DUT-Bangladesh linkage programme: evaluation and recommendations

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Preface

This report is the result of a three-months evaluation of the Delft University of Technology – Bangladesh linkage program. It has been initiated to assist people interested in the subjects and provide general insight in the results from student research teams. It is also hoped that it might offer new projects and teams a reference to different sources of information. But more important are the recommendations it aims to present about organisation, preparation, co-operation, follow-up, long and short-term impact of student training in a local setting in Bangladesh.

This evaluation does not comprise specific information about the projects. It is not a guide, explaining what the different projects are about. It is written for those who already have a general knowledge about issues such as the Flood Action Plan, Water Management, Arsenic contamination, Char dwellers, etc. The report explains how projects have been carried out and merely presents the key results, conclusions and recommendations. For in depth information I refer to the appropriate student reports listed in Appendix B: List of student proposals and reports and Appendix C: Student reports' conclusions and recommendations.

I have evaluated previous student training projects in the following way. My background doesn't really permit me to judge the quality of the work. Moreover, I haven't followed the various projects closely, and had to depend on the reports and interviews for most of the information. It was essential to hold interviews with those that were involved. I would like to thank the students, teachers and other involved that participated in the interviews.

I have also depended on coaching provided by Jan Boes (WTM/DUT). This study has been carried out in co-operation with Willem Dijk (CE&G/DUT) and Khorshed Alam (UST Bangladesh) and with the support of Fazlul Huq Ripon (SSSUK Bangladesh). I would like to thank them for helping me in my work.

Crelis Rammelt, March 2001

(Cover picture: water harvesting. The pictures in this report are gathered from my own trip to Tangail and Gaibandha in 1997.)

Contents

Abbreviations

AMRF	Arsenic Mitigation and Research Foundation
BAMWSP	Bangladesh Arsenic Mitigation and Water Supply Project
BRE	Brahmaputra Right Embankment
BUET	Bangladesh University of Engineering and Technology
CE&G	Faculty of Civil Engineering and Geosciences
CPP	Compartmentalisation Pilot Project
DPHE	Department of Public Health Engineering
DTW	Deep Tube Well
DUT	Delft University of Technology
EGIS	Environment and Geographic Information System project for Water Sector Planning
FAP	Flood Action Plan
FCDI	Flood Control, Drainage and Irrigation
GE	Faculty of Geotechnical Engineering
GO	Governmental Organisation
HYV	High Yielding Variety of rice
ICCO	Interchurch Organisation for Development Co-operation
IDE	Faculty of Industrial Design Engineering
JCDP	Jamuna Char integrated Development Project
JMB	Jamuna Multipurpose Bridge
KJDRP	Khulna Jessore Drainage Rehabilitation Project
LCS	Landless Contracting Society
LGED	Local Government Engineering Department
NGO	Non Governmental Organisation
PRRA	Participatory Rapid Rural Assessment
PSF	Pond Sand Filter
RAS	Research and Advisory Services
RPMC	Resources Participatory and Management Consultants
RWH	Rain Water Harvesting
SEPA	Faculty of System Engineering, Policy Analysis and Management
SSSUK	Shakti Samannya and Sampad Unnayan Kendra
SSWRDSP	Small Scale Water Resources Development Sector Project
TRM	Tidal River Management
UP	Union Parishad
UST	Unnayan Shahojogy Team
UVA	University of Amsterdam
WTM	Sub-Faculty of Technology and Society

Summary

Proposals are often very, sometimes even too ambitious. It seems that most of the time the proposal has more activities planned than are eventually carried out during the research period in Bangladesh. This shows a difference between the ideal situation and practical results.

Students' disillusion about the magnitude of their contribution is very much in line with the low-level of the needed interventions. They hope for a strong and obvious need for certain technologies, a tangible or implementable result, which turns out to be underrepresented.

For DUT mentors the goal is to end up with a concrete visible result. This is something that students in general show at the start too. They express their willingness to leave with this 'built-in' security. Even if technological elaboration is not the primal expectation coming from the counterpart, it is something students often feel they have to put forward. At the start social and cultural aspects seem to most not to be something for DUT students.

Reports usually include specialist terminology. CE&G students usually tend towards technological feasibility studies, if not visible in the proposals it becomes visible in the reports. SEPA students usually incorporate curriculum method in their set-up. Some students stepped away from the constraints of the curriculum in the proposal but tended towards it in the final report. The reports show strong elements of the authors' backgrounds.

It seems students are pushed both by themselves and by their faculty mentors' (or funding programs') expectations to apply what they have learned from university in the training. It is a fact that what they have learned is of a technological nature. Something else, something institutional, social or cultural could seem too far away. Nevertheless studies in a setting such as Bangladesh require incorporation of non-technical issues. Even if an engineer is not a sociologist, the integration of disciplines in development projects is on the increase. There should be a better understanding about the importance is of the 'social' factor. Comparing Western and Southern cultures will show huge differences. Justifiably, students are therefore asked to research much more than technology.

Obviously the initiative is between Bangladesh and DUT, therefore incorporating social issues does not mean abandoning the issue of technology. The projects students are asked to study have in my eyes all the technology that could be wished for. Nevertheless, people should be realistic with respect to what can and cannot be achieved in such a relatively short time.

A thorough preparation might moderate the lack of knowledge about social problems, management, institutional and organisational issues. Preparation is also essential to use the available time in Bangladesh optimally and produce a higher quality of work. Making a planning does not imply actual implementation. Seeing how plans change and reflecting this to the original plans could be a learning experience. However, going into detailed planning can make someone less open-minded and flexible.

In a new culture, new environment, without faculty mentors, the feeling that you are involved in something real and significant makes people react in different ways. This explains partly why students might adapt the ideas they proposed in the first place. Seen in this perspective it is also understandable that a team might put aside the findings from a previous group. There is a sense of pride for personal achievements towards what has been done by other groups, and a feeling that one needs to figure things out by one self. Another influence on the idea of a follow-up is a difference and a certain arrogance between faculties (cultural differences, interests, etc). Inter-faculty co-operation is often difficult to achieve. For a multi-disciplinary team, the reports will generally show fragments of disciplines instead of integrated subjects.

Yet another reason for the problem of follow-up studies is the extreme difference between monsoon and dry season. After reading about and hearing from previous groups, wrong assumptions are sometimes made and results will have to be sought in a totally different context. It would be useful to have the students help each other in preparing for the living conditions and other practical aspects of the training.

It cannot be said that there is a logical sequence of follow-up studies considering the FAP-20 topic. Obviously there are many factors of influence, the season, students' faculties, personal interest, etc. It therefore occurs that a team will work in line with recommendations proposed not by the previous team but one before that. Overall one can however conclude that the different sub-topics (fisheries, organic farming, irrigation, excavation, land acquisition, etc) are gradually and thoroughly being researched. Some parts of the various reports obviously present nothing new while other parts tackle subjects and build on previous findings.

The arsenic topic being relatively new, only a few conclusions can be drawn. It seems that when a linkage program is in its first steps the recommendations are more general. It might become gradually clearer what students in particular can do. With the last report there is now a fairly good picture of the different sub-topics (as it has become clearer also for the FAP-20 topic). Now following teams can easily pick out some of these subjects, again, according to their personal interest, background, etc.

Maybe the answer would be to have students settle for findings from previous teams and build on their conclusions. As it has been explained previously, the problems to be faced are pride, seasonal

fluctuation, different conceptions, etc. There is a large part of fundamental experience that each group has to go through. For this information they cannot depend on previous reports. While studying these issues new and personal conceptions occur which can be used for elaborating on a more specific issue.

There is a noble wish to help the local community, but a student is still gaining experience. A few students felt it was realistic to start by learning instead of wanting to contribute. However, this never meant they didn't make an attempt. All linkage projects are successful according to the counterparts. Changes in a project do not imply that students' work on that subject needs to be abandoned. Rather it influences the way they should be pursued.

Engineering works for FAP-20 are now completed and there is no necessity in attempting to influence these. A relevant issue in the coming years is the monitoring of O&M. With arsenic related projects a shift in the approach is needed due to urgency, quality required, etc. This requires a more precise formulation of student research within the boundaries of this project.

Students often have to manoeuvre between a range of demands from the various parties. An insight on the position a student will play is therefore necessary. He/she has to find out about his/her capacities and communicate this. In many cases a submersion in all the issues can have a positive impact on self-reliance, confidence, realism, etc. Nevertheless, students perceive the role of a local supervisor with knowledge about all the different student projects as essential for a positive outcome of a training. With respect to content, the value of advice from the local counterpart is seen as an imperative as well because supervision from DUT is difficult to achieve.

A focus within a project on a specific component requires a clarified team and student role. To achieve this, a number of mentors and students believe that more steering is needed without hampering personal initiative and freedom. Opting for more specific components does however not result in a more 'concrete' project. Projects should still be open ended, be prepared without false presumptions, and incorporate non-technological issues, etc.

Even if they will not pursue development work, the experience has still been valuable. Relevant lessons have been learned on flexibility, teamwork, open-mindedness, tackling real problems, interrelations between sub-problems, etc. Engagement in a training programme in Bangladesh will confront the participant with problems as real as they can get and push them to question and analyse what they come across.

Introduction

The idea for this evaluation came to surface during a presentation of the last student groups that went to Bangladesh (Delft, October 1999). In the context of sustainable development, practical training and research carried out by students in Bangladesh can offer a meaningful contribution. The contribution can be of a short-term character considering each training period separately, as well as long term in the various project subjects (irrigation, arsenic, flooding, water management, etc) considering a follow-up of successive training periods.

The main critic expressed during the presentation was that the study results from each group separately might, in certain cases, be of less influence and interest to the counterparts. A more co-ordinated and linked scheme of training periods could improve the quality of the results on a long term. Of course this depends strongly on the subject. On the other hand, it could also mean less freedom for the students and a lower personal initiative. Unfortunately it sometimes seems a choice has to be made between a focus on students' achievements or on useful results for the counterpart. One obstacle is the issue of time. Students need a time to adjust, a time to understand some of the problems before being able to contribute or build on a previous study.

This evaluation project will try to recognize some of the processes around training and research projects in Bangladesh for the past four years. An evaluation of previous student training can help improve future training in the next four to five years or argue upon emphasizing certain projects and restraining others. An evaluation can also clarify what can and what cannot be expected from the results and students enrolling in the programme. At the least an evaluation can shed light on the type of projects that are initiated.

Introduction to Bangladesh

Bangladesh is predominantly agrarian. This sector accounts for more then 50% of the GNP. The land is fertile but the productivity is low. The country is not self-sufficient in food production and suffers from a high import and low export of products (only 40% of import expenditures are covered with export profit). Every year Bangladesh depends on millions of dollars of financial support from Northern donor countries and agencies, but aid levels are now falling significantly. Bearing in mind that there is a huge difference between rich and poor, the average per capita income is still only around US$225 (about 80 times less then in the Netherlands).

Bangladesh has a total area of 143,998 square kilometres, with a population of nearly 130 million. A density around 900 inhabitants per square kilometre (the same density you would create by squeezing the world population in the United States only). The capital is Dhaka with nearly 12 million people. The country lies fenced by the bay of Bengal in the south and by India in the north, east and west, and a small boundary with Burma.

Located in one of the wettest regions of the world, Bangladesh has a tropical and subtropical climate. It has been subject to climatic extremities and has three main seasons: the monsoon or wet season from late May to early October, the 'cold' winter season from mid October to the end of February, and the 'hot' dry season from mid March to mid May. The country is also the largest sedimentary delta on this planet. More than 250 rivers, ranging from very big, medium to very small, flow through Bangladesh. Every year normal flooding inundates about one third of the land area.

Objectives

The goals for this study are twofold with the following elements: an evaluation and recommendations.

