr>
<td>Dhenkanal</td>
<td>Odapada</td>
<td>Sariapada</td>
<td>Sariapada, Chhatia, Badakhora, Nilambarpur</td>
<td>300.00</td>
<td>ADF, Dhenkanal</td>
</tr>
<tr>
<td>Dhenkanal</td>
<td>Gondia</td>
<td>Raitala</td>
<td>Raitala</td>
<td>400.00</td>
<td>ASCO, Dhenkanal</td>
</tr>
<tr>
<td>K. Nagar</td>
<td>Kankadahada</td>
<td>Kantola</td>
<td>Kantolo, Jhajribera, Guturigaon, Rodonga, Kerjoli</td>
<td>400.00</td>
<td>JSCO, K. Nagar</td>
</tr>
<tr>
<td><strong>Total • 2</strong></td>
<td><strong>4</strong></td>
<td><strong>4</strong></td>
<td><strong>16</strong></td>
<td><strong>1700.00</strong></td>
<td></td>
</tr>
</tbody>
</table>

As revealed from the table watershed implemented by the Soil Conservation Department and Two Watershed by the fisheries Department were selected randomly for the purpose of investigation in Dhenkanal district.

(d) Selection of respondents:

As per the objectives set for the investigation, people of the watershed areas who are beneficiaries were selected for collection of information. The selection procedure made for the investigation is detailed herewith.

(i) Selection of Watershed Beneficiaries:

Each watershed in the study area covered more than one village. Each watershed has watershed association. The details of the watershed associations of the study area are indicated in the followed tables.
### Table 5.3: Watershed associations in the study area (Kandhamal)

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Block</th>
<th>Name of the watershed association</th>
<th>Village covered</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Khajuripada</td>
<td>Badghera watershed association</td>
<td>2</td>
</tr>
<tr>
<td>2.</td>
<td>Phulbani</td>
<td>Ganjugudawatershed association</td>
<td>5</td>
</tr>
<tr>
<td>3.</td>
<td>G. Udayagiri</td>
<td>Ghatsila watershed association</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td>Raikia</td>
<td>Netaji watershed association</td>
<td>6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>16</strong></td>
</tr>
</tbody>
</table>

### Table 5.4: Watershed associations in the study area (Dhenkanal)

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Block</th>
<th>Name of the watershed association</th>
<th>Village covered</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Dhenkanal Sadar</td>
<td>Bhatia Bola Kateni</td>
<td>4</td>
</tr>
<tr>
<td>2.</td>
<td>Odapada</td>
<td>Sariapada</td>
<td>4</td>
</tr>
<tr>
<td>3.</td>
<td>K. Nagar</td>
<td>Tulasipasi</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td>Kankadahada</td>
<td>Kantolo</td>
<td>5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>16</strong></td>
</tr>
</tbody>
</table>

Thus 16 villages in Kandhamal district and 16 villages in Dhenkanal district were selected randomly for the study. As per the guideline, all families in the watershed areas are the members of the watershed association. They select their President who would be in overall charge of the watershed activities. Besides, the watershed also have watershed committee comprising 10-12 members, i.e. Chairman, Secretary, 2-3 Volunteers, one member of the
Watershed Development Team and 2-3 Representatives from users, Self-help and women groups as well as minority communities. All members of the watershed committee usually nominated by the Watershed Association. The committee members were more conscious, knowledgeable, change oriented and efficient for which they were nominated by the people. It is therefore decided to include all the members of the watershed committee i.e. President of the Watershed Association, Chairman and Secretary of the watershed committee purposively. Two volunteers, ten members each from user group, eight from self-help groups, three from women group and 4 from other weaker communities were randomly selected from each watershed. The total number of respondents selected for the investigation were presented in table 4.5:

Table- 5.5: Sample of the investigation (beneficiaries)

