



**Community Water Supply and Sanitation Programme
Pokhara
Swiss Association for Technical Assistance
SATA**

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N P. W E 85

FINAL REPORT

**COVERING FIVE YEARS OF WORK
1980 - 1985
in the**

**COMMUNITY WATER SUPPLY
AND SANITATION
PROGRAMME**

**WESTERN DEVELOPMENT REGION
POKHARA**

NEPAL

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POKHARA
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Community Water Supply and Sanitation Programme
Pokhara
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SATA

PREFACE

" A journey of a thousand miles begins with ONE step "

Since May 1980 I have been working in the Community Water Supply and Sanitation Project in Pokhara. The work I have done during these five years has mostly satisfied me very much, but at times I was inclined to give up.

Without the help of many friends my work in Nepal would for many reasons not have been possible.

I therefore want to give special thanks to Han who always supported me in working as well as in private matters like a good friend.

Also many thanks to Datta Tray Roy, my friend from UNICEF, Man Bahadur Pun, my Nepali tutor and colleague, Durga Prasad Subedi, with whom I enjoyed many trips in the field, Kubir Jang Gurung and Bhadra Bir Gurung who helped me in my private affairs.

Many others whom I have not mentioned by name - my friends from the MPLD office, the people in our projects and especially the Village Maintenance Workers - have given me a lot of *dukha, sukha*. They have shown me that given the right environment a lot can be achieved in this country, something for which I am grateful to all.

And finally many thanks to Nepal, the beautiful country, that gave me so much of its own during the last five years.

POKHARA 25.3.1985

Heini Mueller

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CHAPTER 1

INTRODUCTION

In the Western Development Region of Nepal, the Swiss Association for Technical Assistance (SATA) is assisting the Ministry of Panchayat and Local Development (MPLD) in constructing water supply and sanitation projects. The Swiss government is donating funds through UNICEF for the supply of materials. The technical SATA staff posted in Pokhara are assisting the Regional Directorate (RD), with the implementation of water and sanitation projects.

During my five years involvement in this work, special efforts have been made to improve the construction quality of the drinking water projects.

Since I have worked as a craftsman before it was natural to take the task of training in vocational skills. To understand to what level our water supply and sanitation technicians have to be trained, I spent considerable time to review the project quality. Only with this experience it was possible to create training curriculums and to train the technicians appropriate to their work.

However we realised that even the best constructed project cannot continue to function if there is no arrangement for maintenance. In the last five years gradually increasing attention has been given to this aspect, especially through the training of Village Maintenance Workers.

The fact that the planning of the construction of our traditional stone masonry tanks was posing big problems, combined with a new influx of ideas brought us to undertake experimenting with ferro- and bamboo cement construction. The new approach has served our programme well and has very much increased our design possibilities.

The need of clean water is very great for many thousands of people in this country. But without preserving the remaining forests, the natural sustainers of the water sources, the construction of a drinking water project would be only half work. Therefore a special project, smokeless chulo stoves, was introduced in 1983 within the CWSS programme. This project is now running smoothly and the efforts we have made during the last years are now paying off.

More and more it turns out, that not only the construction of drinking water projects is essential. The engineering part of our work can to a large extent be standardised and solved. Other aspects like promotion of sanitation, health education, village communication, maintenance and smokeless chulo stoves, are not only more difficult but in the long run also more crucial for an effective project.

To do all this projectwork a very good team spirit is absolutely necessary. I was glad to work in such a good team for the last two and a half year in the rural water supply and sanitation programme in Pokhara.



Community Water Supply and Sanitation Programme Pokhara

Swiss Association for Technical Assistance
SATA

CHAPTER 2

IN-HOUSE TRAINING

Since 1977 SATA is involved with experts in the community water supply and sanitation programme in Pokhara. Initially the major problem was to find the technical staff to build the watersupply systems. As skilled people are difficult to get in rural Nepal, ex-soldiers from the British and Indian army (Barkhalis) were recruited. Because they would already have received a basic technical training while in military service, it was assumed that they would be skilled enough to build water systems for the CWSS programme.

But soon it was realised that their skill had been overestimated and that they had to be taught how to properly build a drinking water scheme.

Because of the monsoon climate in Nepal drinking water projects have to be built during the dry season. The best time therefore to conduct any kind of in-house training is the rainy season. Work is very hard or even plainly impossible during the monsoon and the project work has to be stopped due to:

- near daily rainfall.
- the villagers, who have to do volunteer work for the project do not have time, because they are busy with farming especially planting rice .
- the necessary material for the project can only be transported with a lot of difficulties, because of the high waterlevel of the rivers.
- there are too many leeches near the water source, which makes it impossible to work for the villagers as well as for the technician.
- many of our fieldstaff are farmer as well and they want to work at home during that period.

These reasons illustrate how difficult it is to do a good job in the village during the rainy season .To avoid that we have to send all technicians home during this time, training courses were usually held during these months.



**Community Water Supply and Sanitation Programme
Pokhara**

Swiss Association for Technical Assistance

SATA

In order to be able to do good projectwork the fieldstaff has to be trained in a whole array of skills and tasks.