Evaluate the practical training periods (treated in parts I and II)

-List the network of participants, students, mentors and organizations involved in the training (who did what and when?).
-Understand how a training period has been prepared and what the link has been with previous similar training.
-Form a picture of the learning experience of the training for students and counterparts.
-Get an idea of the expectations (students, mentors and organisations) at start and if these have been met.

Make recommendations for future training and research projects (treated in part III)

-Make a comparison of the results of training periods on similar subjects and relate this to time, preparation, etc.
-Relate the other important factors around a training period (expectations, feedback, co-ordination, etc) and draw conclusions.
-Use the results from previous steps to formulate possible recommendations for future practical training.
-Information is geared towards students, educational staff and counterparts. Interviews with the world of business are irrelevant within this study.

PART I: SPECIFIC EVALUATION OF THE PAST TRAINING PERIODS

Overall and specific approaches

This chapter is concerned with presenting the general approach initiated in the DUT-Bangladesh linkage program. Students have left to Bangladesh with this in mind as well as with a formulation of specific goals for each team also compiled and summarised in this chapter.

Background and general goal

Co-operation between DUT and organisations in Bangladesh started in 1993 with UST. *It was triggered by the mutual recognition that in many cases Northern technology played an adverse role in the development of rural Bangladesh*[1]. With the growing momentum of the Sustainable Development debate, students should be given an opportunity to participate and take part in decision-making.

Already from the start it was obvious that t*he main objective was not the possible technical assistance of Delft students, but the expectation that the experience of a direct confrontation with the situation in Bangladesh would have an impact on their decisions to be made in their future profession*[2]. Besides, such an approach could enhance the chance to come up with appropriate suggestions, conclusions or solutions because of the low profile of students and therefore the extra 'room' they have to operate.

The goals and main objectives from each project separately are described in the following paragraphs. This will offer an overview of what students wanted. Where possible, the text is a compilation of the objectives described in the proposal and the main report.

The following projects have been studied (for more information about the project locations, I refer to Appendix A Organisation structure). The team at the bottom of the list has just recently accomplished training. Team 1 is the first that left for Bangladesh and team 11 the last. If needed, the names of the students can be found in Appendix B List of student proposals and reports.

Team	Project	Period
1	CPP / UST	December 94 – March 95
2	CPP / UST	February 97 – April 97
3	CPP / UST	June 97 – August 97
4	JCDP / UST	July 97 – August 97
5	Kushtia / UST	June 98 – August 98
6	CPP / UST	July 98 – September 98
7	CPP / KJDRP / UST / Uttaran	May 99 – August 99
8	LGED / SSWRDSP / UST	March 99 – August 99
9	SSSUK / UST	May 99 – July 99
10	SSSUK	August 99 – October 99

Team 1: Poverty and technology in Bangladesh: towards a sustainable development. Socio-economic development of women in Bangladesh

A problem is that farmers are highly dependant on supply, costs and quality of production inputs. Farmers also face water-management problems: lack of rainfall and irrigation facilities in the dry seasons, or a combination of extreme rainfall and flooding, soil fertility is decreasing, land is segmented into extremely small fields, which asks for more intensive co-operation, mono cropping is damaging the quality of the soils and so forth.

The objective was therefore to obtain insight into the dominating role of technology, social welfare and natural disasters by participating in the discussion between NGOs, consultancies, and international organisations. Another objective was to recognise local problems, and formulate recommendations and conclusions both critical towards technology and social living conditions. Yet other objectives were to find out about the impact of UST work on the development process and familiarise with the target groups, get an impression of the socio-economic conditions, the position of women in rural society, and traditional work in the region. The results are based on two field studies (Tangail and Gaibandha districts).

Team 2: Integrated Water Management and Peoples' Participation, a bottom-up approach

The overall objectives for this team as well as the next team - who shared their preparation and tried to link their objectives with results from this team - are described in an initial proposal[3]. Initial objectives were to participate in the debate about Integrated Water Management, develop a report for advocacy

[1] Jan Boes, Initial proposal, Integrated Water Management in Tangail Area, a study into the technical possibilities for local initiatives, Delft, September 1996.

[2] Ibid. 1

[3] Ibid. 1

purposes for local NGOs involved, describe local technologies and aim to enhance efficiency by blending these with modern technology.

This team focussed on exploring the framework for future technological developments based on local participation. The main objective was to carry out a bottom-up approach where the opinion of the most affected was used as a starting point. A specific objective was to form a picture of the different parties involved in water management and their opinions.

Team 3: Water, land and people; traineeship of technical students in Bangladesh

Within the combined study, this team aimed to use the framework developed by the previous team (see previous paragraph) and collect/evaluate actual data to design appropriate technological options.

For FAP in general and FAP-20 in particular, the premature search for results by CPP, resistance of local people and the way they were involved, have led to the current problems.

As mentioned in the proposal the target for this research was to investigate the current working of CPP, the bottlenecks in the system, and generate alternatives from a bottom-up approach. The original objective was also to test the alternatives proposed by the farmers and presented in the previous team report. While the previous team started the dialogue with CPP and NGOs involved, the following team would investigate how the realized situation differs from the desired situation. Furthermore, technological proposals for improvement would be developed.

Team 4: Techniques fo coping with erosion and floods in the Jamuna

In the broad belt of the Jamuna river about two million people live on flood plains and unstable islands called chars. The main problems are morphological instability of the chars, (relative) unpredictability of erosion, need for floodwater and fertile silt, danger of high floods, etc. The study answered the following question: what are the biggest (priority) problems? For this, the study aimed to describe the behaviour of the chars, how char dwellers cope, and to propose solutions improving chars' stability, and to improve local technologies.

No answer is given to the question whether upstream river works cause damage to the char.

Team 5: The extent of Arsenic in Bangladesh

Thirty years back people used to drink surface water. Water-borne diseases lead to the installation of tube wells with supposedly clean water. Now groundwater turns out to be contaminated with arsenic, which is fatal in the long run. The various actors have contradicting opinions on the problem and possible solutions, which complicates co-operation.

The objective of this study was *to learn the opinion of the poor people in rural areas and to find out how their state of health and socio-economic well-being is affected by possible solutions*[4]. From the proposal it is obvious that the team is result oriented. Possible measures have been developed in the Netherlands in order to tackle the problem of arsenic contaminated water. The approach ends with a determination of possible technologies, a design and implementation phase.

Team 6: Water Management related to Peoples' Participation and agriculture

The main objective, as formulated in the report, was an active participation with local people and investigation of their problems; towards a more integrate water management, sustainable environment, improvement of economic security and quality of life.

UST has asked the group to *investigate the feasibility of the water management solutions brought up by the local community*[5], a set-up offered by previous teams. It is supposed to be a follow-up study, however it is unclear what exactly has been used and where these alternatives are listed.

An important central research question was if there has been enough rainwater and irrigation to grow crops properly during 95-97. In other words: if the criticism against FAP-20 is valid, and if the problems are not due to the type of season (relatively dry or wet).

Team 7: Peoples' Participation in Water Management, study report about CPP and KJDRP in Bangladesh

Water projects, or parts of them, contract external consultants, this has an impact on the way local people are involved in decision making. Two independent projects were studied and used as examples to form an opinion about Peoples' Participation in water management. The objective was to bring forward an independent evaluation of FAP-20 and KJDRP. The evaluation was concerned with different technological and social approaches of the organisations involved. The team tried to support Uttaran with technical advice on an alternative drainage system in the districts of Khulna and Jessore. It is unclear from the problem definition how the issue of participation would be tackled.

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[4] Carleen Webers, Esther Bloem, Lourens Dijk, The Extent of Arsenic in Bangladesh, Delft, August 1998.

[5] Jet Cox, Robert Kamp, Erik Kemink, Water Management related to People's Participation and Agriculture, Delft, November 1998.

Team 8: Benificiary Participation in the Small Scale Water Resources Development Sector Project

The objectives of the study were to: *participate in all aspects of the project, provide an overview of their scopes and give recommendations for future improvement*[6]. The research aimed to provide insight in the relation between technical and institutional processes, how the SSWRDSP proposes this, how it is and how it should be. During this training, students wanted to co-operate within a selection of technical projects. For this, the goals of the SSWRDSP were taken over and reviewed in the field. No comparison has been made with other Water Management schemes in Bangladesh. SSWRDSP is a part of the National Water Policy, which has not been studied.

Team 9: Short-term arsenic mitigation strategies: possibilities and considerations

The problem is the heavy contamination of groundwater in Bangladesh and with that the lack of co-operation between the parties involved. The objective is therefore *to find out the feasible methods for the short-term supply of clean drinking water to the people* (of Khulna) and at the same time *to fulfil the necessary conditions for a successful participation of the local community in an approach to mitigate the effects of arsenic contamination*[7].

Team 10: Observations on dealing with arsenic, outcomes of a research on cultural, institutional and technical conditions on local participation in mitigating the arsenic contamination

The obvious problem is the arsenic contaminated ground water. The British Geographical Survey estimates that roughly 42 million Bengali are exposed to an arsenic concentration above the WHO standard. In other countries five directions for arsenic mitigation have been observed. The difficulty lies in social, cultural, economic, geographic, hydrological, and other differences among and within countries.

The problem lies not in the mitigation technology itself. *The effectiveness and efficiency of implementation is doubtful, unless the local community participates in the process.* The objective was therefore to answer the following central research question: *which conditions are necessary for a successful implementation of measures with the support, co-operation and co-ordination of the local community in order to mitigate the adverse effect of the arsenic contamination of groundwater in Bangladesh?*[8]

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[6] Jurjen Wagemaker, Wilbur van Beijnen, Beneficiary Participation in the Small Scale Water Resources Development Sector Project, July 1999.

[7] Thijs Nix, Rene Lukasse, Short-term arsenic mitigation strategies: possibilities and considerations, Delft, November 1999.

[8] Pepijn Koenders, Stijn Horens, Observations on dealing with arsenic, Delft, January 2000.

Contents of the reports and updated information

This chapter provides quick insight in what can be expected when reading the reports. It is interesting to compare several research studies on the same subject and see what new information subsequent teams add. In this chapter I will merely mention updated information, a comparison of the reports can be found in chapter Follow-up and feedback evaluation. I also refer to Appendix C Student reports' conclusions and recommendations.

Team 1: Poverty and technology in Bangladesh: towards a sustainable development. Socio-economic development of women in Bangladesh

This is an evaluation of two individual reports, one draft and one final, brought forward by this team: the first student reports on the subject. The first one (from the provisional contents, January 95) gives an introduction to Bangladesh, international co-operation (FAP, and NGOs), UST and its activities. There is theoretical information about Sustainable Development and Technology Assessment, and practical information from both field studies. For the first field study, the chapter describes the location, livelihood, agriculture, water management, local problems, recommendations and technical improvements for the irrigation. For the second field study, the chapter describes the location, FAP in general and FAP-20 in particular, existing FCDI projects, as well as conclusions and recommendations. The author also gives his opinion about technology in the context of the field studies and the relation between farmers and engineers.

Additionally, there is information about agricultural activities such as cropping patterns, types of rice (HYV versus traditional varieties), and production related activities (such as the use of fertilizers, pesticides). There is also material on traditional water management and the way farmers irrigate (water supply, distribution, inundation, and other irrigation practices)

The second report is more directed towards daily activities and life of the rural people. It gives an impression of the economic situation and offers ideas about how to improve this.

Team 2: Integrated Water Management and Peoples' Participation, a bottom-up approach

The first report of the previous team contains a thorough description of general and technical aspects of FAP-20. The report from team 2 focuses on institutions involved, historical perspective and Peoples' Participation. It therefore adds information to the previous report (team 1) on institutional and social matters. The results presented in this report are mainly the results from a series of interviews with farmers and NGOs in the area.

The report starts with a description of the water system (natural resource system, social economic system, and water management system). The report also offers new (historical) information about water changes on different levels and about agricultural practices (HYV versus organic farming). It describes the infrastructure and operational aspects of FAP-20 as well as its objectives in a historical perspective.

