3. RESEARCH METHODOLOGY

The research methodology employed in the present study is explained under the following headings:

3.1 Locale of research
3.2 Sampling design
3.3 Research methods and instruments of observation
3.4 Synthesis of findings

3.1 LOCALE OF RESEARCH

Karnal district of the Haryana state was purposively selected for the study due to the following reasons:

* Location of National Dairy Research Institute at Karnal
* Existence of high yielding cattle and buffaloes
* An important area for sale of crossbred cattle
* Familiarity of the researcher

3.1.1 Location of National Dairy Research Institute

India's premier dairy research and education institution - National Dairy Research Institute (NDRI) is located at Karnal with its nearly 600 strong scientific and technical staff, the institute is involved in research on fundamental and applied aspects of dairying and is an internationally recognised centre of excellence in dairying research. This Institute has developed a good number of technologies and offers consultancy and wide ranging services in various areas of milk production processing and management. NDRI offers training programmes for milk producers and dairy industry and the state departments of animal husbandry and dairying look forward to
this apex body for appropriate technologies and linkage for better dairy development. Hence this was one of the reasons for deciding to select the geographical area of Karnal to study the Dairy Knowledge Information System (DKIS).

3.1.2 Existence of high yielding animals

Karnal is a part of the green revolution belt that extends from Punjab via Haryana into western Uttar Pradesh. Cross breeding of local cattle with pure Holstein Friesian and grading-up of buffaloes with pure Murrah through artificial insemination is the commonly adopted practice of this area. According to the Livestock census 1988, Karnal district had a marginally higher proportion of crossbred cows compared with the total cow population of the state. More than 20 percent of crossbred cows of milk were from the Karnal district. Karnal had a milk production of 3.98 lakh tonnes which accounted for 12.63 percent of the total milk production of Haryana. The higher availability of milk in the district was attributed to the higher concentration of the crossbred cow population (NDRI/FSR/BIOCON Project Report, 1994). Buffaloes of Karnal are adjudged the best in India and constitutes more than 70 percent of the total bovines in milk in Karnal district as well in the state as a whole.

3.1.3 Sale of dairy animals

Karnal is an important trading centre from where crossbred cattle and buffaloes are sold to the adjoining states of Delhi and U.P. and even to distant states as Madhya Pradesh, Bihar, Orissa, Gujarat and Maharashtra. And also NDRI, Karnal auctions dairy animals twice a year for public as well as for government organizations.

3.1.4 Familiarity of the researcher

For carrying out successful field work by establishing proper rapport with the dairy farmers, the familiarity of the researcher to the locale of the study is very
important. Familiarity with the research and extension system of NDRI was also considered a vital aspect.

3.2 SAMPLING DESIGN

One of the critical and controversial areas in the sound use of qualitative, rapid and participatory methods was selection of respondents and sampling. It did not pose the same problem in conventional survey methodology, since a range of sampling techniques and principles has been developed to suit different research purposes. Recently, there is a growing literature addressing research principles in relations to qualitative research (Berg, 1989; Guba and Lincoln, 1989; Patton, 1990). It has become normal practice to let sample selections be determined by informational considerations. Keeping the purpose as to maximize information, the sampling was terminated when no information was forthcoming from additional sampling. This strategy left the question of sample size open. In formal surveys though random sampling errors were very small, the non-sampling errors due to inefficient data collections and unwarranted statistical methods could be more damaging than sampling errors. In a situation where RRA/PRA tools are being used there is seldom time to search out individuals selected through a complete random sample or to code and analyse the information collected. Selection of key informants who had good village-wide knowledge were used as a way for checking the representativeness of individual interviews carried out. However some of the principles underlying random sample selection like stratification were used in the study in order to reduce the biased from a completely purposive sample. The technique of constructing a formal sample ensured that certain specific groups in the population were included, despite the limited size of the sample.