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Category</th>
<th>Dhenkanal district</th>
<th>Kendhamal district</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>i.</td>
<td>Watershed President</td>
<td>4</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>ii.</td>
<td>Watershed Secretary</td>
<td>4</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>iii.</td>
<td>Watershed Chairman</td>
<td>4</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>iv.</td>
<td>Watershed Volunteer</td>
<td>8</td>
<td>8</td>
<td>16</td>
</tr>
<tr>
<td>v.</td>
<td>User Group</td>
<td>40</td>
<td>40</td>
<td>80</td>
</tr>
<tr>
<td>vi.</td>
<td>Self-help Group</td>
<td>32</td>
<td>32</td>
<td>64</td>
</tr>
<tr>
<td>vii.</td>
<td>Women Group</td>
<td>12</td>
<td>12</td>
<td>24</td>
</tr>
<tr>
<td>viii.</td>
<td>Member of the Weaker Community</td>
<td>16</td>
<td>16</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td><strong>TOTAL</strong></td>
<td><strong>120</strong></td>
<td><strong>120</strong></td>
<td><strong>240</strong></td>
</tr>
</tbody>
</table>
This 120 respondents from each districts covering the total sample size 240.

(6) Tools and Techniques used for Data Collection:

a. Pilot Study:

Prior to preparation of the interview schedule, a pilot study was undertaken in Khajuripada and G. Udayagiri blocks and sadar Kamakhyanagar works in Dhenkanal district. The main objective was to collect first hand information regarding ongoing watershed development programmes. Discussions at length were also held with various categories of beneficiaries of different watersheds as well as project personnel involved in implementation of the programme. A total number of 20 beneficiaries and 10 project personnel were informally contacted for securing first hand information. This helped in collecting information on various aspects of watershed activities, which helped immensely in preparing the interview schedule.

b. Preparation of interview schedule

As per the objective set for the study, interview schedule were prepared. Close ended question have been framed in the schedule, to avoid ambiguity and collect appropriate response. The schedule framed for the study consists seven parts. The first part related to general information of the respondents and eight variables such as age, education, social participation, extension contact, source of information, occupation, holding size and annual income were selected.

The 2nd part of the schedule has been framed to collect data on knowledge about the guide line and operational procedures with variable like
knowledge about initiation of the watershed programme, extent of involvement of project officials, knowledge about guideline, watershed programme, objectives, operational procedure, programme development and funding pattern.

Extent of involvement of the beneficiaries in watershed activities were studied in the 3rd part of the schedule. The variable selected were extent of involvement in watershed activities, programme implementation, decision making process, programme formulation, programme implementation, fund utilization, monitoring & Evaluation. The reaction of the beneficiaries about goal and structure of the project, programme development, funding pattern, institutional arrangement, implementation procedure, monitoring and evaluation. Process maintenance of assets creased were dealt in 4th part of the schedule.

The 5th part of the schedule was designed to assess the extend of development occurs to the watershed people particularly on technological, economical, social, infrastructural, cultural, environmental, material possession, cropping pattern and income. The constraints experienced by the beneficiaries relating to organizational, planning, programme development, funding pattern, monitoring and evaluation including suggestion for better functioning implementation were covered in the last part of the scheduled.

c. Pre-testing of the schedule

The scheduled was pre-tested to assess its reliability and validity. After development of the scheduled, it was pre-tested with 15% of the beneficiaries with different categories in each watershed both in Kandhamal and Dhenkanal.
district. Thus all total 18 beneficiaries different categories in each district were contacted for pre-testing of the scheduled. On the basis of the observation made during pre-testing, necessary modifications and refinement were accommoded in the scheduled.

d. Collection of information

The collection of information is another important consideration for getting factual data to arrive at qualitative results. Personal contact was made by the investigator in interviewing the respondents selected for the investigation. Good rapport was established initially in a desirable climate setting with the respondents. Which make easier to ask questions and discuss various issues pertaining to the study. The purpose was clearly appraised to the respondents to develop confidence and obtaining factual information. While asking questions each aspect of the schedule were clarified. The information receiving from the respondents were duly documented for analysis. The investigator also made night halt in the village to personally interview the selected respondents as per their availability as recorded all information. The night halt in the village also make intimacy with the villagers and make the investigator closed to them for which the respondents freely discuss and answer the questions.

