achment 1.
CE SHEET)

Library

Date 10.03.96

ETHICAL REVIEW COMMITTEE, ICDDR,B.

ncipal Investigator Irene Kranzlin

Trainee Investigator (if any)

lication No. 96-016

Supporting Agency (if Non-ICDDR,B)

le of Study The impacts of exo- nous technology on a traditional ource management and the environment

Project status:
(✓) New Study
( ) Continuation with change
( ) No change (do not fill out rest of form)

cle the appropriate answer to each of the following (If Not Applicable write NA).

Source of Population:
(a) Ill subjects — Yes (No)
(b) Non-ill subjects — (Yes) No
(c) Minors or persons under guardianship — Yes (No)

Does the study involve:
(a) Physical risks to the subjects — Yes (No)
(b) Social Risks — Yes (No)
(c) Psychological risks to subjects — Yes (No)
(d) Discomfort to subjects — Yes (No)
(e) Invasion of privacy — Yes (No)
(f) Disclosure of information damaging to subject or others — Yes (No)

Does the study involve:
(a) Use of records, (hospital, medical, death, birth or other) — Yes (No)
(b) Use of fetal tissue or abortus — Yes (No)
(c) Use of organs or body fluids — Yes (No)

Are subjects clearly informed about:
a) Nature and purposes of study — (Yes) No
b) Procedures to be followed including alternatives used — (Yes) No
c) Physical risks — Yes No NA
d) Sensitive questions — Yes No NA
e) Benefits to be derived — (Yes) No
f) Right to refuse to participate or to withdraw from study — (Yes) No
g) Confidential handling of data — (Yes) No
i) Compensation &/or treatment where there are risks or privacy is involved in any particular procedure — Yes No NA

5. Will signed consent form be required:
(a) From subjects — (Yes) No
(b) From parent or guardian (if subjects are minors) — Yes (No)
6. Will precautions be taken to protect anonymity of subjects — (Yes) No
7. Check documents being submitted herewith to Committee:

___ Umbrella proposal - Initially submit an overview (all other requirements will be submitted with individual studies).
✓ Protocol (Required)
✓ Abstract Summary (Required)
✓ Statement given or read to subjects on nature of study, risks, types of questions to be asked, and right to refuse to participate or withdraw (Required)
___ Informed consent form for subjects
___ Informed consent form for parent or guardian
___ Procedure for maintaining confidentiality
✓ Questionnaire or interview schedule *

* If the final instrument is not completed prior to review, the following information should be included in the abstract summary:
1. A description of the areas to be covered in the questionnaire or interview which could be considered either sensitive or which would constitute an invasion of privacy.
2. Examples of the type of specific questions to be asked in the sensitive areas.
3. An indication as to when the questionnaire will be presented to the Cttee. for review.

ee to obtain approval of the Ethical Review Committee for any changes ing the rights and welfare of subjects before making such change.

Principal Investigator

Trainee

ENTERED 2 1 JUN 1996

**CHECK-LIST FOR SUBMISSION OF PROPOSALS TO THE RESEARCH REVIEW COMMITTEE (RRC)**

**[Please tick (✓) the appropriate box]**

1. Has the proposal been reviewed, discussed and cleared at the Division level ?

   Yes [✓]

   No [ ]

   If 'No', please clarify the reasons: _____

2. Has the proposal been peer-reviewed externally ?

   Yes [ ]

   No [✓]

   If the answer is 'NO', please explain the reasons: The proposal has been reviewed by an interdisciplinary review committee at the University of Basel. This committee approved the proposal.

3. Has the proposal scope to address gender issues ?

   Yes [ ]

   No [✓]

   If the answer is 'YES', have these been adequately incorporated in the proposal. Please indicate: _____

4. Has a funding source been identified ?

   Yes [✓]

   No [ ]

   If the answer is 'YES', please indicate the name of the donor: _____

   Cantonal Hospital of Basel / University of Basel, Swiss Development Cooperation (SDC)

5. Whether the proposal is a collaborative one ?

Yes ☐

No ☑

If the answer is 'YES', the type of collaboration, name and address of the institution and name of the collaborating investigator be indicated:

6. Has the budget been cleared by Finance Division ?

Yes ☐

No ☑

If the answer is 'NO', reasons thereof be indicated: extra-mural activities, scholarship

7. Does the study involve any procedure employing hazardous materials, or equipments ?

Yes ☐

No ☑

If 'YES', fill the necessary form.

22.09.96
Date

Signature of the
Principal Investigator

RESEARCH PROTOCOL

Title of study: **The impacts of exogenous technology on traditional resource management and the environment in rural Bangladesh**

1. Principal Investigator: Irène Kränzlin, research fellow, Department of Geography, University of Basel, Switzerland

   Co-Investigator: Dr. Bilqis Amin Hoque, Head Environmental Health Programme, Health and Population Extension Division, ICDDR,B, Dhaka, Bangladesh

2. Other Investigators: Prof. Dr. Rita Schneider-Sliwa, Department of Geography, University of Basel, Switzerland

   Prof. Dr. Klaus Gyr, Head of Department of Gastroenteorolgy Cantonal Hospital of Basel/University of Basel Switzerland

4. Starting date: 1st October 1996

5. Date of completion: First phase: 31st May 1997
   Second phase: 31st December 1997

6. Total budget requested: no budget requested, time-limited scholarship

7. Funding source: Cantonal Hospital of Basel/University of Basel, Swiss Development Cooperation (SDC)

8. Head of Programme: Mr. Syed Shamim Ahsan, Director Health and Population Extension Division, ICDDR,B Dhaka/Bangladesh

9. Signature of the Division's Director:

## Abstract

In Bangladesh, water related diseases are endemic. As people consume contaminated surface water for drinking, diarrhoeal diseases are widely spread. The goal of the International Drinking Water Supply and Sanitation Decade, to provide safe drinking water to everybody, has been taken seriously in Bangladesh where the Governement as well as international donors stressed water supply and sanitation projects intensively. Thus, the tubewell coverage increased from 125 persons sharing a handpump in 1988 to 92 persons in 1991 (UNDP-World Bank, 1993). However, the objective to use tubewell water for all purposes turned out not to be feasible mainly for cultural reasons (Bateman et al, 1995). Especially pond water is still prefered for a variety of domestic purposes such as cooking and bathing.

