CHAPTER III

METHODOLOGY

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This chapter deals with the information regarding various aspects of the plan of investigation. The problem, research design and tools for data collection are briefly stated. The variables of the study and the model showing the hypothesized relation among the variables in the study of adoption of a selected model of improved chulha (IC), namely, Mamta Chulha (MC) are explained. Operational definitions and the procedure followed for the development of instruments for gathering relevant data are presented. The procedure for collection of data and the plan for statistical analysis are also described.

The purpose of the study was to throw light on the factors affecting adoption of MC, by beneficiaries of a Central Government of India sponsored National Programme on Improved Chulha (NPIC). Research questions were mainly concerned with relationships between adoption of MCs by beneficiaries and selected situational, personal and family variables. Descriptive survey method was thought to be the best to serve the purpose of the study. Of the various techniques for data collection, interview cum observation method was followed to gather relevant data in this investigation. The main reasons for adopting interview cum observation technique were to establish rapport with the respondents so as to gain their confidence and full co-operation and to ensure completely filled in authentic data

sheets. In addition it has the following advantages (Gorden,1969):

1. It enables the investigator to obtain desired information quickly.
2. It permits the investigator to be sure that respondents interpret questions properly.
3. It allows greater flexibility in the process of questioning.
4. Much more control can be exercised over the context within which questions are asked and answers given.
5. Information can be more readily checked for its validity on the basis of non-verbal cues by the respondents.

1.0 Variables

The interview cum observation schedule was developed to solicit information regarding twenty variables under study in relation to adoption of MC by beneficiaries of NPIC. In the following discussion the dependent variable and the rationale for selecting the respective independent variables are highlighted.

1.1 Dependent Variable

Extent of Adoption of Mamta Chulha (EAMC) was the dependent variable of the study.

Barnett (1953) used adoption and acceptance synonymously and defined it as the growth in popularity of a new idea within the society of its origin. Wilkening (1953) described adoption of an innovation as a process comprised of learning, deciding, and acting over a period of time.

Coughenour (1960) viewed adoption as a function of dynamic inter-relationship of independent elements expressed in terms of variables. Rogers (1962) defined that adoption is a decision to continue full use of an innovation. An innovation is an idea perceived as new by the individual. It is the newness of the idea to the individual that determines his reaction to it.

Rogers and Shoemaker (1971) recoined the name of adoption process as innovation-decision process. According to them the adoption or rejection of an innovation is a decision by an individual. If he adopts, he begins using a new idea, practice, or object and ceases using the idea that the innovation replaces.

Aronson and Yates (1984) stated that the acceptance of innovation occurs simply as a function of appeal through mass media. The example of others is often far more effective than advertising in getting people to adopt new and different behaviours. If mass media are effective at all, it is in conjunction with "social diffusion" which means that the innovation is spreading through exemplary behaviour. Kalra and Singh (1990) conceptualised adoption in relation to the intensive use of educational methods to popularise the chulha.

Ryan and Gross (1943), Pedersen (1951), Wilson and Gallup (1955), Emery and Oeser (1958), Rahim (1961), Bose and Dasgupta (1962), Singh and Pareek (1968), Griffin and Pareek (1970), Rai (1972), Bhagia (1973), Narsian (1978) and many others have conceptualised adoption. The underlying idea in all these conceptualisations is the acceptance of a new idea and its continued use.

EAMC, in terms of the extent of its acceptance, replacement of TRC and continued use as evidenced through (i) replacement by MC, (ii) relative extent of use of TRC in pre and post installation period of MC (iii) variety in cookstoves used during post installation period of MC (iv) extent of use made of MC in daily cooking, (v) period of continued use of MC (vi) functional status (vii) willingness to buy or re-install, repair and maintain MC as and when needed and (viii) willingness to recommend its use to others was explored in the present investigation.

1.2 Independent Variables

The effect of twenty independent variables on EAMC was explored. These variables are presented under three heads, viz, (1) Situational, (2) Personal and (3) Family variables.

1.2.1 Situational Variables

These comprised of level of quality of housing, extent of possession of consumer durable goods, extent of demands on main cook's time, energy base of end uses, extension of activities of families after dusk and energy management practices of family, extent of interaction of main cook and family with different spheres, extent of participation in NPIC by main cook and family, level of quality of installation of MC and type of promoter.

1.2.1.1 Level of Quality of Housing (LOH)

IC characterised with its flue duct system and chimney carries smoke out of cooking area (kitchen) and thus reduces the

damage caused to walls and roof covering material due to soot deposition and smoke. On the other hand, smoke from biomass stoves is reported to be useful to keep away insects and preserve thatch (Bussmann, 1984; Nystrom, 1992). A report from Zimbabwe (Gamser, 1990) stated that kitchen thatch over smoky fires had to be changed more frequently than the thatch of other huts where there was no smoke. The quality of housing reflects aspirations regarding quality of life. It seemed logical that quality of housing would be having some relationship with adoption of MC.

1.2.1.2 Extent of Possession of Consumer Durable Goods (EPCDG)

Consumer durable goods in the possession and use of families add to their real income and plane of living. Cochrane and Bell (1956) defined plane of living as the list of all goods, services, and conditions actually consumed or experienced by an individual or group of people. The plane of living reflects standard of living. Higher the plane of living attained, it is assumed that the greater would be the desire to acquire more non-conventional or new goods. MC is a new innovative cooking unit that is available to families through NPIC. It was thought relevant to study the relationship between extent of possession of consumer durable goods and adoption of MC by beneficiary families.

1.2.1.3 Extent of Demands on Main Cook's Time (EDMCT)

Time is a vital resource which can neither be increased nor decreased. However a person can get the best out of it by

judicious management. The main cook is observed to assume multiple roles in day-to-day living (George,1986). Demands on her/his time due to multiple roles could be varied and many. These demands arise both from sources within and outside the family. When there is more demand, cook would look for alternatives which would minimise work load/drudgery to save time and energy. Such an alternative is a two pot MC which as compared to TRC is believed to cook faster, consume less fuel and generate less smoke and soot and thereby reduce drudgery and demand on the time and energy of main cook who is primarily responsible as the main participant in cooking fuel cycle. However not much effort has been made to ascertain the relationship between demands on the main cook's time and adoption of MC.

1.2.1.4 Energy Base of End Uses (EBEU)

Different technologies for various end uses in home like lighting, transportation, agriculture, and cooking are based on different types of energy forms which may be traditional or modern. Depending on the level of income, families might use different fuels ranging from conventional fuels like kerosene to sophisticated modern energy forms like electricity for home lighting. The relationship between energy base of end uses and adoption of MC was seen to be little studied.

1.2.1.5 Extension of Activities by Families After Dusk (EAFAD)

Usually in villages by the onset of dusk, a drastic decline in outdoor activities might be expected primarily due to poor lighting facilities. However depending on aspirations and values

family members might still carry on activities like home-based self employment work, reading, writing, cooking, sharing and exchanging experiences and so on which would require some form of energy. The relation between families' extent of indulgence in activities after dusk and adoption of MC was little explored through research.