As the study involved AKIS approach related to information management in dairying, researchers, extensionists, input suppliers, marketing agencies and farmers of Karnal were included in the study. All of them were considered as the main actors of the Karnal DKIS (Dairy Knowledge Information System).
3.2.1 Selection of researchers

The scientists of NDRI from the division of Dairy Cattle Breeding, Dairy Cattle Nutrition and Dairy Cattle Physiology were selected purposively keeping the criteria that scientists related with the work of technology development and not less than 50% scientists of each division were included in the study. Informal discussions were held with the concerned scientists which was completed in many rounds, based on the basis of a checklist prepared for this purpose. The checklist comprised mainly items related to research design, technology development, information flow, sources of information, constraints in information flow, farmers and extension participation in research, farmer based research, demand driven technologies and on linkage aspects with various actors of Karnal DKIS (see Appendix). The required secondary information was collected from the NDRI Annual Reports, BIOCON Project Reports, NDRI Newsletters, and Proceedings of DHO workshops.

3.2.2 Selection of extensionists

An inventory of all groups and organisations involved in extension activities in adopted villages was prepared. They involved personnel from Krishi Vigyan Kendra/ Farming Systems Research (KVK/FSR), Extension Division of NDRI, Stockmen of adopted villages of NDRI, Intensive Cattle Development Project (ICDP) staff, Officials from Co-operative Milk Union, Krishi Gian Kendra (KGK), The Haryana State Cooperative Supply & Marketing Federation (HAFED), Banks, Dairy Development Department, Krishak Bharti Co-operative Limited (KRIBHCO), Indian Farmers Fertilizer Co-operative Limited (IFFCO).

The population was divided into groups in proportion to their representation in the inventory and sample was drawn. Thus the study included two persons from KVK/FSR, three from Extension Division of NDRI, five Stockmen, three ICDP staff, one from Milk Union, one from KGK, one from HAFED, one from Canara Bank, one
from Dairy Development Department, one from KRIBHCO and one from IFFCO. Twenty extensionists were approached for this study and informal discussion was held with them keeping in view a previously constructed checklist. The main items of checklist were linkage with various actors of DKIS, information sources used, knowledge of technologies, tapping of indigenous knowledge, factors related to adoption of various technologies by farmers, participation in on-farm experiments, problem diagnoses of farmers and liaison with research (see Appendix).

3.2.3 Selection of farmers

Five adopted villages of NDRI were purposively selected for the study. They were Budhakhera, Navipur, Mahanandpur, Ranwar and Shamgarh. Special care was taken to include resource rich/resource poor, men and women, old/young and landless and landed while identifying key individuals and focus groups for the study. It was not considered necessary to have equal proportion of the above mentioned categories in focus groups. For example it made no difference in the overall effect of discussion with focus groups if one resource rich farmer and two resource poor farmers were involved. However representation of all the above categories was ensured.

3.3 RESEARCH METHODS AND INSTRUMENTS OF OBSERVATION

The research methods consisted of comprehensive set of approaches to gather evidence and analyse specific problems. In this study qualitative research methods were mainly used taking into considerations the nature of the study.

Deviating from the conventional social science methods, PRA (Participatory Rural Appraisal) which is replacement of RRA (Rapid Rural Appraisal) was used in this study. RRA and PRA are two closely related approaches. RRA leads to learning by outsiders in a cost-effective way. PRA, enables rural people to unravel and analyse their own situation in ways they do not normally do and in optimal cases to plan and
act on their own premises. The PRA methods used in the present study included the following instruments of observation:

* Review of secondary sources
* Direct observations
* Interview and discussion with key informants
* Focus group discussions
* Case studies
* Ranking and scoring of options
* Matrix scoring and ranking
* Options assessment chart
* Diagramming
* Mapping

3.3.1 Review of secondary sources

There is always a wealth of information hidden in a variety of secondary sources. It is of utmost importance in research and development work to allocate time for prior documentary studies. The secondary sources of information used in the present study included NDRI annual reports, various seminar/workshop proceedings conducted at NDRI, research project reports, extension literature, leaflets and pamphlets released from time to time by the institute and various extension agencies, Dairy Samachar and extension publication of NDRI and NDRI Newsletters.