This study focus on ponds which represent a traditional water source for rural dwellers in Bangladesh. It is the objective of this study to find out how pond management responds to environmental change, mainly due to technological influence but also due to ecological impacts. In the first part, it will be investigated whether and to what extent the introduction of tubewells has influenced traditional pond management. As the availability to get drinking water from tubewells is much easier today it is assumed that the original user patterns as well as the maintenance and control mechanism of the ponds have changed. Consequently, the pond as a social space, combining social structure and pond environment, is exposed to problems and forced to adjust to the new situation respectively. First a village study on a micro level will be carried out to examine the change of the pond as a social space. A situation analysis out of the village case study will lead to insights on the processes that govern a village community with respect to water allocation. The evaluation of the first stage of the study will consist of a process analysis, detecting the major factors responding to environmental changes.
In the second stage, the study will be extended to a meso level to find out in what way pond management can respond to environmental change drawing on two examples from two distinct environments: The Barind project in Rajshahi District to provide information on the renaissance of ponds due to desertification in the North and in contrast, a region on the Coastal Belt to find out what role pond management could play in an area of high ground water salinity. It is assumed that, even today, ponds can play an important role in rural Bangladesh because of their cultural acceptability and their environmental sustainability. To what extend the potential of the ponds as an alternative water source could be for rural Bangladesh in the future will finally be discussed on a meta level.

This study takes place within the frame of a project in the Environmental Health Programme at ICDDR,B, the field area for the micro study is in Singair Thana, Manikganj District. The micro study will be conducted in two phases, in the postmonsoon and the dry season for a total of five months using both quantitative and qualitative methods. On the one hand, water samples from the ponds under study will be taken and a structured questionnaire will provide basic information on pond and

tubewell management. On the other hand, structured and unstructured observations of the activities around the ponds and the water supply situation during the dry season will be undertaken as well as different kinds of interviews, ranging from informal to semistructured and indepth interviews. Finally mapping of the village and the resources will be included to document the situation analysis.
On the meso level, the main tool of data collection will consist of semistructured interviews.

Thus, from an empirical point of view this study contributes to basic research on pond management in rural Bangladesh. Further, the change of the ponds as a social space reveals how people interrelate with environment and adapt to changes and how social structures are affected by environmental changes. Finally, on a practical level, the study provides a methodological frame through a situation- and process analysis which could be used as a guideline for decision making in development projects.

## Aims of project

The intention of this research study is to find out how and to what degree an exogene technology has changed a traditional resource management in rural Bangladesh. In the case of this study, the impact of tubewells on pond management will be investigated. In a first phase, a situation-analysis will be conducted on the micro level through a village case study. This is supposed to show specific repercussions of tubewell utilisation on use, manipulation and control mechanism of the ponds and their ecology by the villagers. The whole range of social(geographical) quantitative and qualitative methods will be applied, e.g. mapping, structured and semistructured interviews, water sampling and observation. Following a problem-analysis of pond management in general, a focused comparison in two other selected areas in rural Bangladesh will be carried out in a second phase. The goal of this focused interference, conducted on the meso level, is to find out about the role of pond management due to environmental change. Here, focused expert interviews will be the main tool of research. Finally, the study intends to come to some general conclusions on the meta level in order to propose some general measures for sustainable pond management.

General aim

The study has three broad goals:

- empirical goal: to analyse pond management in rural Bangladesh with its social, economical and ecological implications and to propose some measures for a sustainable pond management.
- theoretical goal: to provide a better understanding of the interrelations between man and environment in the case of ponds in rural Bangladesh.
- practical goal: to provide basic data for situation- and problem-analysis to plan further development projects.

Specific aims

Three main hypothesis will be taken into consideration, each followed by their specific sub-hypothesis:

1. Impact on traditional values: The introduction of the tubewells changes the traditional pond management persistently:

*Commercial forms of production (e.g. fishery) will increase: regions that are better off have a higher density of tubewells and therefore more incentives to use ponds in a commercial manner. Thus, the social function of the ponds will be threatened.

*The contamination of the ponds will increase for two reasons: first, the maintenance of the ponds decrease because tubewells now provide better drinking water very easily; second, pond management gets worse with unspecified ownership, e.g. communal ponds. This leads to an increasing risk of disease for the population on the one hand and contributes to a damage of pond ecology on the other hand.

2. Impact on social structure: The introduction of tubewells and the changed pond management change social relations within the village:

*Conflicts potentially increase: New forms of production compete with traditional forms of consumption. Further, during dry season, vulnerable groups are deprived of tubewell water because of its scarcity. This could lead to physical conflicts for drinking water among members of the vulnerable groups.

*Social imbalance will increase: Wealthy villagers will buy ponds, privatise them and set them up for commercial use. The poor and the vulnerable groups lose guarantee to use the ponds in the traditionally free way. This means that water will stop being a free good. Cultural structures modify and water becomes a private good.

*Diarrhoeal disease of the vulnerable groups will increase: the interest of the community to maintain a communal pond decreases. Further, vulnerable groups have to fall back on contaminated ponds during the dry season. That means that the trend of having diarrhoea towards the end of the dry season will increase.