1.2.1.6 Energy Management Practices of Family (EMPF)

In general, management may be said to comprise of planned activities directed towards accomplishing desired ends. Everyone learns to manage, in some manner, the resources at his\her disposal. Some people learn to manage well, others not so well (Nickell and Dorsey, 1967). Effective management is required in utilizing any type of resource, i.e., human or non human, in accomplishing a particular goal. Of the non human resources, management of energy has gained significant importance lately, due to scarcity of conventional fuel forms and projections on a future with enough food to feed millions but not enough fuel to cook. Kaul (1984) made an attempt to study the knowledge and consumption behaviour of homemakers in relation to energy resource. She found that energy consumption behaviour of homemakers was influenced by their exposure to mass media, attitude towards energy conservation and perception of the need to conserve energy. It seemed logical that housewives with a higher level of perception of the need to conserve energy would be in a position to inculcate better management practices geared towards energy conservation in family members. However the

relationship between energy management practices of families and EAMC by them was not explored much.

1.2.1.7 & 1.2.1.8 Extent of Interaction of Main Cook and Family with Different Spheres (EIMCDS and EIFDS)

Gross, et al., (1980) described that the expressive and instrumental activities of the family extend beyond its boundaries. According to them family is surrounded by three environments, immediate, near and larger environments which have been drawn on the basis of three criteria, namely, (i) their varying degrees of physical closeness to family, (ii) frequency of family's interaction with each and (iii) degree of control, family has over each of the environments.

The most immediate and the most intimate of the environments surrounding the family, is the household environment. The next one is the near environment which is the community in which the family lives, works and plays. The larger environment which is the farthest of the three, is the larger society or the culture which surrounds a family.

For the present study different spheres of interaction referred to different environments, viz., immediate, near and larger environments with which the family members interacted to fulfill its expressive and instrumental functions.

It seemed logical that the extent of interaction of main cook and family with different spheres would expose them to new innovations, and would lead to a change in attitude and greater

receptivity to changes in the socio-economic milieu which ultimately would generate a desire to try them. Hence it was thought relevant to explore the association between extent of interaction of main cook and family with different spheres and adoption of MC. EIMCDS and EIFDS were treated as two separate variables.

1.2.1.9 & 1.2.1.10 Extent of Participation of Main Cook and Family in NPIC (EPMCNPIC and EPFNPIC)

Singh (1975) revealed that institutions which have teacher educators exposed to foreign influences through visits, literature and other means of communications, have been able to adopt a large number of innovations in teaching. Teacher educators who have been exposed to various seminars and conferences in the country have also developed proneness to adoption of innovations. NPIC is perceived as a people's programme. People's (families'and cooks') participation in NPIC is likely to enhance their perception on the objectives of NPIC, its importance, benefits of MC as an IC, drawbacks of TRC, construction, use, care and maintenance of MC. User's involvement at every phase of transfer of technology programme to grass-root level is important. Beneficiary families and main cooks may participate actively or passively in NPIC, on the one hand, or they may not participate at all, on the other hand. The relationship between extent of participation of main cook and family in NPIC and EAMC seemed not to have been explored much by researchers.

1.2.1.11 Level of Quality of Installation of MC (LQIMC)

TBSU, Baroda (1991) in its feedback survey observed that in many instances the quality of work of Self Employed Workers (SEW) under NPIC in Gujarat State was very poor which could be due to lack of commitment of SEW to NPIC and poor monitoring of the work at grass-root level by functionaries and officers of nodal department and agency. Moreover use of untrained chulha makers was rampant in the construction of ICs. Use of mould was rarely seen in chulha installation (TBSU, Annual report,1991-92). As a result chulhas did not comply by dimension specifications. Similar observations were made in relation to ICs installed in other states as well (TNAU Annual Report, 1991-92). Feedback surveys have revealed that the practice of rejection of chulha on a large scale was attributable to water leakage from roof (TBSU Annual Report, 1989-90, and IIT Annual Report, 1989-90). George in TBSU Annual Report (1993) emphasised that chimney sealing and clamping were very crucial for successful adoption and sustained use of chulha by users. The literature survey showed that the inter-relationship between quality of installation of MC and its adoption rate needs to be investigated.

1.2.1.12 Type of Promoter

NPIC is implemented under the aegies of Ministry of Non Conventional Energy Sources (MNES), GoI. It has target oriented approach along with achievement of objectives like biomass conservation, reducing drudgery of women, smoke free kitchen and the like. The statewise targets are set up in consultation with

nodal department and nodal agencies in the states and TBSU. In Gujarat state NPIC is implemented through the Department of Panchayat and Rural Housing Development and its network by officers and state nodal agencies like GEDA through its network of voluntary organisations. The TBSU in each state also is entrusted the task of implementing NPIC to set up model villages. The administrative approval containing guidelines, strategies and policies of implementation of NPIC, is circulated to nodal agencies, departments, and TBSU's for their perusual in implementation of NPIC. The mode of operation followed in implementation might depend on the promoter. The review of literature revealed that the functionality rate of ICs like MC and its adoption by beneficiaries is little explored by its promoter. Hence to understand the influence of promoter on EAMC this discrete variable was included in the study.

1.2.2 Personal Variables

Personal variables of the study included main cook's age, education, perception regarding available cooking fuel sources, perception regarding accessibility to available cooking fuel sources, and perceived cost benefit ratio with reference to an IC like MC in daily cooking.

1.2.2.1 Age of Main Cook

Rogers and Shoemaker (1971) reviewed various studies and revealed that in 19 per cent of the studies earlier adopters of innovation were younger ; in 48 per cent, no relationship existed

and in 33 per cent, earlier adopters were older. Rai (1972) found that age was having significant relationship with the time of awareness and time of adoption of innovations in the field of education. Ester (1985) found that younger subjects as compared to older subjects were somewhat more concerned with energy scarcity, more willing to conserve energy, have higher levels of energy knowledge, and perceive more effectiveness of energy conservation information. Suresh (1990) considered that age of beneficiary was one of the variables that would be having an effect on the participation rate in development programme. Since a few studies showed that there is some relationship between age and adoption of an innovation, it seemed logical to explore the relationship between age of main cook and adoption of MC by beneficiary families.

1.2.2.2 Education of Main Cook

Literacy level is known to be a determinant of values, beliefs and attitudes which influence behaviour. It was thought that educated persons would have a better understanding of their environment and hazards caused by human activities, particularly, the use of conventional and less efficient technologies. They might get adjusted easily with innovative\modern technologies and might perceive its benefits to a greater extent as they have greater exposure to science and technology. In the review done by Rogers and Shoemaker (1971), it was observed that 71 per cent supported that earlier knowers of an innovation have more education than late knowers. It was also revealed that 74 per

cent of the studies concluded that earlier adopters have more years of education than do late adopters. Bussmann (1984) revealed that the highest adopters of IC had completed primary school education. A study on Consumer Behaviour and Energy Conservation (1985) indicated that higher educated subjects took somewhat more advantage of conservation information than less educated subjects. Shrestha (1987) found that majority of the users of IC were not educated and were not in a position to understand the importance of energy technology. Suresh (1990) attempted to establish a relationship between education and participation rate in development programmes. Pillai (1993) found that there is a correlation between incidence of abandonment of chulhas and low educational status of the households. Since education was associated with conservation behaviour and participation rate in development programmes, it seemed appropriate that education be considered as a variable that might affect EAMC.