3.3.2 Direct observation

This method is well known from classical anthropology, the difference being a stress on dialogue rather than extraction of data and the generally shorter time available for observation in PRA studies. Observation during all phases of a study contributes information on persistence and change. In the present study, observation was used in
identifying the traditional feeding practices, identifying main breeds, studying the prevalent practices for restoration of lactation and in understanding traditional knowledge systems.

3.3.3 Interview and discussion with key informants

A key informant was not assumed as a person with public status such as an official or a community or family leader, who was literate or comparatively well-off. Key individuals were people anticipated to have particular insight or opinions about the topic under study. In the present study the key informants were identified by enquiring from different sources, who actually practise dairying. Wherever dairying was a sub-enterprise run by other family members, the member who actually handle dairying was selected as the key informant and not necessarily the head of the household.

Similarly a resource poor farmer only could be selected as the key informant for acquiring information on low external input and sustainable agriculture (LEISA). The key informants selected also included innovator (but not quick adopters of recommendations based on research findings) who were actively experimenting - may be on a very small scale and with minor changes of technology - developing indigenous ideas and adapting/incorporating ideas coming from outside. Even though a checklist for gathering information was used during discussion with key informants, the discussion was kept open ended and the farmers were encouraged to speak on their own than being passive listeners to questions (see Appendix).

3.3.4 Focus group discussions

Focus groups selected were a homogeneous group of farmers considered optimal for attaining in-depth information about farming systems. They were used when the dynamics of the groups situation was considered to provide additional information about farming systems. It gave better information than could be obtained in a much more time
consuming exercise of individual interviews with the same people. Probing questions that lead to key issues could make the discussions more dynamic. Chains of interviews between the different key individuals, groups and specialists were used for sequencing of data collection.

3.3.5 Case studies

Case studies were carried out related to the theoretical framework of selected dairy farming technologies in light of their information management for sustainable dairy production.

Case studies related to the dairy production technologies were also done. In the first phase each technology was thoroughly analysed and studied using secondary sources of information as well as discussion with concerned scientists. Once the theoretical framework of the technologies were completed, key informants in selected villages were involved for further case study. Farmers were helped to describe their experience trying out and adopting a particular technological innovation or a practice in specific dairy production activities. Farmers described what was the original problem, what alternative proposals/ideas were considered and their source, what steps the farmer took to tryout each of these ideas and why they had chosen that way. They described their present experiences with the technology, their options for various technologies, their reasons for non-adoption of certain technologies and the process of farmers experimentation and selection of technologies.

Case studies revealed trends overtime, important disruptive events, sources of new ideas or materials option set aside by farmers for different technology and records of tried and proven (or failed) experiments. They were used as a starting point for wider discussion of the same technology or practice.
3.3.6 Ranking and scoring

The ranking and scoring techniques used in PRA differ from the sociological ranking techniques. It was used as a tool for initiating a discussion of possibilities in a local setting. Ranks or scores were easier to obtain than absolute measurements. Informants tended to be more willing and more able to provide relative values than absolute figures.

3.3.7 Matrix scoring and ranking

In the present study direct matrix ranking was used to identify farmers criteria for certain topics. It revealed the preferences of different groups. The criteria used for forming matrices were derived by 'brain storming' farmer focus groups and identifying the ones they regarded as most important and listing them for the purpose of forming the matrix. The group then considered which of the items listed across the top of the matrix was best, judged by each of the criteria in turn. The judging process were prompted by questions such as, which is best? Which is worst? Which is next worst? Of the remaining which is better? The answers were directly incorporated into the matrix. Information on the criteria applied by different groups were condensed to illustrate the overall ranking and scoring.