*Traditional forms of social structure and organisation will disappear, new forms will develop: if pond are privatised then traditional village institutions for control and jurisdiction loose their importance. New power relations will develop within the village, most probabely on an economic basis.

3. Impact on the environment: The introduction of tubewells leads to a decline of the groundwater table and to an imbalance of pond ecology:

*During dry season tubewells dry out more often and longer: the main reason for the abstraction of groundwater by tubewells is for irrigation purpose. The more irrigation cultivations, e.g. boro paddy, is carried out the more likely are dry periods for drinking water. This can lead to a persistent decline of the groundwater table.

*Ponds which are not maintained in a proper way will become a risk for their users: water plants will grow exuberantly and embankments may collapse. Finally, water quality will decrease which consequently affects the health of the users. In the long run, these ponds will turn useless for the community.

<u>Significance</u>

According to the general aims, the significance of this study is threefold:
- empirical significance: Because there is hardly any study on ponds in Bangladesh except on fishery, it is necessary to fill this gap. Ponds represent an essential part of villager's life in rural Bangladesh. Therefore this study is basic research on ponds.
- theoretical significance: The study provides background information on changes of social spaces taking the example of the pond as a social space changed by exogene technology. This is a new line of research in social geography.

- practical significance: The study carries out a situation- and a problem analysis and provides as such a methodological frame which could contribute to the decision making process of a development project.

## Ethical implications

As the methods will include structured and unstructured interviews, a verbal informed consent will be taken, which implies the possibility of withdrawal from the interview. Confidentiality will always be guaranteed. Structured observations of the pond activities will be carried out only after a few weeks being in the field so local people will be already familiar with the researchers and the research. It has to be seen whether a local male observer will be hired for a short period because it is assumed that he would provide additional information from a different point of view.

## Background

Pond management is defined as the use, manipulation and control mechanism of ponds. As there are already studies which show that tubewells can change the social structure of a village community it is rather possible that pond management is also affected by tubewells (Lewis, 1991; Sadeque, 1995).

### Thematic background

For Bangladesh, water is more of a life-line than for other countries in the world. However, the seasonality of its supply often has disastrous consequences: Floods during the rainy season erode the river banks and destroy the homesteads of thousands of people, and during the dry season surface water sources dry up and groundwater levels decline reducing water supply drastically (Rahman et al, 1990). Both, floods and droughts are followed by water related diseases such as diarrhoea as people consume polluted surface water sources. Thus, the need for safe drinking water is obvious, and its provision was the main objective of the International Drinking Water Supply and Sanitation Decade 1981-1990.

In Bangladesh, the Ministry of Local Government, Rural Development and Cooperatives (MLGR&C) is the responsible agency in Water Supply and Sanitation. Since 1972, the Department of Public Health Engineering (DPHE), its implementing agency, has installed 185.000 tubewells. Subsequently, the Government received support from UNICEF and the Danish Government in their Rural Water and Sanitation Programme (DANIDA, 1979). The coverage of tubewells for drinking water gradually increased to a considerable degree: by 1988 1.3 million tubewells had been installed. This means that at that time, 125 persons shared a handpump (Aziz et al, 1990). By 1991 2.45 million tubewells provided water, and the user size came down to around 92 persons per tubewell (Sadeque, 1995; UNDP-World Bank, 1993). Despite this progress, morbidity rates from water related diseases could not be diminished effectively. At the end of the decade the professionals agreed that the software component should be strengthened

in future projects. New concepts were taken into account such as community participation, changing hygiene behaviour, hygiene education and women's involvement in water supply and sanitation projects (Hoque et al, 1991).

As groundwater supply is the safest water source, the overall premise during the decade was to promote tubewell water for all domestic purposes, that is, not only for drinking, but also for washing, bathing, cleaning of kitchen items and cooking. Recently conducted studies (Bateman et al, 1995; Hoque, 1995 a) admit that this goal is not feasible, mainly for cultural reasons. Traditional sources of domestic water supply such as ponds remain an important source for rural people's everyday water consumption. But there is another important factor that restricts an increase in tubewell water consumption: the groundwater table in Bangladesh is declining steadily. The reasons for this alarming fact are numerous: the abstraction of water from the Farrakha dam on the India-Bangladesh border, flood embankments, intensified irrigation and an increase in demand for water due to population growth and new technology for water supply (Rahman, 1990; UNDP-World Bank, 1993; Chisholm, 1993). A recent study from the Department of Public Health Engineering (UNICEF/DPHE, 1994) shows that while 8 percent of Bangladesh experienced low water tables in 1980, this number has increased to 15 percent in 1988 and is supposed to increase to 40/ 50 percent in the year 1995/ 2000 respectively. The consequences are serious: 400.000 shallow water tubewells have to be replaced by tara pumps which are much more expensive and technically sophisticated, that is, difficult to maintain. Due to the scarcity of drinking water in the dry season from February to May, conflicts are evident among the different users of tubewell water. Tubewell owners and farmers claim their rights and set up restrictions for non-owners and landless people despite the social obligation in Bangladesh to give drinking water for free (Sadeque, 1996). These vulnerable groups, then, are forced to fall back on other water sources, mostly on surface water. The most common source are ponds which have poor quality of water and therefore expose these people to a high risk of water born diseases. Today, in rural Bangladesh, communities are being divided into those members who have access to modern technologies and those who do not have access, who are deprived from the previously common property water. Sadeque (1996) refers to this phenomenon as "Conventional Exploitative Development" of natural ecosystems which could be resolved by the "Reform Sustainable Redevelopment" according to Regier, Mason and Berkes (1989). It seems that, while the tubewells became the main source for people to get safe drinking water in a convenient manner, they devaluated traditional patterns of social water supply. This now results in polarisation within the community and increasing tensions. A solution is needed as traditional forms of water management are likely to have vanished.