1.2.2.3 Perception Regarding Available Cooking Fuel Sources (PRACFS)

Majority of the users of solid biomass stoves collect cooking fuel free of cost from home gardens, community lots, forests and other woodlands (Patel, 1989). When families consuming different cooking fuels perceive fewer options of its available sources or a decline in the options of its available sources, it implies a limitation on the sources from where cooking fuel could be procured by them. Then, it is natural for

them to look for means of conserving cooking fuels from perceived available sources. National Council of Applied Economic Research (1975-76) observed that rural areas differ considerably in the energy consumption pattern owing to local availability of fuel resources. The perception regarding available cooking fuel sources is likely to affect the fuel use pattern and the technology in use. Since PRACFS was not much studied in relation to EAMC it was included as a variable in the present investigation.

1.2.2.4 Perception Regarding Accessibility to Available Cooking Fuel Sources (PRAACFS)

Alluri (1988) opined that the poor can see the energy problem of decreasing . . . accessibility to fuel and resources due to changes in land cover, cropping pattern and social relationships in the village. Remedial measures like improvements in cooking methods and stoves can ensure both . . . and accessibility. Rijal, et al., (1990) considered variables such as forest accessibility, market accessibility . . . to explain variations in energy use.

Though there are different fuel sources available, only some might be accessible to potential users due to various reasons such as income of the family, distance to the fuel source, and cost of the fuel. For instance, when prices go up due to scarcity, people who usually purchase wood may be prepared- to invest in an energy saving stove. Alternatively they may decide to use other commercially available fuels. However families who

collect fuel have little alternative but to search longer and harder; or have to turn to other lower grade non-commercial fuels such as dung or agricultural residues/wastes as buying wood may be beyond their financial resources (Foley and Moss, 1985). When accessibility to selected fuel sources declines, there might be a tendency to look for an alternative which would conserve the fuel. Hence it was thought appropriate to explore the relationship between EAMC and PRAACFS.

1.2.2.5 Perceived Cost-Benefit Ratio (PCBR)

Bhola (1967) stated that the nature and extent of investment and type and amount of return will determine the probability of diffusion of an innovation. Every innovation will have a salience ratio that will determine adoption. The salience ratio is Return/Investment or R/I. The greater the value of salience ratio, the greater the probability of adoption. The importance of cost for accepting an innovation is discussed quite convincingly by Barnett (1953) in the following passage :

> "The cost of acquiring or using a novelty may be prohibitive as far as potential acceptors are concerned. This is an obvious deterrent to the widespread adoption of a host of modern innovations and importations in both the technological and the ideological realms. A great many people in the world today are ready to accept-in fact, psychologically they have already accepted - television sets, electric lights, electric dishwashers, radiant heat rest cures, sanitation programmes, modern house designs,

and many other changes, but they are unable to afford them. The restraining effect of novelty costs is evident when they are absent. It is relatively easy to get people to try something if allowing so, entails no loss to them. They may think that it is no good or harmful just because it costs them nothing, but they are more likely than not to accept it just because it is free".

The concept of perceived cost-benefit ratio is used synonymous to salience ratio in the present study. It was observed that the relationship between PCBR and EAMC was not studied. Costs reflected investment (I) and the difference between costs and benefits reflected return (R).

1.2.3 Family Variables

Family variables of the study comprised of family caste, family size, and landholding.

1.2.3.1 Family Caste

Vasisht (1976) found that caste was positively related, though not significantly with adoption of labour saving devices by rural homemakers. NCAER (1993) observed that a marginal increase in the working proportion of chulha was in other caste households over SC/ST households, though the difference was non significant. According to Admiministrative Approval (1991-92) at least 10 and 20 per cent of the targets of NPIC should be implemented in the SC/ST areas/households respectively. Thus it

seemed logical to explore relationship between family caste and EAMC.

1.2.3.2 Family Size

Gupta, et al., (1982) and Natarajan (1992) observed that household size was related to energy consumption of family. Gupta, et al., (1982) found that as family size increased, daily average energy consumption per person decreased. However Pachauri and Rao (1981) stated that household size did not appear to have a major effect on energy consumption.

As number of members in a family increases it is likely that energy requirement for cooking and other purposes would also record an increase though not proportionately. In other words, total energy consumption would increase in absolute terms though per capita energy consumption may not reveal an increase in the same order with an increase in family size. An improved cooking technology like MC is appropriate to curtail cooking energy consumption and to stretch the same quantum of fuel over more tasks as it is thermally more efficient than traditional chulhas. Moreover MCs tend to ensure cleaner cooking environment with the least smoke, if not smokeless cooking, due to better combustion. Review of literature revealed that the relationship between family size and EAMC has not been explored much.

1.2.3.3 Landholding

Pillai (1993) found in his study that there was a relationship between size of landholding and type of fuel used.

He propounded that those who bought firewood from the market might adopt the technology of IC somewhat faster than those who procured it from their own garden or field. Logically it was expected that poor families who collect fuel from wasteland spend considerable time in gathering the fuel. Here the opportunity cost becomes significant. It was observed that the relationship between size of landholding and adoption of MC was not explored much.

2.0 Model Showing Hypothesised Relation Among Variables in the Study of EAMC

The proposed model on adoption of MC is illustrated here. It shows that adoption of MC is influenced by situational, personal, and family variables. In this model hypothesised relationships are represented by continuous lines and assumed relationships with broken lines.