The theory and practice around Peoples' Participation is treated, as well as the standpoints and role of NGOs on the issue.

Team 3: Water, land and people; traineeship of technical students in Bangladesh

The report starts with a description of the setting of the project, a description of Bangladesh, the project

area and CPP background. This report deals with three selected problems around the FAP-20 project. It starts with water shortage in general; one reason for this is the lower river water discharge. This change is studied as well as different possible interventions. Especially in the dry season this becomes an important (second) problem. This report gives specific (technological) suggestions to improve the situation during this particular period. Land acquisition is the third problem described in the report. This report offers new information about land registration, legislation related to land acquisition, specific acquisition cases of CPP, compensation. Acquisition is still taking place, not so much for building structures but more for re-excavation of khals.

The report lists different existing problems and aims to select the most important to research further on the basis of available technological knowledge within the team and possible relationships between problems.

This report focuses more on developing (technical) solutions. Some of the proposed interventions are worked out in detail: adaptations in the river system, the river input, usage of ponds, open wells, etc.

Team 4: Techniques fo coping with erosion and floods in the Jamuna

There is a lot of technical information such as discharge, bathymetric measurements, hydrological analysis, and morphological study of the Jamuna River. The report is oriented towards technical results with a chapter on measures to increase sedimentation, local building materials, etc. It gives information about the forecasting of erosion and flood related problems.

This is the first team of students placed on this subject. There is new information about JCDP, the condition in which char people live, the problems they encounter, as well as their local coping technologies and mechanisms.

Team 5: The extent of Arsenic in Bangladesh

Data about the origin of arsenic contamination, geology and chemistry has been collected in the Netherlands. The proposal already contains a long list of recent publications and articles about the subject.

The main report starts with a description of UST, Bangladesh and Kushtia district. There is also interesting information about the various actors involved and their respective roles in the drinking-water sector. The actors are classified according to their approach to the problem (analysing/solving) and working methods (bottom up/top down/commercial). The report also tackles hydrogeology, hypotheses regarding the origin of arsenic contamination, and measuring tests. To better understand the seriousness of the problem medical aspects of contamination have also been treated.

The study concludes with a research on the solutions for the supply of clean water, two technologies are finally chosen as best recommendations on the short term.

This team is the first student team to involve in this subject. It gives an initial and more general overview of the issue compared to following reports. It also provides particular information about the district of Kushtia, one of the most affected by arsenic.

Team 6: Water Management related to Peoples' Participation and agriculture

This report contains basic background info about FAP and CPP such as financial aspects and hydrological information. It also focuses on Sub-Compartment 11 (SC11) concerning, climate, soil, groundwater, agriculture, latest monsoon seasons ('95-'97). The report gives a description of the hydrological situation, latest effects of the monsoon of '98, water supply, and water requirements. The study proposes alternatives towards organic agriculture and flood control in SC11. There is specific information about fertilizers, pesticides.

In the report you will find up-to-date info about CPP with reviews from CPP-team, as well as recent changes in the institutional set-up (like the reformation of committees). There is also new information about changes in the water system. The Dhaleswari river intakes are changing due to developments of the Jamuna Bridge, new monsoons, etc. Team 2 and 3 however already treated this subject.

Team 7: Peoples' Participation in Water Management, study report about CPP and KJDRP in Bangladesh

The report starts with the necessary descriptions of Bangladesh, the studied districts of Tangail (CPP area) and Jessore/Khulna (KJDRP areas), problem definition and objectives. Then, the report is divided into an analysis of the two projects. For both projects, a general description is given, as well as the context, history and present situation. The conclusions and recommendations for both projects are also kept separate (there is no comparison).

New study areas and a new project are tackled: the districts of Khulna and Jessore and the KJDRP. The team did not concentrate its focus merely on KJRDP or on a few of the recent changes in the FAP-20 project. This limited them in going deeper in the description of the issues. The report gives a description of the area where KJDRP operates, the organization of the project, the tidal river system, implemented designs, and peoples' opinion.

When it comes to CPP, the report doesn't provide much new information about participation and chemical fertilisers issues. About the topic of agriculture, the outcome remains the same. This team also concludes with the risks of HYVs of rice, and accompanying chemicals. Updated information described in the report is about land acquisition; works in process have been stopped after legal procedures and successfully filed cases (a lot of info about land acquisition can be found in the report from team 3). There is some up-to-date information about the (recent) history of FAP-20 (concerning changes in the CPP consulting team), but unfortunately it does not go very deep (partly again due to the short time spent on the project). The report also offers recent information about maintenance work and newly designed fish inlets (and mitigation measures), emerging erosion problems, and reforms in Water Management Committees (institutionalised Peoples' Participation). Other information about the institutional reforms can be found in the report from team 6.

Team 8: Benificiary Participation in the Small Scale Water Resources Development Sector Project

This report gives a thorough description of the Participatory Water Management approach theoretically used by the LGED in the SSWRDSP. The main part is dedicated to what the team actually see being done in this respect. Participation issues in practice are described according to economic, social, technical and environmental 'indicators'. Finally the report gives a description of the visited sub-projects.

This student project is the first carried out in co-operation with LGED. The report is of a descriptive nature. The counterpart, their project and sub-projects descriptions offer as a matter of fact new information.

Team 9: Short-term arsenic mitigation strategies: possibilities and considerations

The report is an extension of the proposal. General information about Bangladesh, its administrative system, the problem definition, goals and objectives are practically left unchanged. Most of the material on the origin of arsenic and medical effects presented in this report was already treated by team 5.

However the objective and sub-objectives were primarily related to participation and social issues, the most important results presented in this report are of technological nature. A chapter presents field visit results, in other words the most important 'social-related' findings. These are of course specific to the area and villages.

New information gathered in this report mainly come from the British Geological Survey[9]: a study that clarifies the reasons opting for the theory of Oxyhydroxide reduction.

The report informs about two types of short-term technical solutions: those concerned with treatment of arsenic contaminated water and those concerned with supply methods of arsenic free water. The report offers new information about specific local use of water in some villages of the Khulna Division.

Team 10: Observations on dealing with arsenic, outcomes of a research on cultural, institutional and technical conditions on local participation in mitigating the arsenic contamination

The contents are directed towards a description of the short-term measures. The team offers a rather complete report.

The report starts with an introduction to the arsenic problem, extent, history, origin and medical effects. It extensively informs about various actors in the programme, from grass-root to international level, from Donor agencies to NGOs to GOs. It gives a description of the SSSUK project. Possible existing solutions to the problem are explained. Insight in the research questions leads to a Multi Criteria Analysis and a strategy on how to implement projects.

The report offers a well-defined problem definition, central and subordinate research questions. It explains the advantages and disadvantages of the various existing and experimental methods for supplying clean drinking water. SSSUK projects in Khulna, Bagerhat and Noakhali have been studied by the previous team and are visited again by this team. The village of Samta in Jessore is added to the study by this team.

[9] British Geological Survey, Mott MacDonald Ltd (UK), Groundwater Studies for Arsenic Contamination in Bangladesh, January 1999.

PART II: OVERALL EVALUATION OF THE PAST TRAINING PERIODS

Objectives and Expectations

These paragraphs are concerned with the requirements and types of training as defined by the faculties involved. Participating students were from the faculties of Civil Engineering and Geosciences (CE&G), System Engineering, Policy Analysis and Management (SEPA), Industrial Design Engineering (IDE), Geotechnical Engineering (GE), and Economy at the University of Amsterdam (UVA). This chapter focuses on the main faculties involved.

One should however keep in mind that the results required by these faculties might not always be what is required in the situation of Bangladesh. One should make a distinction between several types of results. There are the immediate results for the counterpart and for the situation in Bangladesh; this might be a set of recommendations for new technological projects, some short-term solutions, an initiated dialogue between institutions and organisations, or a research in the field. Another result is the influence on the students. There are noticeable immediate changes, such as a broadening of the cultural horizon, or an insight in practical work in a developing country. On the long term a confrontation with some of the problems encountered in Bangladesh can have an impact on situations and decisions the future engineer might encounter in his or her future profession.

The wishes of students and counterparts are therefore also treated in this chapter. It will however shed light on a difference between wishes and expectations.

Faculties and DUT educational staff

Quoting from Civil Engineering and Geosciences (CE&G) education information, the Traineeship Bureau mediates between fourth-grade civil engineering students and companies or organizations offering traineeships. Organizations benefit from the students' fresh and analytical point of view. Trainees are *cheap, highly motivated and innovative employees*[10].

Within CE&G, Civil Project Education (CPE) organizes problem-oriented trainings for CE&G students. Projects are based on actual practical problems. In groups, students work on finding solutions with special attention to social, economic and technical aspects. Every year about one hundred projects are initiated with CPE. Relevant aspects are developed and lead to a technically and socially sound solution. While doing this, students learn to apply their knowledge. The most important goals are to gain experience in acquiring information, defining a problem, formulating the objectives, applying and integrating expert knowledge, teamwork, oral and written presentations, and thinking result-oriented.

Subjects for projects must fulfil certain basic requirements (formulated out of educational considerations): subjects have to link-up with a topical matter (recent and actual), and there has to be enough available information on the subject like topographical data, policy documents, etc. There are also more specific requirements for students projects in the first, second, third and fourth year. Only in the fourth year are students allowed to carry out a project abroad. A project has to concentrate on one specific field and technical design. Some of the issues are Water Management, Construction, Infrastructure, etc.

In their third year System Engineering, Policy Analysis and Management (SEPA) students are asked to build up on-the-job experience by order of an external (non-faculty) problem-owner. The end goals are to have the student gain insight in the systematic application of methods and techniques for solving a problem, work as a team, define and plan a project, check and report the progress, present written and oral reports. The concrete contents of the project are defined by the specific project itself, interest and preference of the concerned student. It is not unusual to see students go abroad for this project.

Industrial Design Engineering (IDE) is a five-year programme, and in the last two years there is room for training in the Netherlands or abroad. This can be the opportunity for students to put their personal accents on IDE. An information portfolio[11] has been written for students going to developing countries for their practical training or graduation project. For practical training there are three parties involved: student, faculty and counterpart. A teacher or professor who has to watch over the direction taken and quality of the project represents the faculty.

The idea remains that in the name of education an organization or company is loaded or charged with the student. Students are often advised against doing training projects abroad because of the lack of specific IDE expertise. Other issues that can cause a problem are: the (low) level of technology, the uncertainty of the planned activities. In practice, for a training period, much less is required (particularly compared to graduation projects). The ‘rules’ are not obvious. A student can simply leave for a training and return after a few months with a short evaluation.

Geotechnical Engineering (GE) training has to be carried out at geodetic companies or (research) institutions in the Netherlands or abroad. Student activities need to have the same level (and learning experience) as a starting geodetic engineer. Therefore, for projects abroad, the student also has to learn

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[10] http:/www.citg.tudelft.nl/projectow/ctpinfo

[11] Bram Donkers, Yvonne de Mey van Streefkerk, Industrieel Ontwerpen en Ontwikkelingssamenwerking, Delft, November 1992.

to overcome problems associate with that.

Each student has a faculty mentor responsible to guarantee the quality and level of the training. Placement and subjects are chosen in cooperation with the section. Specific information about the placement, the goals, etc, has to be prepared beforehand.

In the new programme, training will generally last for three months. The objectives of a training are:
-to apply the theoretical and practical knowledge from the first three years and apply this in practice, thus contributing to the processing of knowledge and creating a basis for the graduation project.
-to gain or enlarge technical expert knowledge, organisational insight and other social abilities.
-to give the opportunity to get acquainted with the geodetic trade.