Technical skills

- masonry work
- plan reading
- proper laying and joining of pipelines ,both HDP and GI
- plumbing work
- correct spring capping
- absorb new technologies like ferro- bamboocement work
- correct latrine constructions of private as well as school latrines

Additional skills

- organise village labour
- solve conflicts properly
- properly communicate with the people involved in the project
- organise material transport
- organise a reasonably successful maintenance system in the village
- communicate his knowledge of smokeless chulos and sanitation to the villagers
- act like a promotor for rural development, e.g. show how to make small bamboo cement containers

In other words, the water supply and sanitations technician (WSST) must be a very capable man in all aspects of his work. As most WSST have not passed the School Leaving Certificate (SLC, lowest Nepali educational qualification) it is clear that as a rule the technicians are severely overtaxed by the extensive tasks and responsibilities. The knowledge base is lacking for such a demanding job, and within the project we are only partially able or successful to give specific training.



**Community Water Supply and Sanitation Programme
Pokhara**

Swiss Association for Technical Assistance

SATA

Special training

Ferrocement

This special training was given for the first time in 1983 to a selected WSST group in the field, as a practical part of that new technology in our CWSS programme. Two water tanks were built each of 10 000 lt. The training was 3 weeks, and each WSST was able to build a ferrocement tank by himself afterwards. Then in 1984 again a practical training was organised in the field, this time for the remaining technicians. Within the Dulegaunda rehabilitation project two 20 m³ Ferrocement tanks were constructed.

Smokeless Chulo

In the summer of 1981 the first training on how to install and to monitor a smokeless chulo stove took place. At this time the chulos were made with mud and cow-dung. With the support of UNICEF (Mr. A. Bachmann) a second training was held in 1982. This year, the new pre-fabricated "New Nepali Chulo, -Type MAGAN" was introduced for the first time in our CWSS programme training.

Bamboo cement tank

In 1984 the first Bamboo reinforced water tank construction training was conducted during a period of total 15 days. A few very qualified WSST constructed a tank of 4500 lt. During the rest of the monsoon again a total of 4 Bamboo cement water tanks were constructed at various places around Pokhara.

Health education

In 1984 all WSST participated in a special health education training at the medical campus in Pokhara. During a 7 day training basic and detail knowledge about environmental hygiene and sanitation, personal hygiene, water and food, excreta and water-borne diseases were refreshed.

Project coordination course

Since 1984 the leaders of the water project committee together with the WSST have participated in a special communication workshop. During this workshop they have the opportunity to discuss together with office staff (administration) the best possible ways of the implementation of their projects. Also the workshop enhances understanding, provides a forum to exchange experiences and explain HMG's different policies concerning project implementation.



Community Water Supply and Sanitation Programme
Pokhara

Swiss Association for Technical Assistance

SATA

Sanitation

Since 1981 every year the rainy season has been used to train the WSSTs how to construct different types and designs of private and school latrines. Altogether around 45 latrine units in and around Pokhara could be constructed in this manner. The heavy rainfall during the months of July, August and September makes it a risky affair to build larger sets of latrines because of the danger of caving in of the latrine pits. Special measures have to be considered and subsequently taken to prevent this occurrence. This has been quite a good experience process for our technicians.

Beside this special trainings every year since 1982 the WSST have got refresher courses about all subjects related to drinking water projects.

The recruiting of new WSST is very important for the CWSS programme. Every year the project volume has been increased, which is a good development, as long as there are enough trained WSST to ensure, that the quality of construction work can be maintained. Thus after recruiting new staff they also have to be trained in a proper way for their future work. The new WSSTs have to pass quite a lot of courses before they get the WSST certificate. Over the years the training schedule has matured and is now well established.

First they have to pass a 6 week training, the so called basic foreman course, which gives them the initial theoretical knowledge and practical skills. Next, they are sent out to a project site together with an experienced WSST to do practical project work in the field for at least one full construction season.

In the next rainy season the upgrading course will take place which again lasts for 6 weeks. Again one full construction season the new technician will have to work under the supervision of an WSST and is then allowed to participate in the final foreman course. Once he has successfully passed out of this last course, he is allowed to call himself a water supply and sanitation technician. A very long time he has to learn, total 2 years in order to get the WSST certificate. This system has been developed in the last years in order to hold up the good quality of CWSS-project work for which the Western development region is well known in Nepal.

To set up these training courses has been quite an effort and would certainly not have been possible if a reasonable foundation had not been laid by earlier collaborators in the CWSS programme. In this context I especially want to mention Mr. Lekh Bdr. Gurung, who has developed all teaching material and course schedules for the basic-, up-grading and village maintenance worker courses.

Community Water Supply and Sanitation Programme
Pokhara



Swiss Association for Technical Assistance

SATA

With all the various courses it was not any more possible to manage all the work properly and therefore SATA employed a training coordinator. Mr. Pun took over all my training work and created new courses like: health education and village leaders courses specially oriented on communication. It may be noted here that already in earlier courses the emphasis on good social communication was present in the WSST refresher courses, through the kind services of my friend Datta Troy Roy, communication specialist with UNICEF.