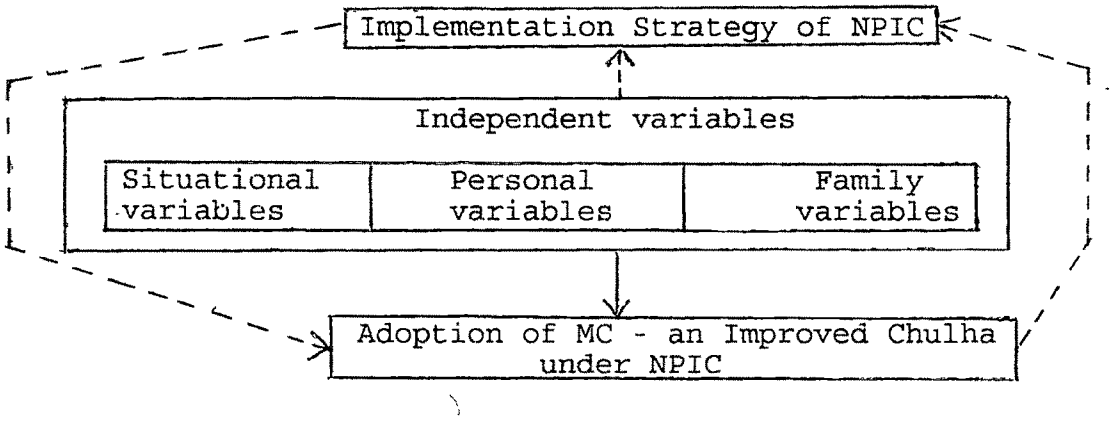

Fig.1 Model showing hypothesised relation among variables in the study of adoption of MC

----------Assumed Relationships

_____Hypothesised Relationships

Independent variables comprised of situational, personal, and family variables. Situational variables included were level of quality of housing, extent of possession of consumer durable goods, extent of demands on main cook's time, energy base of end uses, extension of activities after dusk by the families, energy management practices of the family, extent of interaction of the main cook and family with different spheres, extent of participation of main cook and family in NPIC and quality of installation. Personal variables studied were main cook's age, education, perception on available cooking fuel sources, accessibility to available cooking fuel sources and perceived cost-benefit ratio of using MC in daily cooking. Family variables included family caste, family size and landholding.

The broken lines with arrows marked between implementation strategy of of NPIC and situational, personal and family variables, indicate that the latter is assumed to exert an influence on the former (Figure 1). The implementation strategy of NPIC would in turn is assumed to affect the adoption of MC installed under NPIC. Family and personal as well as situational variables exert direct influence on adoption of MC and this is indicated through continuous lines with arrow drawn between these concepts in the framework. An explicit expression of adoption of MC, an improved chulha, by its beneficiary amongst others, is its acceptance for using it in daily cooking of family meals and replacement of traditional TRC by MC. Once families thus become adopters of MC, they are directly enhancing their own family

well-being and also contributing to national causes of biomass conservation and maintenance of ecosystem balance.

3.0 Operational Definitions

Certain terms were defined for successful conduct of the investigation. The operational definitions, thus made, are given below:

3.1 Adoption refers to acceptance of new idea(s), behaviour(s) or thing(s) with which the old one(s) is/are replaced. In the present study adoption of MC refers to the decision of beneficiary families to accept and use an innovative cookstove, viz., MC in daily cooking in the place of traditional or conventional stove by following certain lines of action. These lines of action put constraints on the use of TRC in daily cooking, facilitates continued use of MC and propagates its use to others. Extent of adoption of MC reflects the extent to which MC is accepted and used in daily cooking as evidenced by also the extent to which it replaced TRC amongst other things.

3.2 Energy refers to all non-human power utilised by families in the course of its daily living.

3.3 Extent of Interaction with Different Spheres refers to frequency of interaction of family or main cook with different institutions in its immediate, near and larger environments for various purposes related to socialisation, consumption, production and human resource development. The term sphere of

interaction is used synonymously to environments of interaction, namely, immediate, near and larger.

3.3.1 Immediate Environment refers to potential areas of contact or interaction of family or main cook within the boundaries of their resident village which includes nearby shops, market places, farm, neighbour's house and the like.

3.3.2 Near Environment is defined as potential areas of contact or interaction of family or main cook beyond its resident village but within the boundaries of the taluka/block. Thus it would include nearby villages and towns within the taluka/block.

3.3.3 Larger Environment refers to potential areas of contact or interaction of family or main cook with villages, cities/towns outside the boundaries of its taluka and /or district.

3.4 Perception Regarding Available Cooking Fuel Sources (PRACFS) is the awareness of users/beneficiaries regarding various cooking fuel sources in their vicinity which are available options for them to procure fuels from.

3.5 Perception Regarding Accessibility to Available Cooking Fuel Sources (PRAACFS) is the awareness of users/beneficiaries regarding the various available cooking fuel sources from where they can or to which they have access to procure fuels for cooking.

3.6 Perceived Cost-Benefit Ratio (PCBR) is the ratio arrived at by considering perception of beneficiaries regarding benefits

accrued/might accrue and costs incurred/might be incurred as a result of adoption of an improved cookstove like MC. PCBR is synonymous to salience ratio which is the ratio between Returns and Investment (R/I). Investment relates to cost and returns relate to difference between costs and benefits.

3.7 Energy Management Practices of Family (EMPF) refers to norms held regarding energy management practices that are followed by family with reference to lighting, cooking and transportation. It depicts good or poor practices reflected through energy conservative or energy intensive practices respectively.

3.8 Vigha is a unit for measurement of land. Two vighas are equal to one acre and one hectare is equal to 2.47 acres or 4.94 vighas.

4.0 Interview cum Observation Schedule

An interview cum observation schedule with five distinct sections was found to be an appropriate tool for the present study. The first section of the schedule comprised of questions related to the background information of the sample, second section dealt with the details regarding family energy consumption pattern, end uses and technologies used, spheres of interaction, and so on. In addition, questions to collect data pertaining to demands on main cook's time, number of persons involved in gathering cooking fuel, perception regarding options of available cooking fuel sources and accessibility to available cooking fuel sources, location of TRC and MC and the like were

included in the second section. The third section consisted of queries to identify motivating factors for being a beneficiary of NPIC, details and quality of installation of MC, participation in publicity and education campaigns, stoves used by purposes/tasks and frequency of its use before and after installation of MC, changes made in cooking and fuel management practices due to MC, follow-up of MC and so on and so forth. The fourth section of the schedule comprised of scales to assess perception of cost-benefit of using MC, energy management practices and adoption of MC. The last section comprised of observation schedule to record data on material goods possessed by the family, material of walls, floors and roof of the dwelling unit, existing condition of MC, changes made in the chulha and so on.

4.1 Development of Instrument to Measure Energy Management Practices of Family

The objective of assessing the energy management practices pursued by respondents required standardised scale to measure quantitatively the same. In the present study specific situations reflecting energy intensive practices and energy conserving practices were utilised to determine the energy management practices related to cooking, lighting and transportation. Thus statements that reflected energy intensive and energy conservation oriented behaviour formed the scale.

4.1.1 Item Collection

The content of the scales comprised of statements called items. The most important factor considered in collecting information and framing the item was that it should reflect either energy intensive (energy non conserving) or energy conserving behaviour acts with reference to energy end uses. Items were developed on the basis of literature surveyed, and discussions with guide. These were then edited. Energy Management Practice Scale (EMPS) had sixty five statements initially.

4.1.2 Content Validity of the Scale

The carefully edited items were then submitted to a panel of ten judges who were experts from the Faculty of Home Science and Faculty of Education and Psychology, M.S.University of Baroda, and Gujarat Energy Development Agency, Baroda. The judges were requested to indicate the clarity of each statement. Moreover, they were asked to check each item in the listed statements and place it in one of the following categories where it fitted the best- 1) Energy Intensive (energy non conserving) 2) Energy Conserving. The operational definitions of each of these terms were also furnished to the judges. Out of ten, only nine judges returned the schedules on EMPS given for establishing content validity. The judges' responses were then coded and tabulated. The screening of the items was done on the basis of the following criteria :

(1) Any item reported as clear by all was to be included in the EMPS to be used in the pilot study.