In general, depending on the faculty different approaches are employed regarding projects and traineeships. Within faculties the specialisation a student has chosen can influence supervision and guidelines. Guidelines of two different departments from the faculty of CE&G follow different objectives. At the department of Hydraulic Engineering a training has to be a strict following of the technical methods taught at the faculty. We can say that technology is the main concern. At the department of Integrated Water Management there is, as the name suggests, a general approach towards technology, which could fit linkage programme projects in Bangladesh better.

Concretely and in relation to the DUT Bangladesh linkage programme, a few things can be said. It has been difficult until now to have a supervisor from DUT visit a team during its stay in Bangladesh. For some students this has been seen as another problem to resolve. Next to the task they have to develop solutions, suggestions or investigations, students also have to find out about their own capacities and communicate this. In some cases they feel they have to pass on an explanation of their role to the people in Bangladesh. A role they often do not quite grasp themselves. On the other hand, in many cases a submersion in all these issues can have a positive impact on self-reliance, confidence, realism, etc.

Participating students

I have tried to see how expectations make room for realities along the way. Student expectations are particularly visible in the proposals (see Appendix B List of student proposals and reports). It has to be remarked that these proposals are often written with a purpose (need for financing, or need to fit in a certain curriculum). This might influence the goals that have been written down as well.

Team 3 expected to use the results of the previous team and to carry out *a technical analysis of the area*[12]. The previous team started the dialogue with NGOs and people involved in CPP. Together with those findings, a collection of opinions and arguments would be used to see how the desired situation differs from the actual situation. The results would be an overall view of the present situation, a set of recommendations for technological and managerial improvements of CPP. The team acknowledged that the proposal was not a definite plan. Firstly, at that time the previous team had not returned with suggestions and recommendations, and secondly team 3 (rightfully) expected the plans to change after a confrontation with the situation in Bangladesh. Additional subjects are tackled in the final report, such as selecting priority problems. Attention is obviously given more to technological information and less to managerial improvements, except for land acquisition issues.

Team 4 wished to test their theoretical knowledge in a real-life situation. The team decided to focus on certain aspects of the problem due to its broadness. The aim was neither to give a detailed analysis of the changing river flow pattern nor to give an answer to whether and how river works affect the char inhabitants. The study would focus on char behaviour, coping mechanisms, living conditions of char inhabitants and possible solutions to increase char stability. However the team goes quite into technical details in the main report, with discharge and bathymetric measurements, hydrological, and morphological analysis of the river.

Team 5 aimed to find short term and long-term (technological and managerial) solutions for the problem of arsenic contamination, in particular for the inhabitants of Kushtia. If possible the team even aimed to *implement the best design*[13]. Research and literature study have led to a basic understanding of the arsenic contamination, its origin and its effects. The aim for the period in Bangladesh is to focus on mitigation measures on macro-, meso- and micro levels. The team wanted to set-up a ‘small’ project to provide one village with clean drinking water, which obviously was a stringent demand.

Team 6 would carry out a feasibility study for water management solutions rooted in the local community. It was going to be based on alternatives put forwards by the people and previous teams. Already the proposal shows what the team calls promising technical solutions for water shortage. The investigation would also include economic issues like differences between the rich and poor, a cost-profit and earning capacity analysis. The final report however does not mention the technical solutions for water supply. It is more descriptive and the alternative solution it recommends is not so much about water supply anymore but much more on ecological agriculture. It seems in this case that the

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[12] Floris Boogaard, Werner Halter, Ernst van der Leij, Ida Wallast, Jacco Zwemer, Water, Land and People, Traineeship of Technical Students in Bangladesh, Delft, September 1997.

[13] C. Webers, E. Bloem, L. Dijk, 1998, Ibid. 4.

multidisciplinary character (CE&G and UVA, economy) brought forward in the proposal was difficult to achieve and cannot be traced back in the main report.

In short, team 7 aimed at evaluating different approaches of organisations involved in FAP-20 and KJDRP, as well as the related drainage problems. The negative side effects of agricultural and water control development projects on the environment and ecology require attention. A way to improve projects is to integrate rural inhabitants in the process. The ultimate goal was to evaluate both projects with local knowledge as a main issue. Therefore the original purpose of this project was to advise on a technological level, and to learn on participation and integration issues. Due to lack of time, the team was only able to stay on a descriptive level in the final report. The main contribution of this report is an update of the current situation, with the latest changes in the region.

A student in team 8 prepared a proposal explaining how the aim would be to combine the curricular elements: training, research and case study. The stay would be for 4 ½ months. During training the aim would to assist in design for irrigation, drainage and flooding, and to conduct field trips. The case study would focus both on technological and institutional matters. The research part would be concerned more with bottom-up approaches to development. Some of the objectives that would be part of the compulsory curriculum were to understand and evaluate the design processes within SSWRDSP and walk through an entire design-cycle. In relation to the elective research course the objectives are kept very general. The goals presented in the proposal have been met and presented in the final report.

Team 9 aimed at finding short- and long-term solutions for the problem of arsenic contamination in particular for the inhabitants of Khulna. The objectives in the proposal have literally been reproduced from a previous proposal. Measures taken until now have a strong technological drive. The team wanted to work in a more multidisciplinary way. Most of the objectives concerned the way people obtain and use water and the relation with arsenic contamination. When it comes purely to technology, the team would study the methods described by team 5 on their feasibility, in light of this team's own findings.

Counterparts and Bangladesh-based mentors

During discussions with counterpart organisations it becomes clear that the level of expectations is very low. The main objective of the Bangladesh-DUT linkage program is definitely not a directly perceptible contribution of the students in the various projects. On the contrary, the counterpart expects to contribute something to the students (see chapter Learning experience versus contribution).

To start with, a 'technological' contribution will definitely not be on the level of development, considering the short period in Bangladesh. It will be more on the level of monitoring and evaluating technological projects. Furthermore, trying to force a technological contribution might in some cases send the wrong message. It could indirectly mean undermining the local capabilities if these have not been studied properly. With regard to the amount of time at hand it is therefore logical that students will be able to do two things: one is the monitoring of high-tech projects, and two is the study and understanding of local mechanisms.

Still UST, SSSUK and JCDP do not even expect such contribution. The interest in the country, culture, people, local practices, etc is already enough. Both ways it can be expected that these linkage projects will help building a sounder North/South relation. Cross-cultural development of both parties is central and *an open dialogue about North/South relations should have its consequences in both directions as well as on the relation itself*[14].

Next to intensive association with the local people, NGOs offer an important contribution in projects logistics, hosting, translations, etc. Students perceive the role of a local supervisor with knowledge about all the different student projects (Khorshed Alam for UST) as essential for a positive outcome of a training. This role is also indispensable when it comes to daily adaptation difficulties. With respect to content, the value of advice from local (rural) NGOs is seen as an imperative as well. Technical supervision provided by the LGED was probably the highest compared to other projects. LGED involvement did not actually extend to logistics or after office hours.

Conclusions

General conclusions are difficult to make, how can one know the exact reason for a certain project outcome and result. Might it be the character of the curriculum, the interaction between team members, or a certain general approach of Delft students? The following are simply a few of my observations, which should be seen as discussion points.

Proposals are often very, sometimes even too ambitious. It seems that most of the time the proposal has more activities planned than are eventually carried out during the research period in Bangladesh. This shows a difference between the ideal situation and practical results.

Reports (including this evaluation) often use specialist terminology. CE&G students usually tend towards technological feasibility studies, if not visible in the proposals it becomes visible in the reports. SEPA students usually incorporate curriculum method in their set-up. Some students stepped away from the

[14] J. Boes, 1996, Ibid. 1.

constraints of the curriculum in the proposal but tended towards it in the final report. The reports show strong elements of the authors' backgrounds. Inter-faculty co-operation is often difficult to achieve. I find it understandable that for a multi-disciplinary team, the reports generally show fragments of disciplines instead of integrated subjects.

Often students wish for an important technical component, which turns out to be underrepresented. There are exceptions, for example where students planned a social and institutional oriented research but came back with a technical report (which remained unsatisfactory even by Delft standards).

For faculty people, there is a strong push to build in a pre-written goal at the beginning of a training period, internship or research period. This goal is to end up with a concrete visible result. This is something that students in general show at the start too. They express their willingness to go on study training with this 'built-in' security. A technological result is a prerequisite for students who have followed a technological curriculum, not only for DUT mentors, but often for the student themselves as well. Even if technological elaboration is not the primal expectation coming from the counterpart, it is something students often feel they have to put forward. At the start social and cultural aspects seem to most not to be something for DUT students.

It seems students are pushed both by themselves and by their faculty mentors' (or funding programs') expectations to apply what they have learned from university in the training. It is a fact that what they have learned is of a technological nature. Something else, something institutional, social or cultural could seem too far away. Nevertheless studies in a setting such as Bangladesh require incorporation of non-technical issues. Obviously the initiative is between Bangladesh and DUT, therefore incorporating social issues does not mean abandoning the issue of technology. The projects students are asked to study have in my eyes all the technology that could be wished for.

Follow-up and feedback evaluation

One part of this evaluation study is to read the different reports and try to compare results, quality, depth, etc. Projects are also, if possible, evaluated on their 'follow-up' component. With that I mean how the project is linked to the previous one. A project proposal is often available, I looked into what students expected to be doing, whether there was a link with previous student reports to start with, or whether this has been followed later during practical work. I looked at previous recommendations and the link to following goals. Goals and objectives from a main report, reviewed in practice, seem more realistic than those written beforehand in the Netherlands. Goals from a proposal are valuable for comparing expectations and results (See chapter Objectives and expectations).

From recommendations to goals

Considering the optimistic goals certain student teams have set, 3 months is generally too short unless there is a certain long-term overview and continuation of the work that has already been done. Students point out that a connection between teamwork is difficult to achieve. Everyone wants to 'reinvent the wheel' and walk through the first exploration steps in Bangladesh without merely falling back on the findings of previous teams. This is necessary for a large part. There is fundamental information within each project that students have to gather initially. Quoting a DUT staff member this basic information is an introduction to Bangladesh, the culture, the problems and the organisation. More specific information can help build a follow-up process.

Two topics have resulted in a series of student assignments. One of them is the study on Tangail and the FAP-20 project. Key issues are peoples' participation, integrated water management, floods and draughts, agriculture, irrigation, etc. The second topic is the involvement in arsenic related problems. Key issues for these projects are ground water, arsenic mitigation, institutional change, peoples' participation, health, environment, etc.

Other topics (LGED and JCDP projects) have involved only a single student group. There hasn't been any follow-up assignment yet. This Paragraph will therefore only focus on the following topics: FAP-20 and the Arsenic projects.

The various reports often include general recommendations as well as specific follow-up proposals. A few general recommendations, thought to be valuable for the continuation of the FAP-20/arsenic topics, are also presented in this chapter. Then a comparison with the goals of the following team can be made as well as what has actually been carried out during training (and visible in the reports).

FAP-20 topic

Recommendations have been written by team 1 for the purpose of general development and not so much for follow-up training projects. However, some of the suggestions are useful for subsequent teams: technologies are needed using local materials and knowledge, farmers' education has to be ensured when it comes to HYV, and ground water supply has to be secured to increase production during the dry season.

Initial objectives of team 2 were to participate in the debate about Integrated Water Management,

develop an advocating tool for local NGOs involved and describe the local technologies and aim to enhance efficiency by blending these with modern technology. In the results team 2 tackled the institutions involved, historical perspective and Peoples' Participation adding institutional and social information to the previous research.

Team 2 recommended further investigation on the reasons for water level dropping, water use during monsoon and the role of organic farming. Technological suggestions are an analysis of the potential of canal re-excavation and research in the design of roads and embankments in ways to reduce siltation.

Team 3 aimed to use the framework developed by team 2 and collect actual data to design appropriate technological options. While previous teams started the dialogue, this team would investigate how the realized situation differs from the desired situation and propose technological improvements. This team tackled water shortage, possible interventions and land acquisition problems and focussed on technical solutions, some of them worked out in detail: adaptations in the river system, usage of ponds, open wells, etc. Land registration, legislation, acquisition and compensation were treated as well.