7. OPERATIONALIZATION & MEASUREMENT OF VARIABLE

A. Selection of variables

Variable is a property that takes different values. Independent variable is the presume cause of depended variable. The independent variables included in the scheduled were selected through extensive review of the literature,
discussion with experts and preliminary study conducted in the area of investigation. The variables which found to have relevancy with the objectives of the study were mostly selected. The variable selected under each objectives are detailed herewith.

a. Socio-economic variable

(1) Age
(2) Education
(3) Occupation
(4) Social Participation
(5) Extension Contact
(6) Source of Farm Information
(7) Holding size

b. Knowledge about the watershed Development programme.

i. Programme initiation.

ii. Involvement of official

iii. Knowledge about guideline, watershed programme, objectives, operational procedure,

iv. Programme development, funding pattern

c. Extent of Involvement in Watershed Activities & Implementation

The variables studied were involvement in watershed activities, programme designing, Discussion making process, programme formulation, Implementation, Fund Utilization, Monitoring & Evaluation.
d. Attitude towards implementation of the project attitude towards programme development funding pattern, institutional arrangement, programme implementation, monitoring & evaluation, maintenance of assets.

e. Extent of development

Extent of development occurs on technological, economical, social, infrastructural, cultural, environmental, material possession, cropping pattern & income were studied.

f. Constraints in implementation of the programme

The constraints experienced in relation to organizational, planning programme development, funding pattern, monitoring and evaluation were selected for the purpose of investigation.

Suggestion for improvement in programme development, functioning and implementation procedure were also studied.

B. Measurements of variables:

Variables used in the study were quantified depending on their relative merit in qualifying the measurement. Scoring method was adopted to measure the variables as detailed herewith.

(i) Age:

It is the chronological age of the respondents in completed years at the time of inquiry. The scoring made for analysis is as follows.
(ii) **Education**

Education indicates the level up to that the individual had studied. For the project personnel the scoring was as follows:

<table>
<thead>
<tr>
<th>Education</th>
<th>Score assigned</th>
</tr>
</thead>
<tbody>
<tr>
<td>Matriculation</td>
<td>1</td>
</tr>
<tr>
<td>Inter College</td>
<td>2</td>
</tr>
<tr>
<td>Graduate</td>
<td>5</td>
</tr>
<tr>
<td>Post Graduate</td>
<td>7</td>
</tr>
</tbody>
</table>

For studying the educational status of the beneficiaries, the number of years of formal education attended by the respondents were taken into account. The scoring system followed by Trivedi (1963) and adopted by Tripathy (1977) in socio-economic status scale was used to quantify the educational status. The scoring made is as follows.
### Education Score assigned

<table>
<thead>
<tr>
<th>Education</th>
<th>Score assigned</th>
</tr>
</thead>
<tbody>
<tr>
<td>Illiterate</td>
<td>0</td>
</tr>
<tr>
<td>Can read only</td>
<td>1</td>
</tr>
<tr>
<td>Can read and write</td>
<td>2</td>
</tr>
<tr>
<td>Primary</td>
<td>3</td>
</tr>
<tr>
<td>Middle School</td>
<td>4</td>
</tr>
<tr>
<td>High School</td>
<td>5</td>
</tr>
<tr>
<td>College</td>
<td>6</td>
</tr>
</tbody>
</table>

(iii) **Social participation:**

Social participation in this study refers to the extent of involvement of the watershed beneficiaries with various social organizations exists in their area. The extent of participation was quantified in a 4-point continuum as detailed herewith (Rao 1975).

#### Extension of participation

<table>
<thead>
<tr>
<th>Extension of participation</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very often</td>
<td>4</td>
</tr>
<tr>
<td>Often</td>
<td>3</td>
</tr>
<tr>
<td>Some times</td>
<td>2</td>
</tr>
<tr>
<td>Never</td>
<td>1</td>
</tr>
</tbody>
</table>

(iv) **Extension contact:**

This variable was studied in terms of the frequency of watershed beneficiary’s contact with change agents. The responses were noted on a four-point continuum i.e. very often, often some times and never and scores assigned as 4, 3, 2 & 1 respectively. The total score of the beneficiaries denotes the degree of his contact with extension agency.
(v) **Sources of farm information**:

Sources of farm information refers to the extent of receiving the farm information from various sources such as mass media, farm literature, personal contact, seminars, workshops etc. The degree of contact was measured in terms of very often, often, some times and never which were scored as 4, 3, 2 & 1 respectively.

(vi) **Occupation**:

Occupational status refers in the study are farming and other sources of income. The scoring pattern followed was in the line of Somasundaram (1976) which are given below.