The two future strategies mentioned above with their respective policy implications can be summarised as:

1. A large number of shallow water tubewells would be replaced by tara pumps. which are provided and subsidised by the Government. This not only means a financial burden for the Government, also more local dependence on centralised structures, thus

aggravating the social gap. Finally, to confront the water crisis only with technological measures cannot prevent the groundwater level from declining in the long-term.

2. Alternative water supply sources would be reconsidered and existing surface water sources optimised such as ponds, beels, rainwater catchments and others. These sources could serve for all purposes other than drinking water supply, including irrigation.This would remove the stress from tubewell water abstraction.

In the study planned, ponds as an alternative water supply source will be reconsidered because, it is a traditional source of domestic water supply, culturally accepted and ecological sustainable. Further, pond management does not require big investments and, based on local decision making, could better meet the needs of the users and guarantee equal access to all members of the community.

Conceptual considerations

Ponds, man made surface water sources, determine the rural landscape in Bangladesh. But ponds, as a traditional water source, play also an important role in social life of rural dwellers. Focusing on the ponds means to look at various aspects which can be divided into the four following groups:

1. Economic aspects: Generally ponds are used for two main purposes, for productive purposes (fishery and irrigation) and for consumptive purposes (domestic use). Fish production is said to be a traditional use of the ponds, and fish is an important source of protein for the rural population (Khan, 1990). For irrigation, however, water is extracted more from other surface water sources or from the groundwater than from ponds (Badaruddin et al, 1990).
2. Legal aspects: As ponds have a multipurpose character, conflicts between the different users are likely to occur: fish production with fertilization, for example, impedes bathing (Khan, 1990). Conflicts of interest are related to modes of ownership. In general three types of ownership can be distinguished: private, public and ejmali ponds. The latter are a kind of communal pond at the time of the zamindars (personal communication Zahir Sadeque). Thus, what kind of regulating institutions for pond use exist today? Is the pond ownership changing from a public to a privat good ? What is the community doing in cases of conflict? What institutions act as arbiters?
3. Sociocultural aspects: Although most villagers nowadays consume tubewell water for drinking purpose, pond water is prefered for cooking and bathing. As surface water is not considered safe, certain risk factors have to be taken into account. How do people perceive these risks? Although it seems that women are aware of environmental pollution and even make suggestions to keep ponds clean (Shamim/Shalahuddin, 1994), a reaction to these problems does not take place. At this point it is important to look at the gender implications of pond management, the different perceptions and fields of responsibility.

4. Physical and environmental aspects: The ecology of the ponds - the quality of the water, the coverage of water plants etc. - may depend on various factors, such as the kind of ownership and the degree of maintenance. This has to be investigated.

Theoretical considerations

The theoretical body of the study consists in a conceptual interface of three different concepts and debates. Each of them is the result of a crisis and tries to find a way out of the environmental, social and development policy. After the following critical review of these concepts, I will present the points crucial to my study:

1. The Technological Debate

In the Third World, technology has been considered as the main trigger for power and wealth. Since the 1960s the industrial countries have responded to this demand by transfer of technology, which has been last but not least a successful business for the providers of this technology. However, following critical voices in the early 1970s (e.g. Meadows, 1972: Limits to Growth) the existing concept had to be changed: In 1979 UNCTAD developed a code of conduct with respect to the transfer of technology (Betz et al, 1984). Further with the concept of Appied Technology small scale and less capital intensive projects based on local resources were promoted (Carr, 1985). Although this concept presume locally adapted technology, the starting point of research has always been the developing region and its level and capacity of development. The *effects* of local adapted technology on the region, its community and environment has been left out of consideration. Nor has there been any interest in the economic, ecological and socio-institutional sustainability of a technology: How does a technology influence the different socio-economic groups within a community? Who are the winners, who the losers? Is there any change in the institutional system due to technology? How does technology affect the physical surroundings?

2. Regional rural development (RRD)

Many concepts for rural development has been developed with the intention to support the rural population intensively because it was assumed that the key of poverty is to be found in the rural areas of the developing countries. Most of these concepts were constructed in the 1980s and have been replaced by more relevant concepts in development policy (see UNDP Human Development Report, 1995). For example, the recently revised concept from GTZ (the German Society for Technical Co-operation) stresses four principles to reduce the practical problems with programme implementation for the planning and implementation of development projects: Target group orientation, poverty orientation, participation and sustainability (GTZ, 1991). Of particular interest to this study are the principles of target group orientation and sustainability: Target group orientation means that every member of the community , but especially the poor ones, should take profit from a project. Further economic, ecological and socio-institutional sustainability should be strengthened in each project, especially with respect to resource management (GTZ, 1993).

## 3. Political Ecology

Political Ecology is the synthesis of ecology and political economy. The term was introduced in the late 50s with the first awareness of the impacts of technology on the environment. Nuclear weapons, ecological disaster, and the petrol crisis in the early 70s made people even more sensitive on the limits to growth (Atkinson, 1991). Out of criticism on materialistic western society and its positive scientific system the return to a natural relationship of man with nature was aspired (Evans, 1979). As in the second half of the 1980s political movements (green parties) arose in the west, in the developing countries ecology groups also started to interpret ecological problems with the principles of political ecology. Their aim is to understand the political causes and conditions of environmental change (Bryant, 1992). Today, political ecology has its place in the research agenda of development, leading to a variety of research topics.