General recommendations from team 3 valuable for a follow-up are to find an easier way to cope with water shortage, to improve operation and maintenance, water distribution, fisheries' situation and to investigate the effects on adjacent areas.

UST asked team 6 to investigate the feasibility of the water management solutions brought up by the local community, a set-up offered by previous teams. The main research question is if the criticism against FAP-20 is valid or if problems are due to lack of natural water supply in '95-'97. Results focus on Sub-Compartment 11 concerning, climate, soil, groundwater, agriculture, and latest monsoon seasons. The study proposes alternatives towards organic agriculture and flood control in SC11. The report gives a description of the hydrological situation, water supply, and water requirements.

Team 6 recommended finding solutions to the problems of siltation in the Lohajang, better ways to maintain embankments and shift the agricultural practices (organic farming).

Team 7 studied two independent projects. The objective was to bring forward an independent evaluation concerned with the different technological and social approaches of involved organisations. There are limited new results about water management, agriculture. The report updates information about land acquisition, changes in CPP, maintenance work and newly designed fish inlets, emerging erosion problems, and reforms in the committees.

Arsenic topic

The objective of team 5 was to learn the opinion, state of health, socio-economic well-being. The approach is a determination of possible technologies, a design and even implementation phase. This is the first team involved in this subject, and just as the first team involved in FAP-20, recommendations are directed more towards what could eventually be done, and not so much on student training follow-up.

The objective of team 9 was to find out feasible methods for short-term supply of clean drinking water to the people while fulfilling the necessary conditions for a successful participation. Team 9 actually built on a general introduction to the arsenic issue presented by the previous team, but focussing on technology. Main recommendations are that priority should be given to short-term clean water supply and less to research. Other recommendations are also more general just as previous the team.

The objective of team 10 was to find the necessary conditions for a successful implementation of measures with the support, co-operation and co-ordination of the local community. This team went into detailed description of the issue and tackled it from various angles.

Conclusions

In a new culture, new environment, without faculty mentors, the feeling that you are involved in something real and significant makes people react in different ways. This explains partly why students might adapt the ideas they proposed in the first place. Seen in this perspective it is also understandable that a team might put aside the findings from a previous group. There have been examples of this. Another reason is a difference and a certain arrogance between faculties (cultural differences, interests, etc) that also influences the idea of a follow-up. There is probably an understandable sense of pride for personal achievements towards what has been done by other groups, and a feeling that one needs to figure things out by one self.

Yet another reason for the problem of follow-up studies is the extreme difference between monsoon and dry season. After reading about and hearing from previous groups, wrong assumptions are sometimes made and results will have to be sought in a totally different context. It would be useful to have the students help each other in preparing for the living conditions and other practical aspects of the training.

It cannot be said that there is a logical sequence of follow-up studies considering the FAP-20 topic. Obviously there are many factors of influence, the season, students' faculties, personal interest, etc. It therefore occurs that a team will work in line with recommendations proposed not by the previous team but one before that. Overall one can however conclude that the different sub-topics (fisheries, organic farming, irrigation, excavation, land acquisition, etc) are gradually and thoroughly being researched. Some parts of the various reports obviously present nothing new while other parts tackle subjects and

build on previous findings.

The arsenic topic being relatively new, only a few conclusions can be drawn. It seems that when a linkage program is in its first steps the recommendations are more general. It might become gradually clearer what students in particular can do. With the last report there is now a fairly good picture of the different sub-topics (as it has become clearer also for the FAP-20 topic). Now following teams can easily pick out some of these subjects, again, according to their personal interest, background, etc.

Learning experience versus contribution

There is a huge difference for the students about the way they perceive the training before actually going, and after coming back. This 'new learning experience' is sometimes not shared nor understood by faculty mentors. All students are afterwards convinced that this experience has been a valuable one. The question is: what was the nature of this experience? It cannot be a 'technological' experience because there often simply isn't a tangible, technical result (surely less than what students had hoped for). This is one of the topics this chapter will treat. In line with this, I have tried to explain different views on contribution, learning experience and the relation between the two.

Technology

The conceptual framework where a technology finds its basis consists partially of three components: capital, labour and infrastructure. Comparing Western and Southern cultures will show a completely reversed situation. For this reason students enrolling are asked to research much more than technology. There should be a better understanding about the nature of the earning experience, and it should be clear to everyone involved how crucial the social factor is. The importance of this factor becomes obvious to a student while staying in Bangladesh.

The conducted interviews revealed that student expectations do not always fit the real situation. Next to the immense learning experience, there is also in some cases a disillusion about the impact of their contribution. This is probably in relation to technology and the low-level of the needed interventions. Often students hope for a strong and obvious need for certain technologies. Once in Bangladesh some still feel a pressure to come up with a technology, which results in a rather forced and unnecessary situation. Unnecessary: because the technology itself is not a requisite (from the perspective of the counterpart!), and besides, technology is more than merely a physical product. One could look into financial, maintenance, organisational issues around a technical product that are most relevant in a technological study. During an interview it was said that a student should be schooled to think about technology in a wider perspective. Before actual technical development, one should question one self about the why, how and where.

If one of the outcomes of this evaluation will be a more stern selection, it would be relevant to understand the position of a student towards technology. A 'technology' is one possible end-result of 'technological' training. The reason for entirely falling back on technology might also come from students' insecurity towards sociological aspects. This leads to an incomplete study because of the unavoidable relation between both issues.

According to a faculty mentor, technological drive within a project does not imply that it cannot incorporate properly social matters. (It can even comprise the element of uncertainty accompanying issues involving the people.) In some cases implementation of technology might lead to a better insight in the social organisation and entanglements. In my opinion this can be true to a certain extent, but in practice convincing DUT will be difficult. It has to be said that in Bangladesh, the urge to implement technologies has sometimes led to situations with dramatic effects on the lives of the 'beneficiaries'.

Contribution

Most DUT mentors emphasize firmly the importance to contribute something during training: might it

be in the form of a tangible result or a project evaluation or description. This need for a contribution seems to be emphasized even more in case of training in a developing country. This is in line with the ongoing feeling that students are almost a burden to the training company or organisation. Of course it would be particularly undesirable in a country like Bangladesh to have students burden local NGOs, but in my opinion this is a very pessimistic view. Students do possess the advantage of having a fresh look on a problem, of being independent and flexible. There is a (cultural) unwillingness for many Bengali living urban areas, as opposed to Dutch students, to work in rural Bangladesh. Moreover students can work very independently. For example, the Dutch Embassy asked the LGED supervisor how much time had to be invested in assisting the students, this added up to 3 days work per student over 4 or 5 months. That report has been appreciated, even by Delft standards. Nevertheless, people involved should look realistically at what a student can and cannot achieve in such a relatively short time. Instead of holding on to high hopes, a description or an evaluation of a technology is already a good achievement.

A DUT staff member stated that students could contribute best on a conceptual level during a three-month training in an overall framework of projects (possibly the Arsenic Mitigation and Research Foundation, AMRF). Wanting more might require a long-term approach, a combination of several follow-up studies, graduation projects, or PhD research, etc.

As it has been mentioned, DUT staff views the student as a burden to the training company. In the case of training in Bangladesh the emphasis on useful, tangible, technological student contribution is seen as a must. This feeling is by far weaker when the student is involved in a Western company. For Bengali counterparts this can obviously raise the question whether their own abilities are undermined. In the particular case of the linkage program with UST, SSSUK and JCDP there has never been a request for a tangible or implementable result. Quoting from the LGED supervisor: “training starts and ends with learning, a contribution is simply a bonus”.

The case of LGED/SSWRDSP can be used as an example of what a student can contribute in a relatively short time span. Simply put, the training analysed what was written in project reports and compared this with actual facts. The study was more descriptive than instigational. This might have caused minor frictions but it also pointed out lacks in the projects that could more easily be heard (and hopefully incorporated) because it was a student that mentioned them and not a permanent staff member.

Learning experience

Students opt for these projects for different reasons, while some choose for the adventure, others choose for the possibility to apply their knowledge in practice, or to learn something about work in a developing country, or even to build up their resume. But whatever the reason, they all feel the drive to contribute what they can, or what they know about. This contribution is likely to be in line with their background as DUT students, which in some cases might even lead to a kind of competition between students.

Once in Bangladesh DUT students are sometimes treated as engineers instead of students. Even if there is a noble wish to help the local community with technical improvements, a student is still in a phase of gaining experience. A few students feel that it is realistic to start by learning instead of wanting to contribute. Some know this before leaving, some realise this on the spot. They are convinced of this due to cautiousness or insecurity about their own capacities. Students see how dangerous it can be to propose an unfounded solution and are therefore careful in what they state. If they are not they will eventually be confronted with the fact that the community will not change fast enough for them and adopt a (technological) change.

Nevertheless, this doesn’t stop hard working, but in a more realistic and receptive way. A student said he didn’t expect high achievements on a technological level but still made an attempt. In my opinion there is a need for students that adopt this more modest attitude.

Students’ learning experience does not rule out commitment and assistance to the Bengali community. A question might be how to realistically reconcile both. A more important question is how to have them understand better that their position influences their capabilities and therefore should influence their goals.

Practical training is for most students the first occasion to encounter actual organisations and companies with actual problems. In comparison with the professional world, most DUT projects have pre-written problem definitions and built-in securities, which leaves less to personal initiative. Therefore many students still feel a big gap between theory and practice and a discrepancy between DUT and professional projects. Engagement in a training programme in Bangladesh will confront the participant with problems as real as they can get and push them to question what they see in an analytical way.

There is one aspect that all participants seem to agree upon: the impact on future engineering careers. All students come back from Bangladesh with a positive attitude. Even if they come to the conclusion that they will not pursue development work, it has still been a valuable experience. The benefit might have been on a personal level but surely also on a professional level. While some students try to consciously fit the experience in their professional lives others choose other directions. But whatever the choice relevant lessons have been learned on flexibility, working as a team, open-mindedness, tackling real problems, interrelations between sub-problems, etc. A good sign is that most students still carry this

experience enthusiastically with them and share this during the interviews.

On the long term, counterpart organisations expect a slow shift in western attitude. Students will go back to the Netherlands with new ideas and a broader experience. It is a fact that an engineer will generally not be a sociologist (or the other way around). However, considering the amount of narrow sighted large-scale projects that have failed in Bangladesh and, as it has been said, the growth of community lobbying; the integration of disciplines in development projects is becoming a must. For engineering works this means that social aspects have to be taken into account during early phases of development of a technology (versus implementation of a technology). External social input (incorporating socio-cultural research) would be the obvious thing to do. However, comparing local practices with the way western top-down projects are being implemented will help students to critically review their own activities in their future professions. Social aspects will not anymore depend on an external input but will be inherent to the engineering activities, at the least it will allow a better communication between the two disciplines.

I find this personally a noteworthy learning experience considering that most technical universities have little to no classes related to social issues. This learning experience is in direct relation to technology and can in the long run stimulate *changes in curricula of Northern institutes and towards a better perception of the position of the social weak people in Southern countries*[15].

Conclusions

Students' disillusion about the magnitude of their contribution is very much in line with the low-level of the needed interventions. They hope for a strong and obvious need for certain technologies, a tangible or implementable result, which is however not required by the counterpart. Conversely most DUT mentors emphasize the importance of a tangible contribution, a project evaluation or a description. Nevertheless, people should be realistic with respect to what can and cannot be achieved in such a relatively short time. Wishing for more might require a different long-term approach. Even if there is a noble wish to help the local community, a student is still gaining experience. A few students felt it was realistic to start by learning instead of wanting to contribute. However, this never meant they didn't make an attempt.

An engineer is not a sociologist. However, the integration of disciplines in development projects is on the increase. There should be a better understanding about the importance is of the 'social' factor. Comparing Western and Southern cultures will show huge differences. Justifiably, students are therefore asked to research much more than technology.