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farming alone</td>
<td>1</td>
</tr>
<tr>
<td>Farming + labour</td>
<td>2</td>
</tr>
<tr>
<td>Farming + caste occupation</td>
<td>3</td>
</tr>
<tr>
<td>Farming + business</td>
<td>4</td>
</tr>
<tr>
<td>Farming + independent profession</td>
<td>5</td>
</tr>
<tr>
<td>Farming + service</td>
<td>6</td>
</tr>
</tbody>
</table>

(vii) **Farm size**:

Farm size has been operationalized as the actual farm land of a family. This was also further classified as wet area and dry area. To get uniformity, the land holding was covered into a single unit by using the following procedure.
One hectare of wet land was equated to be equivalent to two hectares of dry land. This conversion was arrived in consultation with officers of state department of Agriculture.

The respondents were classified into three category i.e. marginal, small and big farmers on the basis of their holding size as per the guideline of the state government, Orissa. It is clearly noted in the guidelines of agricultural intensification project, Agriculture and Cooperation Department, Government of Orissa that a Marginal Farmers (MF) possess land holding below one hectare, Small Farmer (SF) above one and below 2 hectares, Big Farmer (BF) above 2 hectares of land and no land holding were land less labourers. This classification was used in the study and scoring made i.e. 1,2,3,4 for land less, marginal, small and big farmers respectively.

(viii) Annual income:

Income of the farmer has direct bearing with use of improved farming. Income position of a farmer indicates the purchase and use of inputs in farming operation. The income of the farmer in the study area covered both from primary and secondary sources. The total income received from all sources was taken into account for further analysis. The scoring pattern followed for analysis of data is as follows.

<table>
<thead>
<tr>
<th>Level of income</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to Rs.10,000/-</td>
<td>1</td>
</tr>
<tr>
<td>Rs.10,000/- to Rs.15,000/-</td>
<td>2</td>
</tr>
<tr>
<td>Rs.15,000/- to Rs.20,000/-</td>
<td>3</td>
</tr>
<tr>
<td>Above Rs.20,000/-</td>
<td>4</td>
</tr>
</tbody>
</table>
(ix) **Knowledge about guidelines:**

A specific guideline was developed by the Ministry of Rural Development, Govt. of India, for implementation of watershed development programme. Each individual involved in the implementation must have well understanding to the guidelines. Knowledge to the individuals about guidelines were assessed and the scoring made as follows as per the responses received in a three point continuum such as fully partially, not involved/Always, occasionally, never/strongly agree, agree, disagree and scoring made 3, 2 & 1 respectively.

(x) **Extent of involvement**

The watershed development project is purely a participatory approach. All the persons involved in the process have to participate fully to achieve the desired goal. Attempt made to measure the extent of involvement of the personnel in watershed activities in a three point continuum i.e. fully, partially and not involved for which scoring was done 3, 2 & 1 respectively.

(xi) **Attitude towards watershed developed programmes:**

Reaction of the watershed beneficiaries involved in the implementation were also studied. Various activities under taken for the study were attitude towards objectives, organisations structure programme development, funding pattern, institusional arrangements programme implementation; monitoring and evaluation as well as maintenance of assets. Reaction of the watershed beneficiaries towards these activities were made with the scaling as strongly agree, agree, undecided, disagree and scoring done as 4, 3, 2 & 1 respectively.
(xii) **Extent development**

The variables studied on the extent of development occur to the people towards technological, economical, social, infrastructural, cultural, environmental, material possession, cropping pattern and income were studied in a five point continuum such as strongly agree, agree, no mention, disagree and strongly disagree with weightage given as 5, 4, 3, 2 & 1 respectively.

(xiii) **Constraints impending in successful implementation**

Constraints related to organizational, planning, programme development, funding pattern, monitoring & evaluations as well as suggestions towards improvement on programme development, functioning and implementation procedures were studied in the scale points of strongly agree, agree, no mention, disagree and strongly agree with scoring of 5, 4, 3, 2 & 1 over the framed statements under each variable.

8. **Statistical methods used**:

The following statistical methods were used in this study for analysis of responses based on the nature of the data and type of information required.