(2) Those items on which sixty seven per cent or more of the judges showed agreement with regard to the category where it fitted the best were to be included in the EMPS to be used in the pilot study.

Thus out of the original set of sixty-five items, forty-four items satisfied both the criteria and were included taking care to have more or less equal number of statements indicating energy intensive and energy conserving behaviour acts in the scales to be used in the pilot study (Appendix 1).

4.2 Development of Instrument to Measure Perceived Levels of Benefits and Costs

Cost Benefit Perception Scale (CBPS) was used to find out the costs and benefits that were perceived as accruing or would accrue to the beneficiaries when they owned the new cooking technology, i.e., MC under NPIC.

4.2.1 Item Collection

The statements pertaining to the variable under investigation were gathered.

The following criteria were considered while editing the statements :

(1) The statements should be brief, clear and straight forward.

(2) The statements should be as simple as possible.

(3) The statements should reflect either perceptions on benefits or costs.

(4) No statement should have double negatives or other confusing expressions.

(5) Double barrelled statements should be avoided.

The CBPS thus prepared initially had thirty six statements.

4.2.2 Content Validity of the Scale

The carefully edited statements were submitted to a panel of ten judges consisting of experts from the Faculty of Home Science and Faculty of Education and Psychology, M.S.University of Baroda, and Gujarat Energy Development Agency, Baroda. The judges were requested to indicate whether each of the statement in the scale reflected cost or benefit with reference to adoption of MC. In addition they were also required to indicate the clarity of the statements. Nine out of ten judges returned the scale duly checked. The judges'responses were coded and tabulated.

The following criteria served as a basis for the selection of statements :

(1) Any statement reported as clear by all was to be accepted for inclusion in the scale.

(2) Those statements where sixty seven per cent or more of the judges agreed on the appropriateness of the statement to reflect perception regarding cost or benefit of MC to be included in the scale.

(3) Any statement reported as ambiguous by three or less number of judges was to be modified and resubmitted to a minimum of five judges for scrutiny and if found clear to all, then it was to be accepted for inclusion in the perception scale.

All the criteria were applied simultaneously. Twenty nine statements were chosen for inclusion in CBPS to be used in the present study.

4.3 Development of Instrument to Measure Extent of Adoption of MC

Mamta Chulha Adoption Scale (MCAS) was developed to measure EAMC by beneficiaries of NPIC. MCAS used in the present study was evolved based on the previous researches undertaken by Technical Backup Support Unit (TBSU), Home Management Department and other researchers (Vingle,1987) with some modifications and additions. The different parameters that were used to measure adoption of MC included extent of replacement of TRC with MC, use of TRC in pre and post installation period of MC, variety in cookstoves used during post installation period of MC, extent of use of MC in daily cooking, period of continued use of MC, functional status of MC, measures taken/to be taken for repair, maintenance and replacement of worn out parts of MC, and recommendation of MC to others. MCAS had eight components on which pertinent data were gathered. Wherever relevant, information during pre and post installation period of MC were gathered to compute EAMC.

5.0 Pilot Study

Pilot study was conducted on a sample of forty families chosen through purposive sampling method from village Sindhrot. The main cook furnished data on baseline characteristics, energy consumption pattern, details regarding TRC, appropriateness, advantages and disadvantages of MC, energy management practices of the family and perception of benefits and costs due to adoption of MC and so on. Minor changes were made in the interview schedule on the basis of the pilot study.

The data pertinent to MCAS, EMPS and CBPS were scored, coded and subjected to statistical verification for establishing the reliability of the instruments and for constructing the final scales.

5.1 Reliability of the Instruments

To ascertain the reliability of the instruments the following procedure was adopted.

5.1.1 Split-half Technique

In this technique of establishing reliability coefficient, the whole scale was divided into two halves, using odd numbered items for one half and even numbered items for the other half. Each of the two sets of items of each instrument was treated as separate scales. The respondents who scored high on odd items should score high on even items as well, if empirical errors have been kept to a minimum and the same applies in the case of low

scores as well. The coefficients of correlation computed using Pearson Product Moment formula served as a measure of reliability. From the self correlation of the half tests, the reliability of the whole test was estimated using Spearman Brown Prophecy formula which states

$$r_{rel} = \frac{2.r}{1+r}$$

Where r_{rel} is the reliability coefficient and r is the correlation coefficient.

Item analysis was carried out to ascertain whether the items were discriminating those who earned high scores from those who earned low scores in the respective scales.

5.1.2 Reliability of EMPS

From the correlation coefficient computed for the items of EMPS by split half method using Pearson Product Moment formula, the reliability coefficient was computed by Spearman Brown Prophecy formula. The rrel of EMPS was estimated to be 0.61. The final scale thus developed had twenty three statements.

5.1.3 Reliability of CBPS

CBPS was administered on forty respondents of the sample beneficiary families in the pilot study. The split-half technique was employed in estimating the reliability of CBPS. The correlation coefficients worked out to be 0.85 and the

reliability coefficient computed by Spearman Brown Prophecy formula was 0.92. The final scale had twenty four statements.

5.1.4 Reliability of MCAS

The correlation coefficient of the items of MCAS using Pearson Product Moment formula was 0.81, and the reliability coefficient computed by Spearman Brown Prophecy formula was 0.89. The final scale thus developed has eight aspects to measure EAMC.

6.0 Data Collection Procedure and Scoring of the Instruments

Beneficiaries of an IC- Mamta Chulha under NPIC in Gujarat state formed the population of the study. Three villages, out of which two from Baroda district and one from Mehsana district, were selected through purposive random sampling technique. These villages were selected due to easy accessibility and familiarity with location and officers implementing NPIC at district and taluka level as well as with functionaries at village level. Moreover, in all these villages beneficiaries had the same model of IC, viz., Mamta chulha, a two pot fixed model with chimney.There are 3 distinct groups of promoters of chulha under NPIC in Gujarat State, namely, State Government (SG) through its administrative network at state, district and taluka/block level, Non-Government Organisations (NGO) which are registered autonomous bodies with their own constitution and code of conduct, and TBSU which is established by MNES, GoI under NPIC. The three villages, viz., Vadadla, Kanjari and Sindhrot selected were such that in each of these villages, NPIC was implemented exclusively by any one of each of these bodies, SG, NGO and TBSU.

The list of beneficiaries in each of these villages was procured from TBSU. There were altogether 200,215 and 239 beneficiaries in Vadadla, Kanjari and Sindhrot respectively. One hundred and thirty beneficiary families were selected randomly by fish bowl technique from each of these three locations of study. Each of the beneficiary families was contacted and the main cooks who formed the respondents were identified.