Even if they will not pursue development work, the experience has still been valuable. Relevant lessons have been learned on flexibility, teamwork, open-mindedness, tackling real problems, interrelations between sub-problems, etc. Engagement in a training programme in Bangladesh will confront the participant with problems as real as they can get and push them to question and analyse what they come across.

[15] J. Boes, 1996, Ibid. 1.

PART III: RECOMMENDATIONS FOR FUTURE TRAINING PERIODS

Projects' emphasis

In this chapter I have compiled information proposed by counterparts and students relating to the choice for certain projects and the emphasis within these projects, on certain concrete sub-projects or on the approach (long/short term, large/small scale).

Choices among projects

Mutual differences in the nature of projects should influence which projects or which component will be pursued more intensively. A project for the arsenic issue has a strong long-term element. This influences the activities of students groups who will be operating on a short-term basis. It will require a different approach and supervision.

In the past student's criticism on certain projects presented in the reports might influence acceptance in the future. In the particular case of LGED, students were acting under the Technical Assistance Team and therefore had no formal position to interfere and evaluate implementation. This is now gradually changing and it could be expected that students might involve again in the future. Depending on the project it can be wishful, needed, undesirable or even dangerous to lay into an issue and enter a discussion. For one thing, a sufficient period of stay and preparation invested in the project will help students adopt a proper attitude. It depends as well on the type of project and sensibility of the issues. The low profile enables students to initiate a discussion with people from various corners. However, some students feel that the discussion around FAP-20 has been going on for a long time already. During an interview, a student said that the FAP-20 issue has become a bit washed out. There is a doubt about further possibilities. Besides, the advantage of the low profile status of students is believed to have diminished along the way. For FAP-20, DUT students are by now more and more associated with UST and the criticism it states. Due to the political incline it is difficult to take on an independent position.

Choices within projects

The counterpart sees all linkage projects as successful. Changes in the studied problems do not imply that students' work on that subject needs to be abandoned, rather adjusted. Therefore, within projects it is also possible to put an emphasis on elements that are believed to be more relevant or more appropriate for student research and practical training. One example for CPP could be to organise a series of follow-up training projects where students focus on different sub-compartments. It might be interesting for a team to study a smaller part of the project area. Therefore enabling to analyse more thoroughly a specific situation and water system. For several students as well as for UST there is a feeling that until now FAP-20 has been followed in a particular way that needs to be adjusted. Recent changes in FAP-20 ask for an adapted student training approach. Engineering works are now completed and there is neither necessity nor urgency in profound studies and attempts to influence these in an advocacy type of approach. Therefore it would be more relevant at this time to make a comparison between what has previously been stated by the CPP with what is actually the case. A relevant issue in this respect is the monitoring of O&M. This in combination with Peoples' Participation issues was also mentioned during an interview with the Bangladesh Water Development Board as an interesting area for training. However it is advisable to allow a certain time (one year) for the FAP-20 project to 'settle'. Impact and change due to the project will probably not be visible right away and sending students in an early stage might therefore be uninteresting and unfair.

Experience gained from past training in arsenic mitigation can help model future student projects. Within arsenic mitigation projects a shift in the approach is needed due to urgency, quality required, etc. This requires new types of student training and a more co-ordinated approach where students might carry out more specific sub-projects. Within this projects students could be asked to emphasize on a certain technological, an institutional, or an organisational aspect (short-term mitigation technologies and institutional system). Many facets could be tackled. The subject itself asks for a multidisciplinary approach reconciling - to name a few - health, geological, institutional and technological aspects. A presentation of these various fields of interest to students prior to the preparation could help them define a problem definition and objectives more precisely, according to their specialisations. This way a lot of freedom is still granted to students as well as the opportunity for a thorough preparation.

Small/large scale and short/long term

After the basis has been laid different teams could focus on a specific component (suggestions for precise research, proposed by students, are the smaller projects from the National Water Plan, land acquisition issues, Sub-Compartments for FAP-20, a precise technology or institution for the arsenic issue, etc). For this the role of the team has to be clarified. A number of DUT mentors believe that steering is needed for a clearer demarcation. Obviously, if this role is spelled out too much personal initiative and freedom are hampered. I believe that in practice it doesn't have to be a choice between dominant control and free initiative, but a balance in between.

However, one thing has to be noticed; opting for smaller fragments does not necessarily result in a more concrete project. The approach can still be leaving an open end, preparing without false presumptions, incorporation of non-technological issues, etc.

One possibility would be to define overall goals, and fit short-term student consultancies in a long-term vision. In the case of the Arsenic Mitigation and Social Mobilisation Project, the objectives, strategies, program design and structure have been set-up[16]. The role of student research within the boundaries of this project could be formulated more precisely. A team will be able to follow clarified objectives and contribute part of a whole.

Conclusions

All linkage projects are successful according to the counterparts. Changes in a project do not imply that students' work on that subject needs to be abandoned. Rather it influences the way they should be pursued.

Engineering works for FAP-20 are now completed and there is no necessity in attempting to influence these. A relevant issue in the coming years is the monitoring of O&M. With arsenic related projects a shift in the approach is needed due to urgency, quality required, etc. This requires a more precise formulation of student research within the boundaries of this project.

A focus within a project on a specific component requires a clarified team and student role. To achieve this, a number of mentors and students believe that more steering is needed without hampering personal initiative and freedom. Opting for more specific components does however not result in a more 'concrete' project. Projects should still be open ended, be prepared without false presumptions, and incorporate non-technological issues, etc.

[16] Arsenic Mitigation and Research Foundation, Arsenic Mitigation and Social Mobilisation Project, Programme proposal, Dhaka, 1999.

Practicalities

In this chapter some practical aspects of training are presented. The question is raised whether there should be a strict selection of students and a more organised team forming. Other practical topics are treated such as duration, issues of co-ordination, preparation, planning, etc.

Student and team characteristics

Social aptitude and technological knowledge are two important student characteristics for a successful fulfilment of the training period. A lack in one of these might drive the student to draw back in the other. A report with technology in the spotlight might be the result of a team of students that lack certain social skills and chose to focus on what they understand best. On the other hand one can see students not confident in presenting these technologies and therefore 'flee' in a social discourse.

The (general) opinion from the interviews is that such training is only suitable for a certain type of students. Students will face both technological and social issues. Knowledge about social problems and mechanisms is lacking for a large part. It is hoped that a thorough preparation might moderate this.

Altogether, students also see the need for understanding management, institutional and organisational issues. For this it is appropriate to have SEPA students participate. It might however be more daring and more important to involve CT&G students from an educational point of view.

Quality of student work important in the starting phase of a new project (such as a follow-up for arsenic mitigation). It is of utmost importance for a good co-operation with Uttaran (follow-up water management, irrigation, etc). The type of students working closely in an interdisciplinary team obviously has a huge impact on the atmosphere, the results, and the way students look back upon the project. Problems of teamwork are hard to forecast and to prevent. Within a team there can be clashes between intentions. Students involve for different reasons, while some follow a personal conviction, others follow a general belief in the obligation of doing something humanitarian.

The way previous teams have been working together can show how to improve team-organisation in the future. One of the lessons to be learned is about the number of students in a group. Two to three students working together seem to most interviewees in the Netherlands as the best entry. Even the larger team divided work into smaller teams. The number of students in a team is also a relevant factor for the results of field trips. A team of three students will be much less imposing than five or six students. Teamwork is also concerned with co-operation with the counterparts. It is unavoidable that cultural differences sometimes create awkward situations. This has never been an unsolvable problem and is seen as an experience as well.

Here are a few examples of how teamwork has been carried out. In the second team (three participants) two faculties were represented. Most of the work was carried out as a team. The following group counted (five participants) two faculties with various specialisations. General information was gathered jointly. Later smaller groups were formed and the more specific (technical) work was carried out. Team 8 consisted of two students (same faculty). Work was carried out practically separately. This was mainly due to independent preparation, different (curricular) goals and separate arrivals in Bangladesh.

Training characteristics

As it has been said technological and social learning experiences are highly related. The understanding of the distance between traditional and high-tech practices cannot be understood fully without a time in Bangladesh, this is generally accepted. Staying in Bangladesh however isn't sufficient as such, students also have to immerse themselves in Bengali life to understand the culture, way of life and therefore also local technological habits and choices. If not, the entire basis of the DUT-Bangladesh linkage program is lost. It is obvious to me however that many Bengali people involved in the linkage have gained worthy understanding of how to cope with students from a different culture for the past 4 years.

In '97 students from CE&G were working in a totally different context with totally different goals at the Jamuna bridge. The way they were hosted didn't allow them to get in touch with the real Bengali life and culture. Fairly said, this was never the objective, the training was merely technological (top-down and high-tech). If the objective is to incorporate social aspects this should be reflected in the way students are hosted and mingle with the community.

Preparation and planning

The first groups involved in FAP-20 had a more intensive preparation, with weekly discussions (also with UST) about the subject and a workshop on FAP. The last teams were less prepared. The first teams did not have the opportunity to read previous reports. All this resulted in a different kind of preparation. The question is: (how) does it influence the results?

It is a given fact that students cannot and will not leave for much more than three months for their practical training. Therefore, an intensive preparation is essential to use the available time in Bangladesh optimally and produce a higher quality of work. Some students are involved in complex issues and are asked to form an opinion in a relatively short time. Without sufficient preparation a training period might come across as a defiant attempt to know better than the people that have been working there

longer. This is an issue that most agree upon.

The issue of planning is one of many opposing opinions. One group believes the special need for a tight time schedule and planned activities when going abroad where less DUT supervision can be expected. Others claim that this is not realistic in light of the fact that in a developing country plans change all the time. This being a known fact less attention should be given to planning during preparation. In the worst case a planning might even force students to hold on to wrong ideas once there. Yet another group believes that making a planning does not imply actual implementation. Seeing how plans change and reflecting this to the original plans can be a learning experience as well and can actually help in understanding a certain situation better.

My personal experience makes me lean towards this last idea. However I do believe that students should not go into detailed planning. This can make someone less open-minded and flexible. One should know at all times that plans are definitely likely to change.

Students say that they were asked to prepare a detailed planning by the funding organisation. Most of the time students do not see the use of this, knowing that goals are always reviewed on the spot. During an interview with DUT staff it was said that graduation projects are not suited for this due to stronger DUT requirements on preparation, planning and results. In my opinion there should be more room to discuss this in light of the fact that there have been many successful graduation projects in Bangladesh.

Duration

Most students say they did not feel the need to stay longer than three months. A longer time might have helped to get into a more detailed and supported research but would not have fundamentally changed the results.

The reason for this is the 'open-end' character of the training. The team probably adapts to the duration of the stay and simply put: the results are the findings at the end of those three months.

Co-ordination

A set of recommendations is needed, towards the educational staff of DUT, in order to set-up a program that would better fit in the curriculum. This evaluation could be used as an explanatory 'package' for faculty mentors explaining the exact nature of these trainings (social versus technological, learning phase versus a simple application of technical knowledge, etc).

Students often face insecurities about the position they will take up once in Bangladesh. For example, one team got involved in the objectives of SSSUK (plus Uttaran and Rupantar), UST, CE&G (departments of Land and water control and Health care), and WTM. Yet another team got involved in the objectives of LGED, UST, CE&G (practical training, fourth year project), and WTM research.

Students come to ask themselves many questions. Will they simply operate within a (technical) project? Will they carry out work under an assignment for UST? Will they simply work following DUT (or funding organisation) guidelines? The result is that the student often has to manoeuvre between the diversity of demands from the various parties involved. Sometimes even conflicting interests can occur which requires diplomacy in the report and during the usual workshop organised at the end of each period. An insight on the position a student will play is therefore necessary for student and counterpart as well.