(i) **Percentage**

Percentage was used in descriptive analysis for making comparisons. To calculate the percentage, the frequencies on the particular cell was multiplied by 100 and divided by the total number of respondents in that particular category.
(ii) Mean score

It is also another simple comparison, which is calculated by using the formula,

\[ M.S = \frac{\sum fx}{N} \]

Where \( \sum fx \) = Total score obtained in individual category

\( N = \) Total number of respondents

(iii) Rank order analysis

On the basis of average mean score, the rank order was made. The item scoring highest mean score was given first rank and the next highest with 2\(^{nd}\) rank and so on.

iv. Correlation

It was employed to find out the association of the dependent variables with the independent variables. It was also used to observe relationship of the independent as well as dependent variables themselves. Pearson's coefficient of correlation was used to find out zero order correlation between dependent and independent variables to observe the degree of closeness of linear relationship. The formula used for calculating co-efficient of correlation is as follows

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

Where \( N = \) Number of pairs correlated

\[ 92 \]
X & y = The variables being correlated

\[ \sum = \text{Summation of overall cell entries of variables} \]

R = Correlation of co-efficient between x & y

v. Test of significance:

This test was used to know whether the observed sample correlation is statistically significant to indicate correlation in the population. The test is implied by using the formula:

\[ t = \frac{r}{\sqrt{1-r^2}} \times \sqrt{N - 2} \]

- \( t \) = Calculated value of student 't' from the sample observation which has \( N-2 \) degrees of freedom.
- \( r \) = Calculated correlated value.
- \( N \) = Number of pairs correlated

If calculated 't' value exceeds the table value either at 5% or 1% level of significance, then correlated value is in accordingly significant at 0.05 or 0.01 level of profitability.

vi. Critical ratio test

The method is used to test the significance of the difference between percentage. The test is implied by using the formula as given below.
\[ P = \frac{N_1 P_1 + N_2 P_2}{N_1 N_2} \]

\[ Q = l = P \times (\sim 100 - P \text{ (Value)}) \]

\[ \sigma D^2 = \sigma P_1 - P_2 = \sqrt{\sigma^2 P_1 + \sigma^2 P_2} = \sqrt{PQ + \frac{1}{N_1} + \frac{1}{N_2}} \]

\[ C.R. + \frac{(P_1 - P_2) - 0}{\sigma P_1 - P_2} \times 100 \]

Where C.R., = Critical ratio value

\[ N_1 \& N_2 \text{ = Size of both sample categories} \]

\[ P_1 \& P_2 = \text{Percentage occurrence of a given behaviour} \]

\[ P = \text{Percentage occurrence of the pooled behaviour} \]

\[ Q = \text{Differential percentage of the pooled behaviour} \]

\[ \sigma D^2 = \text{S.E. of the difference between } P_1 \text{ and } P_2 \]
Fig.6 CONCEPTUAL FRAMEWORK OF THE STUDY
Impact of National Watershed Development Programme

OBJECTIVE - I
Socio-economic characteristics
- Age
- Education
- Social participation
- Extension contact
- Sources of Information
- Occupation
- Farm size
- Income

OBJECTIVE - II
Knowledge about watershed project
- Program initiation
  - Involvement of official
  - Guideline
  - Watershed programme
  - Objective
  - Operational procedure
  - Programme development
  - Funding pattern

OBJECTIVE-III
Extent of involvement
- Activities
  - Programme design
  - Decision making
  - Programme formulation
  - Programme implantation
  - Funding pattern
  - Monitoring & evaluation

OBJECTIVE-IV
Attitude towards the project
- Objective
  - Structure
  - Programme development
  - Funding pattern
  - Institutional arrangements
  - Implementation
  - Monitoring & evaluation
  - Maintenance of assets

OBJECTIVE-V
Extent of development
- Technological
- Economical
- Social
- Infrastructural
- Cultural
- Environmental
- Material possession
- Cropping pattern
- Income

OBJECTIVE-VI
Constraints & suggestions
- Organisational planning
- Programme development
- Funding pattern
- Monitoring & evaluation
- Suggestion for programme development
- Functioning
- Implementation procedure

Respondent Beneficiaries
Statistical Methods
- Percentage
- Mean score
- Mean score correlation, test of significant

Beneficiaries
- Percentage
- Mean score
- Mean score correlation, test of significant

Impact

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