The interviewer first met Sarpanch of the respective villages so as to win his confidence and to orient him about the importance of the study and solicit his/her full support throughout the conduct of the study. Respondents were explained the purpose of the study and value of their whole hearted cooperation for the successful completion of the study, and they were requested to extend the same. The data collection period fell between June to December, 1992 and March to April, 1993. At the end of each day, the schedules were checked for completeness and correctness of data gathered. In case any clarifications were to be made the same was done in subsequent visits. The edited schedules were then ready for data processing.

6.1 Soliciting Data on Selected Independent and Dependent Variables of the Study and Related Aspects and Scoring Pattern

First of all, detailed information regarding baseline data, sources of energy availed of and the reasons for preferring the same, the cost incurred on energy consumption per month,

different types of energy forms used for different purposes, number of persons involved and mode of procurement of cooking fuels, problems with TRC and so on were gathered through personal administration of household energy survey schedules. Subsequently in the second round data on factors that motivated the families to become a beneficiary of NPIC, location of MC, details on installation, extent of participation of family and main cook in User Education Camps (UECs), functional status of chulha, changes made in cooking and fuel management practices due to MC, changes made in MC, reasons for satisfaction / dissatisfaction with MC, and the like were gathered.

6.1.1 Energy Management Practices of Family (EMPF)

Standardised Energy Management Practice Scale (EMPS) with twenty three statements was used to ascertain EMPF related to cooking fuel, lighting and transportation. Families were requested to report the frequency of following the given practices in the scale. The response categories given were always, sometimes and never with scores of 3,2,1 assigned respectively for statements revealing energy conserving behaviour. Reversed scoring pattern was followed for statements revealing energy intensive behaviour. The scores were interpreted such that the higher the score, the better the management practices. The range of scores was from 23 to 69.

6.1.2 Perceived Cost-Benefit Ratio (PCBR)

A Cost-Benefit Perception Scale (CBPS) was constructed and standardised to measure perception of cost-benefit due to

possession of MC by its beneficiary under NPIC. There were twenty four items in the final CBPS. In CBPS the response categories for each item included `agree', `uncertain', and `disagree'. The response indicating benefit or cost due to possession of MC with reference to each statement was assigned a score of 3. A score of `zero'was assigned to the response `uncertain'. After computing total score for cost and benefit for each respondent, the difference between benefit score and cost score was estimated. PCBR ratio was calculated by using the formula Returns/Investment, where Returns = Benefits- Costs and Investment = Costs. The PCBR was interpreted such that the higher the value, the higher the ratio of benefits perceived and vice versa. The possible PCBR ranged from -1 to +1.

6.1.3 Level of Quality of Housing (LOH)

Level of Quality of housing was assessed in terms of permanency or durability of the materials used for the structure of house, type of house, water facility, and sanitary services available. Regarding structure of house, scores of 1,2,3 were assigned to kutcha, semipucca and pucca units respectively. Similarly, scores of 1,2 and 3 were given to row house, twin block and detached house respectively.

The data on sanitary services was quantified by taking into consideration the bathroom and toilet facilities. While 1,2 and 3 were assigned to kitchen corner used as a bathroom,sheltered bathing area in yard and a separate pucca bathroom respectively, scores of 1, 2 and 3 were assigned to open

defecation, separate borehole or WC without flushing system, and WC with flushing system respectively. Scores of 1, 2 and 3 were assigned to common water source, own water source and both respectively. The scores ranged from 5 to 15. The higher the score, the better the quality of housing.

6.1.4 Extent of Possession of Consumer Durable Goods (EPCDG)

An inventory of durable goods in the possession and use of family under investigation was gathered using a check list. Based on the value of the item which is dependent on the base material and the relative character (value) of consumer durable goods in each category, a scoring pattern was evolved arbitrarily (Appendix II). The higher the score, the greater the number and better the quality of consumer durable goods in the possession and use of family, the higher the level of living.

6.1.5 Extent of Interaction with Different Spheres (EIDS)

The EIDS score was arrived at by computing the product taking into consideration 1) the spheres with which the family interacted, 2) the purpose and 3) the frequency of interaction with each. The spheres with which the family interacted were identified as immediate, near and larger and these were ascribed 1, 2 and 3 scores respectively. Purposes of interaction with different spheres were categorised into four, viz, consumption related, socialisation related, production related and human resource development related and the scores given were 1,2,3, and 4 respectively. The frequency of interaction for each purpose

was quantified by ascribing scores of 1,2,3,4,5 for `once in a year', `one to <6 times in 6 months', `one to <4 times in a month', `one to 3 times in a week', and `4-7 times a week' respectively. Thus the better the quality of purpose and the more the frequency of interaction with a particular environment, the higher the score. A weighted score was then computed for arriving at the final EIDS taking into consideration the extent of exposure by assigning scores of 1,2 and 3 for immediate, near and larger environments respectively. This weighted scoring pattern was used on the assumption that the exposure that the family or cook gets by virtue of visits to larger environment would be more than near environment and that of near environment would be more than immediate environment. Thus EIDS was computed for each member above three years of age in the family from which the EIFDS (Extent of Interaction of Family with Different Spheres) was arrived at by summing up each individual score. EIMCDS represented the Extent of Interaction of Main Cook with Different Spheres.

6.1.4 Energy Base of End Uses (EBEU)

The data were gathered on fuel forms that powered different end uses, viz., lighting, transportation, cooking and agriculture operations to ascertain the energy base of the same. Electricity, petrol, and diesel were clubbed together under modern fuels, while kerosene and biomass were clubbed together under conventional fuels. Scores of 3,2,and 1 were assigned if any end use was based on only conventional, combination of conventional

and modern, and only modern fuels respectively. Thus the higher the score the more conventional the energy base used. The range of score was from 4 to 12.

6.1.5 Extension of Activities of Family After Dusk (EAFAD)

Data on activities carried out after dusk were gathered by means of a check list. If active life requiring any energy (fuel) base ceased with the onset of dusk then a score of 1 was assigned, if any family member indulged in low energy (fuel) consuming tasks like talking or sharing experiences, taking rest and meals after dusk then a score of 2 was assigned while if the activity was energy intensive like reading, writing and stitching, then a score of 3 was assigned. In this manner scoring was done for each activity and the total score was then computed by summing up each activity score. The range of scores was from 8 to 24.

6.1.8 Extent of Participation of Family in NPIC (EPFNPIC)

This variable was measured through ascertaining exposure of family members to user education camps (UECs), their presence during installation of MC, and their contribution towards NPIC in terms of labour, material and cost sharing of MC as its beneficiary.