Conclusions out or these debates:
Although all the concepts above agree that due to change of social systems over time, concepts have to be adapted, they hardly ever examined the impacts they could have on a social system. Therefore, a conceptual interface guides the following questions for my study:
- Although the concept of Appropriate Technology made some efforts to integrate the social component, technology was always regarded as a neutral instrument for the purpose of economic development. Thus, in my study I focus on the gap of this concept: which are the ecological and socio-economic effects of a technological measure?
- Political ecology suggests themes that unequal distribution of a scarce resource and/or an ecological disaster can create conflicts. Therefore, it is essential to consider ownership of natural resources and the use of and control over resources as well as the regulative institutions. For example: How does environmental change affect social inequality? How does a change in resource management affect local conflicts?
Political ecology, therefore, criticises economic growth and stresses man and environment relationship. The potential of this concept to respond very flexibly to the interrelations of environmental and social system makes this concept very useful for my study.
- The concept of Regional Rural Development presents interesting empirical and methodological considerations for my study:

  The empirical aspects refer to the sustainability of resource management and considers questions like: Who uses the resource how, why, and why not? Who is responsible for the manipulation of a resource? Who controls use and maintenance of a resource?

  The methodological aspect refer to the principle of target group orientation which seems to be an appropriate tool in order to take into consideration the problems, possibilities and experiences of local people. Hence, special attention is given to the vulnerable groups of a community.

Thus the theoretical significance for my study lies in a changed perspective: my focus will not lie on the development of a region or its inhabitants but on the impacts, devel-

opment (in the form of technological measures) has on people and environment. According to the current debates, I will also address social and ecological sustainability.

Methodological considerations

As the study will imply three different levels of scale (micro, meso and meta level), the selection of the study sample and the corresponding methods will follow this pattern.

1. Study Sample

On the **micro level**, data requirements and unfamiliarity with the culture demands an extended village study. This is to gain peoples confidence and to address cultural and linguistic problems. However, since the study is not an ethnographic field-work, the sample cannot be too small. Further, to study the pond space and human interactions, it makes sense to start with the pond as the research unit. Therefore, a village with a wide variety of pond use and ownership patterns will be selected with the help of a pond matrix. In this case, settlements from other villages (paras) might also be included. The sample size of the households will be taken according to the number of the households in the respective village. The micro study will take place in Singair Thana, Manikganj District, area of the ongoing project of ICDDR,B/ Environmental Health Programme.
Although I am aware that the extended village case study will not be representative, important conclusions can be drawn for further research: a process analysis shall reveal the components of socio-spatial change due to environmental (i.e. technological) change. A discussion on the **meta level**, then, will provide some key answers on the potential role of pond management in the future within environmental change.
In order to show possible roles for future pond management, two focused case studies in selected areas of Bangladesh will be carried out in a second stage of the study. The insight of two ongoing projects on the **meso level** (probably in Rajshahi and Faridpur Provinces) will reveal some general regional potentials and problems. For final conclusions and measures for a sustainable pond management in the future, analysis finally returns to the meta level.

2. Methods

The whole range of social(geographical) methods will be used. Primary data include quantitative and qualitative research methods as well as mapping, while secondary data refer to literature research (see Bernard, 1994; Flick, 1995).

Quantitative Methods:
- A structured questionnaire will be conducted in the first phase of field work on the micro level. It will provide basic information on the village community, as well as on their use of and access to water sources. Depending on the size of the study village, a random sample might be taken.

- Water samples are taken twice during the micro level study in order to examine the level of contamination of the ponds according to the season (post monsoon and dry season): the first sample will be taken in early October, the second at the beginning of April.

Qualitative Methods:
- In order to get information on legal and political issues with respect to ponds and tubewells, Experts- and Key Informant Interviews will be conducted (with political and religious leaders).
- For historical background on pond management and its potential change, Episodic Interviews with elder villagers are planned.
- In depth interviews with members of the vulnerable groups (e.g. poor women) will provide information on their coping strategies as related to water supply during the dry season.
- Different kinds of observations will be undertaken: in the first phase of field work unstructured participant observation provides an insight in the daily activities of the villagers with respect to water supply. Structured observation around the ponds will be included later on. In the second phase of field work, observation will focus on processes around the access and availability of pond and tubewell water.
- For the meso level study, Expert- and Key Informant interviews will be the main tool for data collection.

Mapping
There will be two different kinds of mapping: mapping for information gathering, and mapping for the purpose of illustration
-mapping for information gathering will include resource mapping (i.e. villagers assist in drawing a map of their village), mobility mapping (i.e. user patterns of tubewell and ponds are to be indicated on a sketch), and mental mapping (the image of ponds from children's perspective will be drawn).
- maps for illustration consists of village mapping as well as tubewell and pond mapping

3. Data analysis

Especially at the beginning and during unstructured data collection, taking of field notes (jottings) will be the basic form of data collection. The infomation taken will be written up and coded constantely (every day) in order to analyse the actual state of the research and to plan the further proceedings. Discussions on the daily work and exchange of impressions complete this ongoing process.
The questionnaire will be analysed either by manual coding or by entering the data in a microcomputer and using a statistical package (SPSSX). This depends on the sample size because highly sophisticated statistical correlations are not planned.
Structured observations will be taken with an observation matrix as well as situational protocols.

Mappings are conducted with the help of the villagers, using either paper and pens or the ground and the material on place. Village mapping will be done on the basis of mauza maps.
Episodic and in depth interviews will be recorded with a tape recorder, transcribed in Bengali and then translated in English.
The analysis of the water samples will be conducted at ICDDR,B/EHP laboratory.