3.3.8 Options assessment chart

It is another way of obtaining peoples' options on various criteria selected by the community. What options the farmers set aside for various aspects of technologies were analysed under the present study. Focus groups were subjected to 'brain storming' discussion on the technologies and their criteria for ranking technologies were studied. The criteria formulated by the participants were modified and put in proper language. The keys for various degrees of assessment were formulated. Going through each column of the Option Assessment Chart (OAC), what people thought of the long-term impact on the
criteria of introducing the specific opportunity/technology was analysed. The impact were marked according to the signs in the key box. The outcome was a set of options the farmers assessed according to the criteria formulated by themselves for impact of various technologies and modified with the help of researcher.

3.3.9 Diagramming

Making diagrams is simply the visual presentation of data and causal relationships. It is means of generating and presenting empirical facts as well as a form of interaction. In the present study diagramming was done with the active participation of key informants and focus groups. Diagrams were drawn on the spot with a stick on wetted earth with the help of local informants, representing concept diagram for farmers decision making in feeding and breeding practices and venn diagram to depict the participants sense of relations between local group and organisations with respect to information management.

3.3.9.1 Concept diagrams

Concept diagrams include map, sketch, seasonal calendar, time trends, causal flow diagrams, systems diagram and venn diagram. In the present study concept diagrams for information management and venn diagrams to depict linkages were used.

(A) FLOW DIAGRAMS

Flow diagrams were prepared with the help of villagers to depict the information management in feeding and breeding practices. Flow diagrams were made also to explain the causal relationship in farmers' decision making related to
feeding and breeding. The diagrams of the five villages were condensed into a single format for clarity of presentation.

(B) VENN DIAGRAMS

Venn diagrams, sometimes called chapatti diagrams after the Indian pancake-shaped bread, place circles of different sizes in symbolic relationships to each other. Venn diagrams were used in the present study to depict the participants sense of linkages between various actors of the Karnal DKIS. The size of the 'chapattis' symbolized the different weights allocated to the groups or organizations by the participants (Fig. 3).

3.3.10 Mapping

Mapping is a very useful tool to draw a comprehensive view of the information system and to analyse the linkages in it. Maps of the information systems can show the overall view of the system the directions and character of the links between actors and the strength of the links. Mapping AKIS was used to compare, sectorial, regional, national or international AKISs. The mapping in this study started with the policy makers and ended in knowledge utilization by farmers. Knowledge generation, research technology development and knowledge exchange came in between. Wherever, reciprocal relations existed, they were marked with arrows in the opposite directions. While mapping the AKIS generic names were mainly used to show the particular organisation carrying out a component of AKIS or they were substituted by real organizations when found necessary.
SM = Stockman       N/F = Neighbour/Friend
MV = Milk Vender    VET = Veterinary Doctor
IA = Input Agencies EXT = Extensionist
EM = Electronic Media MA = Marketing Agency
RB = Rural Bank     PM = Print Media
DC = Dairy Co-operatives

--- = System Boundaries ------ = Knowledge System

Fig. 3 Venn diagram
3.3.11 Formation of linkage matrix

An indepth study of the secondary source of information was undertaken to understand the linkage system in Karnal DKIS. The various actors in the DKIS were contacted and were asked to indicate other dairy knowledge agents with whom they had contacts and about their reciprocal links with all other actors. For this a checklist of questions was prepared, but maintained the interviews open. The answers received from actors about their relation with the other actors were crosschecked with the latter. Those actors who played no real or only a very marginal role were eliminated. The subject matter content of the reciprocal communication links and their relative strength (mainly frequency) in both directions were tabulated. Information on the strength of the reciprocal links among the actors in the DKIS and on the main subject matter content of this information was summarized in the matrix form.

3.4 SYNTHESIZING THE FINDINGS

Participatory methods means potential participation in all stages of a study and continuous analyses. In the present study - following the PRA concepts - the observations and interview/discussion transcripts were summarised. Critical analysis and interpretation of the gathered information was done. Continuous analysis of data as a part of the PRA was carried out along with gathering of information from various actors. The conclusions were further systematically studied and analysed with regard to the previous studies and the findings were synthesised.