6.1.8.1 Exposure of Family to User Education Camps (EUEC)

Exposure to UECs by family was measured in terms of involvement of family members as participants in UECs, number of UECs attended by family, and attendance in UECs prior to and

after installation of MC. The exposure of family to UECs in terms of the member attended, viz, none, minor children, adult men and adult women was separately treated by assigning scores of 1,2,3, and 4 respectively taking into consideration differential levels of their participation in cooking fuel cycle (Foley and Moss, 1984). The exposure of family to UECs was quantified further in terms of the number of UECs attended. Thus the maximum score that could be earned by a beneficiary family was 4 if all the three UECs were attended and 1 if no UEC was attended.

The exposure of family to UECs on the basis of attendence in UECs prior to and after installation of MC was quantified by assigning a score of 4 to those who attended all the UECs prior to and after installation of MC, 3 to those who attended some of the UECs prior to and after installation of MC, 2 to those who attended any UEC either prior to or after installation of MC and 1 to those who attended none of the UECs prior to or after installation of MC.

The sum of scores on each of these three aspects made up the EFUEC score of the family.

6.1.8.2 Presence of Family During Installation of MC (PFDIMC)

The data on presence of family during installation of MC, were quantified by ascribing scores of 1,2,3 and 4 for `nobody present', `male family member/s present', `female family member/s' present, `male and female member/s present' respectively.

6.1.8.3 Contribution of Family for Installation of MC (CFIMC)

The third parameter used to measure EPFNPIC was contribution of family towards possession of MC under NPIC. A beneficiary family could contribute by way of material, labour and cost sharing towards installation of MC in their kitchens.

The response categories for material contributions were (i) none (ii) mud and dung, (iii) brick, mud and dung, and (iv) brick and cement mortar and these were assigned scores one through to four respectively. The second aspect - contribution of labour by family in the tasks of preparing material mix and installation of MC-was ascertained in terms of (i) none (ii) family's labour reluctantly at intervals (iii)family's labour willingly at intervals and (iv) family's labour willingly throughout and these were assigned scores of one through to four respectively. Data on cost sharing was also quantified. Scores of 1,2,3 and 4 were assigned if family's monetary contribution towards cost sharing was `nil', Rs.5.00, Rs.10.00, and Rs.15.00 respectively. The sum of scores on these three aspects made up the score on contribution of family towards installation of MC.

The EPFNPIC score of the family was arrived at by summing up the scores earned for EUEC, PFDIMC and CFIMC. The higher the score, the greater the extent of participation of family in NPIC. The range of scores was 7 to 28.

6.1.9 Extent of Participation of Main Cook in NPIC (EPMCNPIC)

EPMCNPIC was measured separately by taking into consideration only those data on exposure to user education camps

(EUEC), presence during installation of MC (PDIMC) and contribution for installation of MC (CIMC) that were relevant for main cook's participation.

6.1.9.1 Exposure to User Education Camps (EUEC)

Exposure of main cook to UECs was measured in terms of her/his presence in UECs, number of training camps attended, and training camps attended prior to and after installation of MC. Scores 3, 2 and 1 were assigned for presence in UECs `throughout', `partially' and `not at all' respectively. Number of training camps attended was quantified by assigning scores of 3, 2 and 1 for all, some and none respectively. Exposure to UECs prior to and after installation of MC was measured by assigning scores of 1, 2 and 3 for UEC attended neither before nor after installation of MC, attended either before or after installation of MC and both before and after respectively. The sum of scores on each of these aspects made up EUEC score of main cook.

6.1.9.2 & 6.1.9.3 Presence During Installation of MC (PDIMC) and Contribution for Installation of MC (CIMC)

Regarding presence during installation, scores of 1, 2 and 3 were assigned for `not present', `main cook present at times', and `main cook present through out' respectively. Contribution of labour was measured by ascribing a score of 1 to `no contribution', 2 to `contribution reluctantly', and 3 to `contribution willingly' by main cook.

Thus EPMCNPIC score was computed by summing up the scores earned for the above mentioned parameters. The range in score was 5 to 15. The higher the score, the greater the extent of participation of main cook in NPIC.

6.1.10 Level of Quality of Installation of MC (LQIMC)

The aspects that were used to measure quality of installation of MC were method of construction, use of prefab components, retention of dimensions in field as per specifications, chimney sealing and clamping, provision of ash hole, material of cowl and fixing of chimney outlet.

The method of construction, namely, (i) cutting out MC in mud block with mould and (ii) installation of pothole liners in mud/brick platform, was ascertained in relation to each MC and the data were quantified by assigning scores of 1 and 2 respectively to each of these methods.

Data on second aspect considered for quality of installation,namely, use of prefab components, were quantified by giving scores of 1 and 2 for MCs with (a) all parts in mud and (b) all parts in prefab components respectively.

The next parameter of quality of installation, namely, dimensions of different components of MC like firebox, second pothole, first tunnel, second tunnel and fuelfeed inlet opening were checked against design specifications to ascertain whether it was as per specifications or not. A score of 1 was assigned

for each part that was not as per specifications and 2 for each that was as per specifications.

Parameters like chimney sealing and clamping, and ash hole were checked in MCs installed to verify its absence and presence in each case. Scores of 1 and 2 were assigned to each if the same was `absent' and `present' respectively. Scores of 1 and 2 were assigned for asbestos cement (AC) cowl and ceramic cowl respectively.

The last aspect under quality of installation considered was whether the chimney was fixed through wall or roof and a score of 2 was assigned if through wall and a score of 1 was assigned if through roof.

The LQIMC score was arrived at by summing up the scores earned on each of the above twelve parameters and the range of scores was from 12-24. The scores were interpreted such that the higher the score, the better the level of quality of installation of MC.

6.1.11 Extent of Demands on Main Cook's Time (EDMCT)

Extent of demands on main cook's household work time was ascertained by using a checklist of twenty four household activities with response categories marked as `no help received', `some help', `more help', which were assigned a score of 3,2 and 1 respectively. The higher the score the greater the demand on cook's household work time. In other words, the higher the score, the more the demands on main cook due to household chores.

6.1.12 Extent of Adoption of MC (EAMC)

EAMC was ascertained through different parameters such as extent of replacement of TRC with MC, use of TRC in pre and post installation period of MC, variety in cookstoves used during post installation period of MC, extent of use of MC, period of continued use of MC, functional status of MC, measures taken/to be taken for repair, maintenance and replacement of MC, and its recommendation to others. The scores were interpreted in such a way that the higher the score, the higher the EAMC.

The extent to which TRC was replaced by MC in terms of its' frequency of use was identified as a parameter to assess its adoption in daily cooking. The data on frequency of use of TRC and MC for cooking family meals on normal days, were used to assess the extent of replacement of TRC by MC. The evaluatory categories were `no replacement of TRC at all' if MC was never used instead of TRC, `replacement of TRC by MC to some extent' if MC was used rarely instead of TRC, `both TRC and MC used to the same extent', `replacement of TRC by MC to a great extent' if MC was used mostly or always instead of TRC and scores of one through to four were assigned to each respectively.