D. Flow chart

The work plan below shows the activities planned for the first stage of the study (micro level) from October 1996 to May 1997. The second stage of the study (meso level) will be carried out between June and December 1997.

a) First stage of study: work plan from August 96-May 97. (For details, see Annex 3).

| time / activities | aug. | sept. | oct. | nov. | dec. | jan. | feb. | marc | april | may |
|---|---|---|---|---|---|---|---|---|---|---|
| selection of field-area | | ⊢ | | | | | | | | |
| finalizing questionnaire and other methods | | ⊢——— | | | | | | | | |
| organizing field trip | | ⊢ | | | | | | | | |
| | | | | | | | | | | |
| I. phase of fieldwork | | | ⊢——— | ——— | ——— | | | | | |
| water samples | | | ⊢ | | | | | | | |
| mapping (village, resource, ponds) | | | ⊢——— | | | | | | | |
| observation (unstr.) | | | ⊢——— | ——⊣ | | | | | | |
| observation (struc.) | | | | | ⊢——⊣ | | | | | |
| pretest questionnaire | | ⊢ | | | | | | | | |
| conduct questionnaire | | | ⊢——— | ——— | ⊣ | | | | | |
| interviews with experts | | ⊢ ⊢ | | | ⊢ | | | | | |
| | | | | | | | | | | |
| I. phase of evaluation | | | | | | ——— | ——— | | | |
| | | | | | | | | | | |
| II. phase of fieldwork | | | | | | | | ——— | ——— | |
| mapping (mental) | | | | | | | | ⊢ | | |
| water samples | | | | | | | | | ⊢ | |
| observations (struc.) | | | | | | | | ——— | ——— | |
| interviews (experts, Key-Informants, episodic, indepth) | | | | | | | | ——— | ——— | |
| | | | | | | | | | | |
| II. phase of evaluation | | | | | | | | | | ——— |

*Irène Kränzlin, August 1996*

b) Second stage of study: work plan from June to December 1997

| time / activities | june | july | august | sept. | october | novem. | decem. |
|---|---|---|---|---|---|---|---|
| contact to universities and research institutions | ⊢ | | ⊢ | | | | |
| orientation field trips to northern and southern provinces | ⊢ | | | | | | |
| selection of two areas | ⊢ | | | | | | |
| enlargement of the theoretical background | | ⊢ | ⊢ | | | | |
| preparation of interview guidelines | | | ⊢ | ⊢ | | | |
| Field trips to both areas | | | | ⊢ | ⊢ | | |
| evaluation | | | | | | ⊢ | ⊢ |

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## Annex 1: Consent form and details on procedure for maintaining confidentiality

### Consent form

I am a PhD student and I have come from ICDDR,B (Cholera Hospital) in Dhaka.

I am going to conduct a study on the uses and problems of pond management and how tubewells might have influenced pond management.

During three months I am going to stay with my assistant in Singair from where we will come to your village every day. Then, we will come back in March and stay again for a couple of weeks.

As we got to know your village in the past few weeks, we are going to conduct now a survey. The interview with you will last for about 45 minutes and we will ask you some questions about your family and your living conditions, and then about tubewell and pond use and problems.

We are requesting you to take part in this interview. You have the option to accept or to refuse participation. However, all the information collected will be kept confidential. There is no risk for you in participating at any time.

If you agree, you may please sign your name or give left thumb impression on this form. Thank you.

Signature or left thumb impression of the interviewee

Date

### Details on procedure for maintaining confidentiality

1. Instructions on the conduct and the aspects of confidentiality in handling the data will be given in a training before the interview will be conducted. Special attention will be addressed to the use and communication of any personal data of the households under investigation or their members.

2. The data collected will be kept in a locked place.

3. Computer files containing the data will also be maintained in a secure and locked place.

Annex 2: Questionnaire:

☐☐ hh code

**The impacts of an new technology on traditional resource management, social structure and the environment in rural Bangladesh**

---

## A Socioeconomic Issues

1. How many persons are living in your chula/poribar?

   .....

2. How many children of your own are living with you?

| | no of children |
|---|---|
| boys | |
| girls | |

3. Who else is living with you?

| kin-related | non-kin-related |
|---|---|
| | |
| | |
| | |
| | |
| | |

4. How many persons are living generally in your homestead (bari)?

   .....

5. What is your educational qualification?

   ☐ .....
   ☐ illiterate.

6. What is your profession?

- ☐ farmer -> 6.1
- ☐ day labourer
- ☐ trader/salesman? -> 7.
- ☐ craftsman
- ☐ fisherman
- ☐ employee
- ☐ others:.....

6.1 How much land do you own? (in acres)

.....

☐ no proper land.

6.2 How much land do you cultivate? (in acres)

.....

6.3 How much land do you sharecrop in/out or mortgage in/out? (in acres)

- ☐ sharecrop in:.....
- ☐ sharecrop out:.....
- ☐ mortgage in:.....
- ☐ mortgage out:.....
- ☐ none.

6.4 How many acres of each crop do you cultivate and what amount did you get last season?

| crop | area (in acres) | amount (in maunds) |
|---|---|---|
| amon paddy | | |
| aus paddy | | |
| boro paddy | | |
| jute | | |
| sugarcane | | |
| corn | | |
| pulses | | |
| vegetables | | |
| spices | | |
| others: | | |

6.5 With which of these crops would you like to expand cultivation?

.....
.....
.....

6.6 Which crops do you irrigate and where do you take the water from?

| water source / crops | tubewell STW DTW | river | pond ' | canal | LLP |
|---|---|---|---|---|---|
| boro (traditional) | | | | | |
| boro (IRRI) | | | | | |
| Rabi | | | | | |
| others: | | | | | |

6.7. How much of each of your crops do you keep for your own consumption and how much is for sale?

| % / crops | private consumption | for sale |
|---|---|---|
| paddy | | |
| jute | | |
| sugar cane | | |
| corn | | |
| pulses | | |
| vegetables | | |
| spices | | |
| others | | |

6.8 How much would you receive for your land if you sold it? (app. in Tk)

.....Tk

7. How many people in your household earn money off farm?

.....