Often not knowing what is expected from them, they would like more steering concerning the task they are facing. A mentor could go to Bangladesh for trouble-shooting or steering/adjusting purposes. This was the case for the first teams. A reason for these short visits was the relative newness of students' placement for the counterpart. Bengali NGOs involved have gained a lot of experience when it comes to advising and coaching students from the Netherlands. Therefore the presence of a Dutch mentor doesn't have the same priority.

Local Bengali staff feels there should be more interaction between Dutch and Bengali guidance. Closer co-operation could be very helpful when formulating problem definitions and objectives. First of all it might reduce confusion about the task ahead, because as it has been said students are confronted with many, sometimes-conflicting goals. Secondly, students are not in a (confident) position to explaining to teachers what can and cannot be expected from such training. Often teachers haven't personally experienced a confrontation with a situation in a development country. Intensive contact between teacher and counterpart could settle this.

Conclusions

With respect to preparation and planning a few conclusions can be drawn. A thorough preparation might moderate the lack of knowledge about social problems, management, institutional and organisational issues. Preparation is also essential to use the available time in Bangladesh optimally and produce a higher quality of work. Without it students' attitude might come across as immodest.

Making a planning does not imply actual implementation. Seeing how plans change and reflecting this to the original plans could be a learning experience. However, going into detailed planning can make someone less open-minded and flexible.

Regarding coordination and teamwork one can conclude a few things as well. Cultural differences and different intentions of the team members sometimes create awkward situations but never unsolvable and is seen as a valuable experience. Students often have to manoeuvre between a range of demands from the various parties. An insight on the position a student will play is therefore necessary. He/she has to find out about his/her capacities and communicate this. In many cases a submersion in all the issues can have a positive impact on self-reliance, confidence, realism, etc. Nevertheless, students perceive the role of a local supervisor with knowledge about all the different student projects as essential for a positive outcome of a training. With respect to content, the value of advice from the local counterpart is seen as an imperative as well because supervision from DUT is difficult to achieve.

APPENDIX A: ORGANISATION STRUCTURE

For a better dissemination of the knowledge an organization structure of the NGO's, GO's, consultants', universities', embassies' involvement in the different projects has been set-up. All the projects are co-ordinated and managed by drs. J. Boes (DUT, WTM, 015-2781045) and ir. W.J. Dijk (DUT, CE&G, 015-2781811). The following lists give the names of all people involved in one project area or organisation at one point in time.

Map of the studied areas

The following table lists the same projects that are presented above. The project number in the table refers to the number on the map. The teams involved in one of them are given in the last column. This way the reader can find the appropriate report about one of the subjects.

Main project areas studied	Number on map	Teams involved
Gaibandha, UST-projects	1	1,2,3
BRE, FAP 1	2	1,4
FAP 21/22	3	2,3,4
Bhuapur, JCDP	4	4
Jamuna Bridge Project	5	2,3,4
Tangail, CPP, FAP 20	6	1,2,3,6,7
Kushtia, UST-project on Arsenic	7	5
Jessore, SSSUK-projects	8	10
Khulna and Jessore districts, KJDP	9	7
Satkhira, SSSUK-projects	10	9
Khulna, SSWRDSP and SSSUK-projects	11	8,9,10
Bagerhat, SSSUK-projects	12	9,10
Barisal, SSWRDSP	13	8
Noakhali, FAP 5b	14	4
Noakhali, SSSUK-projects	15	9,10
Patuakhali, SSWRDSP	16	8

For each group, the names of the authors and titles can be found in Appendix B List of student proposals and reports.

CPP / UST

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Experts

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Mr. D.R. Frans (LGED)
Mr. M. Kamal (SWMC)
Mr. P. de Vries (Dutch Embassy)

Dutch organizations

DUT, Faculty of Civil Engineering and Geosciences
DUT, Faculty of System Engineering, Policy Analysis and Management
DUT, Faculty of Industrial Design Engineering
DUT, Faculty of Geotechnical Engineering
ICCO

Bengali organizations

UST
CPP
KJDRP

SSSUK / UST

The first team involved in this issue (team 5) studied the Kushtia region, and was not directly involved with SSSUK.

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Dutch organizations

DUT, Faculty of Civil Engineering and Geosciences
DUT, Faculty of System Engineering, Policy

Analysis and Management
ICCO

Bengali organizations
SSSUK
UST
Uttaran
Rupantar
NWC (National Water Council)
WARPO (Water Resource Planning Organisation)
RRI (River Research Institute)
BWDB (Bangladesh Water Development Board)
LGED (Local Government Engineering Department)

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Dutch organizations
DUT, Faculty of Civil Engineering and Geosciences
ICCO

Bengali organizations
JCDP
BUET
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APPENDIX B: LIST OF STUDENT PROPOSALS AND REPORTS

	Names	Reports	Date	Title
1	Steven Visser	Final report	1995	Poverty and technology in Bangladesh: towards a sustainable development
	Nicole van Es	Final report	June 95	Socio-economic development of women in Bangladesh
2	Paul van de Pol Jord Willemse Crelis Rammelt	Initial Proposal (by Jan Boes)	Sept 96	Integrated water management in Tangail area, a study into the technical possibilities for local initiatives
		Final report	June 97	Integrated Water Management and Peoples' Participation, a bottom-up approach
3	Floris Boogaard Werner Halter Ernst van der Leij Ida Wallast Jacco Zwemmer	Proposal	April 97	Project Proposal, Evaluation Study of Compartmentalisation Project, Tangail
		Final report	Sept 97	Water, land and people; Traineeship of Technical Students in Bangladesh
4	Jorrit de Groot Bastiaan Hofland Geert Schut	Proposal	May 97	Project proposal, A bottom-up approach to lower the risks for the char people in Bangladesh
		Appendix	June 97	Report of methods
		Final Report	Oct 97	Techniques for coping with erosion and floods in the Jamuna
5	Carleen Weebers Esther Bloem Laurens Dijk	Proposal	June 98	Arsenic contamination of drinking water in Bangladesh, Research proposal traineeship
		Final report	Aug 98	The Extent of Arsenic in Bangladesh
6	Jet Cox Robert Kamp Erik Kemink	Proposal	June 98	Water Management and the Role of Community Participation
		Final report	Nov 98	Water Management related to People's Participation and Agriculture
7	Kasai Asmeron Maarten Verboven	Proposal	May 99	Plan of action for traineeship Bangladesh, peoples' participation and local knowledge in integrated water resource management
		Final report	Aug 99	Peoples Participation in Water Management, study report about CPP and KJDRP in Bangladesh
8	Jurjen Wagemaker Wilbur van Beijnen	Proposal	Mar 99	Werkplan SSWRDSP
		Final report	July 99	Beneficiary Participation in the Small Scale Water Resources Development Sector Project
9	Thijs Nix Rene Lukasse	Proposal	April 99	Water Use in Khulna, project proposal for a study on the effects of the arsenic contaminated groundwater in the division of Khulna
		Final report	Nov 99	Short-term arsenic mitigation strategies: possibilities and considerations
10	Pepijn Koenders Stijn Horens	Final report	Jan 00	Observations on dealing with arsenic, outcomes of a research on social, cultural, institutional and technical conditions on local participation in mitigating the arsenic contamination

APPENDIX C: STUDENT REPORTS' CONCLUSIONS AND RECOMMENDATIONS

The list of reports can be found in Appendix B List of student proposals and reports. This appendix only includes the main conclusions and recommendations in order to compare the results. The following paragraphs supplement Part 1: Specific evaluation of the past training periods, on what can be expected when reading the different reports. For the first team only preliminary conclusions are listed (taken from the draft reports).

Team 1: CPP / UST

Main conclusions

-There have been huge investments in bank stabilization (Brahamaputra river) over the past 20 years nevertheless there is ongoing erosion.

-There are huge differences between rich and poor farmers and a constraint for them to look and plan in the future.

-There is also a huge status difference between genders. Women have not as much right to be heard than men, and are responsible for food, household and health related concerns.

-Generally men undertake farming and irrigation activities, although women do carry out pre- and post-harvest work (seed preparation, transplantation, rice husking and storing, etc).

-The government pushes HYV cultivation. The author believes that HYV cultivation will require technologies that are difficult to achieve in a sector until now dominated by small-scale, low-tech approaches.

-Living conditions and awareness about hygiene, education and food have improved over the last 5-10 years, and the impact of UST is certainly noticeable.

-NGO work can be very efficient when focused on small areas, in co-operation with the grassroots.

-(In the Gaibandha district) there are no possibilities to pump water from the deep aquifers. Farmers use only Shallow Tube well Pumps and Hand pumps.

-The decrease in soil fertility is already attributed to the adverse effect of intensive use of chemicals.

Main recommendations

-Develop useful technologies for the rural people and use local materials and knowledge.

-Ensure the supply of farm inputs and rice cultivation essentials.

-Ensure the quality of fertilizers and educate the farmers.

-Ensure ground water supply to increase production and soil moisture during dry season

-Ensure soil fertility by re-introducing green fertilizers and multiple cropping patterns.

Team 2: CPP / UST

Main conclusions

-Changes in the water resource system (westward bound of the Jamuna, deforestation in the upper catchments, construction of the Farakka barrage, etc) affect the quality and quantity of water. If this continues, it will have a huge impact on socio-economic changes.

-A water management system should do something about the issue of drastic water dropping.

-The introduction of HYV has changed the environment and economic situation, and will continue doing this in the future.

-There have been important shifts in priority during the implementation of FAP-20. Guidelines have been reformulated.

-Participation is practiced differently by organizations involved, this results in fierce discussions on the subject.

-NGOs need to find ways to develop and advocate alternative strategies to actively contribute to the discussion instead of merely criticizing the facts.

The report describes general recommendations to achieve proper Peoples' Participation (about local knowledge, land acquisition, etc). Other recommendations have been set-up for follow-up studies.

-Investigate the reasons for Water Level dropping.

-Study the water user groups during the monsoon period.

-Analyse the potential of re-excavation of the canals as a solution to the problems.

-Investigate ways to design and construct roads and embankments in a way to reduce siltation.

-Look at the possible role of organic farming.

Team 3: CPP / UST

Main conclusions

-Land acquisition being the original responsibility of the government does not mean that CPP should not inform the people better.

-Recent water shortage is not due to rainfall. Ground water levels are decreasing (but this might not be a trend because it has been monitored for a short time). Dhaleswari discharge is diminishing (and thus water inflow). This last change is the main reason for water shortage in general.

Main recommendations

-Easier way to cope with water shortage can be achieved with a better river water level forecast and information dissemination.

-Small-scale solutions like adapting the Dhaleswari intake (shape, location, sediment catching, river training, etc) or using water lifting devices or removable siphons.

-A spill canal between the Jamuna River and the Dhaleswari could increase the quantity of water reaching the area.

-New/excavated ponds increase the storage of water from one rainy season to a dry season. Open wells could be re-implemented. The infiltration capacity, and thus recharge of groundwater reservoirs can be increased by installing infiltration gaps.

-Follow-up: investigate how to improve operation and maintenance to improve water distribution.

-Follow-up: investigate ways to improve fisheries.

-Follow-up: investigate the effects of the technical proposals for adjacent areas.

Team 4: JCDP / UST

Main conclusions

-Flood is seen as an inconvenience, they live with it and do not fight it.

-Erosion is a bigger problem, preventing the char dwellers to invest in schools, houses, latrines, etc.

-The char dwellers predict flood, but erosion is hard to predict.

-The land is not concentrated on one spot to minimize the risks.

-Catkin reed can stimulate accretion and prevent minor erosion.

-To stabilize the Jamuna, char dwellers are willing to invest time and labour (not money).

-For a good flood forecasting of 1 to 3 days, data from gauging stations in India are needed.

Main recommendations

-FAP-24 prediction method is difficult to use for bank line prediction, although it could be useful for selecting catkin plantation areas (to target silt deposition). The costs are low and the effects can be very important.

-River training should be done slowly; adverse effects on the char dwellers should be compensated.