In a similar manner comparative use of TRC in pre and post installation period of MC, in terms of its extent of use for cooking family meals on normal days was ascertained. The categories were `increased use of TRC', `same extent of use of TRC', `reduced use of TRC', `no TRC in use' in post installation period as compared to pre installation period and scores of 1 through to 4 were assigned to each respectively.

Variety in cookstoves used during post installation period of MC was ascertained as measure of EAMC keeping use of MC only at one end of the continuum and use of other stove(s) without MC in use at the other end with MC along with any one cookstove like TRC, kerosene, electric, gas stove or coal sigdi and MC along with more than one other stove in between the extreme ends. The data were quantified by assigning scores 1 through to 4 to use of any other stove without MC, use of MC with two other stoves, use of MC with one other stove and use of MC alone respectively.

Data on number of items cooked on normal days were gathered from which extent of use of MC to cook items of family meals was computed and then rated as ≤25%, 26 to 50%, 51 to 75% and >75% and scores of 1 through to 4 were ascribed to these respectively.

The data on period of continued use of MC were gathered. To quantify the same, one through to four scores were assigned to each response category respectively in the following manner: (i) a few days to less than 3 months (ii) 3 to less than 6 months (iii) 6 to less than 9 months (iv) ≥9 months.

Functional status of chulha was ascertained in terms of (i) MC demolished (ii) MC present but not in use, (iii) MC in use for occasional cooking and (iv) MC in use for daily and special occasions and were assigned scores of 1 through to 4 respectively.

Measures taken/to be taken to facilitate continued use of MC formed another parameter on adoption of MC. Responses like

`switch over to TRC', `repair MC', `buy new liner if available', and `approach chulha maker to reinstall' were used to ascertain the user's action and these were scored from 1 through to 4 respectively. Scores of 1 through to 4 were assigned for recommending MC to others in terms of never, rarely, sometimes and always respectively.

The extent of adoption of MC (EAMC) by each beneficiary was arrived at by summing up the scores earned on each of the above aspects. The range of EAMC score was 8 to 32.

7.0 Analysis of Data

7.1 Categorisation of the Sample for the Purpose of Analysis

The following variables of the study were categorised arbitrarily for the purpose of analysis and tabulated.

1. Family Caste	i.	SC/ST	
	ii.	General	
2. Family size	i.	Small	- One to three members
	ii.	Medium	- Four to six members
	iii.	Large	- Seven and above
3. Landholding	i.	Landless	
	ii.	Marginal	- less than 4.3 vighas
	iii.	Small	- 4.3 to 8.5 vighas
	iv.	Large	- 8.6 vighas and above

4. Main Cook's Age	i.	Young	- $\leq$ 34 years
	ii.	Middle	- 35 to 59 years
	iii.	Old	- > 59 years
5. Main Cook's Education Level	i.	Illiterate	
	ii.	Low	- Upto 7th standard
	iii.	Moderate	- 8th to 12th standard
	iv.	High	- Undergraduate and above
6. Type of Promoter	i.	Non-Government Organisation	
	ii.	State Government	
	iii.	Technical Backup Support Unit	

The following variables were categorised by taking mean and standard deviation into consideration. Thus mean plus SD or more ($\bar{x} + \sigma$ or more) formed the group-High, mean minus SD to mean plus SD ($\bar{X} - \sigma$ to $\bar{X} + \sigma$) formed the group-Moderate, and mean minus SD or less ($\bar{x} - \sigma$ or less) formed the group-Low, as the case might be.

7. EMPF	i.	Low	- 46.94 or less
	ii.	Moderate	- 46.95 to 58
	iii.	High	- 58.1 or more
8. PRACFS	i.	Low	- 4.18 or less
	ii.	Moderate	- 4.19 to 6.33
	iii.	High	- 6.34 or more
9. PRAACFS	i.	Low	- 1.11 or less
	ii.	Moderate	- 1.12 to 4.14
	iii.	High	- 4.15 or more

10. PCBR	i.	Low	-	-0.39 or less
	ii.	Moderate	-	-0.40 to 0.66
	iii.	High	-	0.67 or more
11. LQH	i.	Low	-	9.04 or less
	ii.	Moderate	-	9.05 to 12.95
	iii.	High	-	12.96 or more
12. EPCDG	i.	Low	-	23.08 or less
	ii.	Moderate	-	23.09 to 60
	iii.	High	-	61 or more
13. EIMCDS	i.	Low	-	42.96 or less
	ii.	Moderate	-	42.97 to 67.07
	iii.	High	-	67.08 or more
14. EIFDS	i.	Low	-	135.55 or less
	ii.	Moderate	-	135.56 to 350.28
	iii.	High	-	350.29 or more
15. EBEU	i.	Low	-	6.61 or less
	ii.	Moderate	-	6.62 to 9.20
	iii.	High	-	9.21 or more
16. EAFAD	i.	Low	-	13.09 or less
	ii.	Moderate	-	13.10 to 16.36
	iii.	High	-	16.37 or more
17. EPFNPIC	i.	Low	-	13.62 or less
	ii.	Moderate	-	13.63 to 20.85
	iii.	High	-	20.86 or more

18.	EPMCNPIC	i.	Low	- 6.91 or less
		ii.	Moderate	- 6.92 to 14.54
		iii.	High	- 14.55 or more
19.	LQIMC	i.	Low	- 16.58 or less
		ii.	Moderate	- 16.59 to 23.21
		iii.	High	- 23.22 or more
20.	EDMCT	i.	Low	- 23.08 or less
		ii.	Moderate	- 23.09 to 50.81
		iii.	High	- 50.82 or more
21.	EAMC	i.	Low	- 12.2 or less
		ii.	Moderate	- 12.3 to 28.15
		iii.	High	- 28.16 or more

7.2 Statistical Analysis of the Data

Frequencies, percentages and means were computed in relation to baseline data, viz, age, education level of main cook, family size, landholding, level of quality of housing, extent of interaction of family and main cook with different spheres, energy base of end uses, extension of activities of family after dusk, cost incurred on different fuel forms, type of stove, reasons for using particular stove, problems faced with TRC, number of people involved in cooking fuel cycle and so on. Further descriptive statistics like frequency, percentage and means were computed for data on procurement of cooking fuel, perception of cook regarding availability of and accessibility to cooking fuel sources, perception regarding scarcity of fuels now

as compared to 2 and 5 years ago, energy management practices, extent of possession of consumer durable goods, extent of demands on main cook's time, perception regarding cost-benefit ratio, quality of installation, extent of participation of family and main cook in NPIC, reasons for satisfaction and dissatisfaction due to use of MC, functional status of MC, measures taken/to be taken for maintenance of MC and so on. Product moment correlations were computed using data from all the respondents for all continuous variables under study. Analysis of variances were computed for extent of adoption of MC and each of the variables under study. When significant `F' values were found `t' tests were carried out. Only `t' tests were carried out for the two discrete variables, viz., type of promoter and family caste. Stepwise regression analysis was performed for assessing the order in the influence of the selected variables on EAMC.

The level of significance required for judging the association between the variables under study was .05 level of probability.