7.1 What kind of off farm employment do they have?

| type of off farm employment | no of persons |
|---|---|
| | |
| | |
| | |
| | |

7.2 How much of your income does result from on farm work? (in Tk)

.....Tk

7.3 How much is your monthly income? (app. in Tk)

.....Tk

8. Are you a member of a Shomiti? If yes, of which one(s)?

☐ yes:.....
.....
.....

☐ no.

**B Tubewell: use, accessibility, problems**

1. Where do you take your drinking water from?

☐ tubewell -> **2.**
☐ pond -> **8.**
☐ others:

2. What kind of tubewell do you have and how many of each kind?

| type of tubewell | number of tubewell |
|---|---|
| handpump | |
| shallow water tubewell | |
| deep tubewell/tara pump | |

3. What do you use the tubewell-water for besides drinking water?

☐ bathing
☐ washing (kitchen utensils)
☐ washing (clothes)
☐ irrigation
☐ others:.....
.....
.....

4. Do you get the drinking water from your own tubewell?

☐ yes -> **4.1**
☐ no -> **5.**

4.1 When did you buy your tubewell?

☐ less than one year ago
☐ 1-3 years ago
☐ 4-10 years ago
☐ I don't know

4.2 Where did you get your tubewell from?

☐ DPHE
☐ local producer
☐ NGO
☐ others:.....

4.3 Who else can use your tubewell?

- ☐ poribar
- ☐ extended family
- ☐ neighbours
- ☐ everybody
- ☐ others:.....
- ☐ I don't know

4.4 Who cannot use your tubewell? Why?

- ☐ ....., because.....
- ☐ ....., because.....
- ☐ everybody can use it

4.5 Do you accept anything in kind of cash from your tubewell users? If yes, what kind of payment is it?

- ☐ yes,.....
- ☐ no.

4.6 Are there certain times during the year that the access to your tubewell is limited? If yes, when?

- ☐ yes, in.....
- ☐ no.
- ☐ I don't know.

4.7 Do you have any problems related with the tubewell or with the extraction of water? If yes, what kind of problems?

- ☐ yes,.....
  .....
  .....
  .....
  .....
- ☐ no.

**-> go to 6.**

---

5. To whom belongs the tubewell that you are using?

.....
.....

5.1 Can you get tubewell water at any time without any limitations?

☐ yes. **->5.3**
☐ no. **-> 5.2**

5.2 Why can't you get tubewell water all the time?

.....
.....
.....
.....
..... **-> 6.**

5.3 Are there certain periods during the year you cannot get tubewell water? If yes, in which period is it and why?

☐ yes....., because.....
.....
☐ no.

6. Do you think that your life has changed since you can get tubewell water? Why (not)?

☐ yes, because.....
☐ no, because.....
☐ I don't know.

7. Do you think that life in the village has changed due to tubewells? If yes, in what way?

☐ yes.....
☐ no.
☐ I don't know.

**-> go to C.**

---

8. Have you ever tried tubewell water for drinking purpose?

☐ yes. **-> 8.1**
☐ no. **-> 8.2**

8.1 Why have you stoped taking tubewell water for drinking?

..... **-> 8.3**

8.2 Why not?

.....

8.3 Would you like to have access to a tubewell?

☐ yes. -> **8.4**
☐ no. -> **C.**

8.4 What possibilities are there for you to get tubewell water?

☐ .....
☐ no possibilities.
☐ I don't know.

## C Ponds: use, changes, preferences, problems

1. Could you please tell me which ponds you normally use and what purpose you use it for?

| use \ pond no | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| bathing | | | | | | | | | |
| washing clothes | | | | | | | | | |
| washing kitchen items | | | | | | | | | |
| ablution | | | | | | | | | |
| taking water for cooking | | | | | | | | | |
| taking water for drinking | | | | | | | | | |
| cleaning animals | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

2. How often do you use these ponds?

| time \ pond no | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| once a month | | | | | | | | | |
| once a week | | | | | | | | | |
| twice a week | | | | | | | | | |
| every day | | | | | | | | | |
| | | | | | | | | | |

3. Please tell me why you use the ponds you mentioned?

| reasons for use \ pond no | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

4. Please tell me with each pond which problems you are likely to face.

| pond no / problem | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| driven away | | | | | | | | | |
| collaps of embankment | | | | | | | | | |
| too many plants | | | | | | | | | |
| getting sick | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

5. Please tell me with each pond who the owner is?

| owner | pond no / relation | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

☐ no, I don't know.

6. Do you think that any of the ponds you are using have changed in some way during the past years? If yes, in what way?

☐ yes.

| pond no / type of change | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| embankment worsend | | | | | | | | | |
| increase of water plants | | | | | | | | | |
| water quality worsend | | | | | | | | | |
| reduction of accessibility | | | | | | | | | |
| more fish ponds | | | | | | | | | |
| | | | | | | | | | |

☐ no. -> **8.**
☐ I don't know.

7. Could you think of reasons for this change?

☐ yes:
- ☐ privatisation
- ☐ less care for ponds
- ☐ more people/users
- ☐ others:.....

☐ no.
☐ I don't know.

8. Have you ever been involved in quarrels about pond use?

☐ yes, **->8.1**
☐ no. **-> 9.**

8.1 What kind of quarrels were these?

.....
.....

8.2 Who mitigated the quarrels?

☐.....
☐.....
☐ I don't know.

8.3 Have there been quarrels in the past about ponds?

☐ yes.
☐ no.
☐ I don't know.

9. Do any of the ponds you are using dry out during the dry season?

☐ yes.
- ☐ pond no 1
- ☐ pond no 2
- ☐ pond no 3
- ☐ pond no 4
- ☐ pond no 5
- ☐ pond no 6
- ☐ pond no 7
- ☐ pond no 8
- ☐ pond no 9

☐ no one **-> 10.**
☐ I don't know

9.1 What are you doing when this/these pond(s) dry out?

.....