Team 5: Kushtia / UST

Main conclusions

-The spreading of arsenic contamination is not fully understood and results in uncertainty about the long-term possibility to withdraw arsenic from deeper or until now clean groundwater.

-There are independent approaches to the issue. A clearer division of the assignments and co-operation could help to fill gaps and change overlaps.

Main recommendations

-There is uncertainty among the community about the collection of lean water. Awareness programs are crucial at this stage.

-The first solution is the monitoring of tube well water and using this water for appropriate purposes. There are still enough safe wells according with clean drinking water, according to this team.

-The second solution is rainwater harvesting. Initial costs are high but maintenance costs are relatively low. There are doubts about the long-term value of this solution.

Team 6: CPP / UST

Main conclusions:

-Lack of monsoon water (’95-’97) is NOT the result of weather, hydraulic situation or capacity of the inlets, but because of early closure of the main regulator.

-Yield has decreased in the last 8-10 years with 33%, use of chemical fertilisers has increased with 50%. Land fertility has declined

-’98 flood has shown the embankment is not secure.

-FAP is justified economically not on flood control grounds but expected economic benefits through an increase in food supply. Yet the most cost-effective way to increase food production is by developing dry-season irrigation.

-Maintenance costs are equal to the damage costs of an average flood.

-There are no new conclusions on Peoples Participation and institutional problems.

Main recommendations

-Find solutions to the problems of siltation in the Lohajang.

-Find better ways to maintain embankments

-Shifts in agricultural practices

Team 7: CPP / KJDRP / UST / Uttaran

Main conclusions

-Conclusions about CPP are comparable with those of the previous teams (unlike some of the recommendations).

-There are serious waterlogging problems in the KJDRP area.

-The efforts towards acceptable Peoples' participation have grown over the past years in KJDRP.

-KJDRP is a complex technological water management piece of work. This, added to slow information sharing, makes it difficult to study.

Main recommendations for the CPP sub-project

-The size of the units (division in sub-compartments and chawks) is very small, this results in an enormous collection of water structures, which is very difficult to maintain. This study suggests that larger units would require fewer structures and therefore less maintenance difficulties.

-The group roughly concludes that CPP being an experiment, should not be replicated, and expensive lessons have been learnt.

Main recommendations for the KJDRP sub-project

-The proposed (technical) solutions should be in line with what the people want. This report concludes with enumerating the various plans and local opinions.

-In line with this, conclusions have been drawn about Tidal River Management (TRM). Depending on the area, the years of experience, the social and environmental impact assessments (carried out by EGIS); the group specifies for which rivers they think TRM is appropriate.

Team 8: LGED / SSWRDSP / UST

Main conclusions

-The local stakeholders identify projects. However, SSWRDSP has to meet a predetermined target (number of projects). This creates ambiguity between quantity and quality.

-The intention is to have stakeholders participate in all phases of the process. In practice Participatory Rapid Rural Appraisal is carried out too rapidly, and there is no participation during the feasibility and detailed design phases.

-The SSWRDSP design stipulates Beneficiary Participation for sustainable operation and maintenance - this shows how the beneficiaries are involved -. However, Participation is practiced quite differently.

Main recommendations

Most recommendations are directed towards participatory processes, and better training and supervision of the people involved. Some of the recommendations are:

-For Participatory Rapid Rural Appraisal (PRRA) the team should be encouraged and given the proper facilities (like transport).

-Water Management Co-operative Associations should get more support and training from the facilitator.

-The role of the Union Parishad (UP) should be intensified.

-The Local Contracting Society (LCS) should be trained, managed and supervised more (an engineer could be contracted to supervise the works).

Team 9: SSSUK / UST

Main conclusions

-The conclusion of the report is solely of a technical nature. Deep tube well water use, Rainwater harvesting and Pond sand filtering are the best solutions proposed.

-The first solution (DTW) is dismissed because of the risks and insecurity of deep groundwater contamination on the long run.

-The second solution (RWH) will be helping only a few families, and probably not the poorest.

-The last solution (PSF) will need an intensive study on institutional aspects because of the extensive use of it as well as maintenance importance.

Main recommendations

-Priority should be given to short-term clean water supply and not to research.

-Technical solutions are brought forward in this report which could be used for this (rainwater harvesting and pond sand filtering) - but how can one know which technologies are best suited without some kind of research prior to this?

-Another very important recommendation is to create awareness about the relation between health and the different water uses.

Team 10: SSSUK

Main conclusions

-There is no assurance that contamination of DTW is due only to improper installation, as some claim, therefore there is no assurance that DTW will remain arsenic free and that Bangladesh should all shift to using these.

-There is enough surface water for drinking purposes. However, pesticides, diseases and industrial pollution put a great hazard on the use of this alternative. Water availability is highly limited to the weather.

-There are widely known and available technologies to chemically remove the arsenic from the water. However, the long-term effects of these solutions on health are yet unknown.

-It seems there are disadvantages accompanying all suggestions. Merely a technical assessment is not sufficient; social, cultural, economical, institutional, geographical, and hydrological elements are playing a much bigger role in the determination of success.

-The DPHE in charge of the national Bangladesh Arsenic Mitigation and Water Supply Project possesses a large network of thana, district and division offices. It could play an interesting role, if not for other problems such as bureaucracy, corruption, lack of capacity, etc.

-NGOs could tackle the problem from the bottom up. Even though NGOs are strongly committed and motivated there is the problem of national co-ordination, technical professionalism, social status, lack of available funds, etc.

-Women play an essential role in household water management. Mitigation measures applied on a community level have implications on drinking water source locations, and direct social implications for the women.

-The lack of sense of community responsibility in the villages has an impact on operation and maintenance of household or community based options. In the case of arsenic mitigation, there could be a lack of responsibility emerging from a lack of education, awareness, or from the capital or labour intensiveness of installations. Like many problems, it comes down to a trade-off between short-term benefits, and economic interests, or between *today's food and tomorrow's water*.

Main recommendations

-In order to ensure operation and maintenance there is a need for strong motivation and institutional facilities. Peoples' participation is essential in the arsenic mitigation process.

-Short-term measures should provide immediate arsenic free water, and put less strain on extenuating future uncertainties. Community-based (vs. home-based) solutions generally have long implementation time due to the needed institutional set-up, and are not acceptable as short-term measures.

-With help of the NGOs it should be possible to implement home-based options.

-On the long term research should be followed to address health effects of chemicals used for arsenic treatment. Furthermore, there is need for reliable information about the occurrence, mobilisation and transportation of arsenic with respect to the role of tube wells.

-Create a sustainable institutional framework to provide the context for options. Responsibility and awareness building should be part of this process.

APPENDIX D: INTERVIEWS

Interviewees

Students
Jurjen Wagemaker, Jacco Zwemmer, Thijs Nix, Rene Lukasse
DUT educational staff
Willem Dijk, Jan Boes, Luc Rietveld
Coaching organizations
Others

Questions to students

General questions

Name?
Faculty?
Phone and (e-mail) address (of the team participants)?
How intensively did you prepare the trip? (duration, number of meetings, etc)
When did you stay in Bangladesh? (Months)
Who (un-)officially supervised you?
With what organizations were you involved?

'Before' questions

What did DUT/education require from you?
Why did you decide to participate in such a training?
What were you expecting before leaving?
Did you understand before leaving what kinds of trainings are done?
How did you prepare? Was it enough? What is the need for preparation?

'During' questions

According to you what have been the (technical/social) knowledge applied?
Would you have wanted to stay longer/shorter? Why?
What were the main problems encountered?
Are you satisfied with the number of students in your team? What is ideal?
How was the co-operation and teamwork? Problems and solutions?

'After' questions

What (technological/social) experience have you gained from this training?
How have your findings been used by the counterpart?
Do you feel your findings have been used by following groups?
What would you tell students who want to go there in the future?
What would you have done differently?
Would you do it again?

Questions to DUT educational staff

General questions

Name?
Faculty/organisation?
Phone and (e-mail) dares?
Did you supervise many students abroad? And where?
How do you feel about students going abroad?
What are the advantages from an educational point of view for training abroad?
How do you feel about trainings with an emphasis on 'experience-something-new' or 'apply-gained-knowledge'?

‘Before’ questions

What are the general requirements/conditions for training/graduating?
How do you feel about (lack of) preparation and efforts in planning?
How does an intensive or less intensive preparation influence the study results?

‘During’ questions

Are you satisfied with the number of students in a team? What is ideal?
What are the main problems students encounter when going abroad?
What are the characteristics of a good training?
What is the best way to supervise a student abroad?

‘After’ questions

What do you want the students to learn/experience from such a training?
Which faculties would you like to see represented in these trainings?
How do you see the future of student training?
Are you planning to supervise more students in the future? For which types of projects?

Questions to coaching organizations

General questions

Name?
Organisation?
Phone and (e-mail) dares?
Did you welcome many students from the Netherlands? Which faculties?
Who else (in the organisation) supervised the students? And what were the responsibilities?
Where would you like to see the emphasis (technical-social)?
Which faculties would you like to see represented in these trainings?

‘During’ questions

Was the time the students spent in Bangladesh enough?
Are you satisfied with the number of students in a team? What is ideal?
How was the co-operation and teamwork with and between students?
What do you think the students can achieve in these trainings? And what not?
What would you require from students coming to Bangladesh?

‘After’ questions

What specific area/aspect of the project would you like to see developing in the future?
How will you use the findings of the student teams?
Have there been ‘visible’ effects from the training periods?
What kind of information would you like to see in the reports?
Are you planning to welcome more students in the future? For specific projects/purposes?

APPENDIX E: EVALUATION PROJECT SET-UP

Activities

1. List the different participants (students, counterparts and mentors)
1a. Find up-to-date addresses. (Information gathered from reports, students' contacts, Willem Dijk and Jan Boes.)
1b. List them according to their respective project.
2. Read the different reports
2a. Compare conclusions and find contradictions from reports on the same subject
2b. Compare depth and quality of the results
2c. Observe any follow-up on previous reports
3. Prepare/Hold interviews in the Netherlands
3a. Prepare different questionnaires for students and mentors, on the subject of preparation, expectations, results, etc.
3b. Travel to Delft and hold interviews (around 10-15 in total) with students, DUT, CICAT (WSO), STAD, WTM, IHE, Mentors IO, TB, CT.
4. Compare the factors around a training period (answer the following questions)
4a. Did the expectations fit the results?
4b. What are the factors (like period of time, preparation, co-ordination, etc) that influence the results?
4c. How do these factors influence the results? What is the link between quality and time, preparation, expectations?
4d. Was the emphasis more on the students' experience or more on useful results for the counterpart (two elements)? (In Bangladesh)
4e. What are typical examples of the first situation and typical examples of the second situation? (In Bangladesh)
5. Prepare/Hold interviews in Bangladesh
    5a. List the different organisations to be addressed.
5b. Prepare questionnaires for Bengali organisations involved in the students' practical training, on the subject of expectations, results, and interest.
5c. Visits to the organisations and interviews (around 5-10)
6. Recommend steps for future training periods (answer the following questions)
    6a. How can a training period comprise the two elements described above?
    6b. Which projects will be emphasised?
    6c. How will the co-operation be with DUT?
    6d. On what kind of financing will we focus?
6e. What should be the character of the training and research periods? ('Learning' training, group training, Masters thesis training, etc.)

Planning

Practical work for this study will take a minimum of 2 months (January 1st to April 1st), 5 days/week, 8 hours/day. In May the report will be finalised and there is a time of preparation in December. It will come to a total of 400 hours work. The following table is divided into 10 weeks. The trip to Bangladesh is included. The exact date of the trip has to be set but a change will not influence the invested time.

The numbers in the table correspond to the activities described above.

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	
Preparation	1	1									Finalisation
	2	2	2								
			3	3	3						
					4	4	4	4			
							5	5			
									6	6	