9.2 Do you think that ponds dried out less before the tubewells were installed?

- ☐ yes. **-> 9.3**
- ☐ no. **-> 9.4**
- ☐ the same
- ☐ I don't know. **-> 10.**

9.3 Can you think of reasons why some ponds did not dry out in the past?

| pond no / reasons | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| more rainfall | | | | | | | | | |
| more care for ponds | | | | | | | | | |
| less people | | | | | | | | | |
| bigger ponds | | | | | | | | | |
| | | | | | | | | | |

- ☐ no. **-> 10.**
- ☐ I don't know.

9.4 Can you think of reasons for this?

- ☐ yes, .....
  .....
  .....
  .....
- ☐ no.
- ☐ I don't know.

10. Have you ever digged a pond or assisted in an excavation ?

- ☐ yes. **-> 10.1**
- ☐ no. **-> 11.**

10.1 Whose pond was it?

- ☐ .....
- ☐ I cannot remember
- ☐ I don't know.

11. Have you ever assisted in the maintenance of a pond?

☐ yes. **-> 11.1**
☐ no. **-> 11.2**

11.1 What were you doing and who was helping you?

| helpers / type of work | | | | |
|---|---|---|---|---|
| weeding the plants | | | | |
| cleaning the embankment | | | | |
| reconstruction of embankment | | | | |
| excavation | | | | |
| | | | | |
| | | | | |

11.2 Do you think that a pond need some maintenance? Why (not)?

☐ yes, because.....
☐ no, because.....
☐ I don't know.

12. Do you know a short story about a pond, or an own experience you will never forget?

☐ yes:
.....
.....
.....
.....

☐ no.

**Personal data:**

Name of the para:.....

First name of the respondent:

Family name:.....

Age:.....

Marital status:.....

Sex:.....

Religion:.....

Interview started:.....

Interview ended:.....

Date:.....

Remarks: .....

.....

.....

.....

.....

.....

.....

## Annex 3: Detailed work plan for the first stage of the study (micro level) from October 1996 to May 1997

### Phase A: a pre-field-work-phase, consisting of field-selection and organisation as well as methodological preparations (august/september)

- the selection of the area will be conducted with the help of a matrix and informal talks. Two areas with a high density of ponds will be visited and all the ponds classified according to certain characteristics (size, ownership, form of use and user radius). The area with the higher variety of pond ownership and user pattern will be chosen.
- the methodological preparations will consist in finalizing the questionnaire, looking for mapping material and statistics of the research area, taking the sample for the questionnaire, preparing guides for observation and interviews and organizing the crew for the analysis of the water samples.
- for the selection of the field-area it is intended to stay at an NGO's office in Singair for about one week. For the period of the field work, a place within a bari (in Singair) has to be found.

### Phase B: the first phase of field work will last for about three months. Mainly inventory but also some explanatory data will be collected (october-december)

- fundamental village mapping will be undertaken as well as resource mapping, where people are asked to draw and show the distribution of water sources (tubewells, ponds, rivers, etc.) on a ground map. Later on, during focused observation, pond mapping will also be conducted.
- water samples of all the ponds in the field area will be taken in the first half of the field work as well as at the end of the second phase of the field work. Like this, contamination during wet and dry season can be compared. The analysis of the samples takes place at ICDDR,B in Dhaka.
- All the observations will be open, that is, with the knowledge of the people involved. Therefore there will be two types of observations: at the beginning, unstructured (descriptive) participatory observation in combination with ethnographic interviews will give the general information on village structure and activities about water consumption and regulation. Field-notes are here the main tool of data collection. Later on, structured observation of pond utilization will follow (e.g. three days during twelve hours). Here, observation records will be used.
- the questionnaire is supposed to give basic information on the socioeconomic status of the villagers and on their attitude and use of tubewells and ponds. The sample will be taken according to the base. The pretest will show where adaptions are necessary.
-interviews with experts ( local leaders, GoB officers, NGOs, tubewell owners, fish pond managers) and Key-Informants are part of the whole field-work, though

their importance lie at the beginning and close to the end of the first phase of field-work.
Two to three interview guides will lead the interview where special attention will be given to the ownership patterns and the maintenance of tubewells and ponds and the changes of water management in recent years.

**Phase C: the first phase of evaluation is supposed to analyse the data collected during the first field work period and prepare the second phase of field work (january/february)**- preliminary analysis of the questionnaire will reveal guidelines for the next phase of field work which will focus on special groups in focused interviews
- the preparation for the second phase of field work includes an adaption of the methodological tools if needed and the set up of guidelines for indepth-, experts- and episodic interviews

**Phase D: the second phase of field work will last for about two months. During the dry season the impact of tubewells on pond management and pond management on village social structure and environment will be studied in depth (march-april)**
- observation will be structured. Processes around the consumption of water for different groups within the village are to be followed. Protocols of situations will be written.
- school teachers will be asked to participate in mental mapping where school children can show their meanings about ponds.
- at the end of april, again water samples from all the ponds available in the area will be taken for analysis.
- different types of interviews will be conducted:
episodic interviews are limited narratives along with a guideline. Here, elder villagers will be asked to tell us about changes of pond management during their life.
Indepth interviews with selected people of the village (especially out of vulnerable groups) will be held in order to find out about their coping strategies during the dry season.
Interviews with experts will provide focused information on conflict management and their way of dealing with water shortage.

**Phase E: the second phase of evaluation will analyse all the data from field work (May/June)**
-- detailed analysis of the questionnaire
- transcriptions of indepth and episodic interviews
- analysis of the water samples
- compilation of information for detailed mapping
- evaluation of observation protocols, field notes, etc.