Anyway, the success for all kinds of trainings conducted in the last 5 years since I was training in-charge was based on good relations with all people involved in the training programme of CWSS.

Since 1984 the CWSS programme is not any more conducting basic-, up-grading and final foremen courses on its own. This part of the training programme could be handed over to the Panchayat Development Training Centre in Pokhara. With active support from our programme they are now able to turn out technical personnel of a standard which is quite acceptable. The arrival of German Volunteers responsible for training preparation and management in PDTC has contributed greatly to an improvement of the quality of the training courses run by PDTC. The fact that the CWSS programme can now rely on the Panchayat Development Training Centre for WSST trainings has indeed created a considerable work reduction for our programme.

Still the training component of our programme is quite time consuming, and the technical aspects of the special training courses needs to be partly standardised to provide a further reduction in unnecessary workload. Conducting these special courses depends still too much on foreign experts, and a shifting of responsibilities for the development and running of the courses to capable Nepali staff is essential in the near future.

A next step in the development of our type of trainings could be the establishment of a kind of standard curriculum for the training of water supply and sanitation technicians, which would be valid for the whole country. An attempt to achieve this was made by scheduling a meeting in Nepalganj in 1983. Due to the heavy workload of the UNICEF and SATA staff involved, the meet never took place. Still the urgency to realise this type of standardisation is very great.

By having WSST trained country-wide on the same standard, the certificates the technicians are getting, are more likely to be recognised and thus to be then of a real value to them.

An other important aim of our continuing training efforts is, that the technicians, further strengthened by their working experience are spreading their knowledge to other people, or even that they start their own business. This country needs urgently qualified workmen in order to upgrade any kind of handwork trade.



Community Water Supply and Sanitation Programme Pokhara

Swiss Association for Technical Assistance

SATA

CHAPTER 3 MAINTENANCE

For many villages a drinking water project is not a new thing. They have built water schemes since long mainly for two purposes: irrigation of terraces and fields, and drinking water. This water is supplied in open channels and unprotected against any contamination.

The lack of understanding for the link between clean and contaminated water is demonstrated by the fact, that every 5 th child dies before its 5 th birthday. For the average Nepali it makes no difference, whether the water is clean or not, as long as the water is tasting good and is near by.

Often the community is maintaining their own water project carefully, because it depends on it.

If a new, piped, water project has been built in the village one of the problems the villagers have to manage is to maintain the new drinking water project. Because the new drinking water project is a new technology for the villagers, they are not familiar with it. New, unknown things have to be explored, and naturally, when taking apart a brass tap, it will get damaged. Not knowing how to fit it together, causes uncertainty and the villagers leave it as it is, damaged. But not only lack of knowledge is hampering the project maintenance also the communication gap between HMG and the villagers is an important factor.

From the beginning of the project the villagers should get the feeling that they are building their own water scheme together with HMG.

HMG is not able to maintain all the projects it has built. It would not be appropriate either, because rural development in Nepal is based on villagers participation. It is the duty of HMG to assist the villagers to maintain their project through:

- supplying the villagers with necessary material that is not available in the bazar.
- train responsible people from the village in maintaining their new water project.

In order to fulfill these responsibilities, HMG has set aside since 1983-84 a special maintenance budget. Since then, the maintenance, rehabilitation activities have gradually increased. It requires active support from all technical and administration staff to ensure a proper implementation of that special task.



**Community Water Supply and Sanitation Programme
Pokhara**

Swiss Association for Technical Assistance

SATA

Most important however special emphasize has been given to train the responsible persons from the villages for maintenance.

In 1979 the first village maintenance worker course has been conducted. Since then every year VMW trainings were held and a total of 212 village maintenance workers have received training from our office.

An attempt to improve the training standard has been made in 1983. Then for the first time the training was conducted in a rehabilitation project. Before, from 1979 to 1982 all trainings were held in the Panchayat Development Training Centre at Pokhara.

By having the course in a rehabilitation project the trainees had the opportunity to learn to maintain a project in a practical way. This approach has satisfied all involved people, as well as the village where we maintained the project.

This type of training must be as much as possible praxis oriented. A VMW (village maintenance worker) is supposed to be a practical worker and practical experience can not be gained only in a classroom. It is less important whether he has got education as that he is motivated to do the work for his community.

This practical training is an integrated part of the maintenance policy of RD Pokhara. When we started going to the field with the VMW course nobody had had experience in conducting field training in our office. With two of our overseers I did more or less the whole work. This was not a satisfactory situation and changes in the sense of handing over of the preparation and the management for the VMW course was absolutely necessary.

In 1984 the course was conducted in Bhansar in Tanahun district. With only little assistance from my side the three overseers, Mr. N. B. Ghansee, Mr. G. S. Pun and Mr. D. P. Subedi have done nearly all the work. This was quite a step forward to hand over the VMW training part of the CWSS programme.

In this year, the preparation as well as the management of the village maintenance worker course was done very capably by our overseers. This clearly shows me that the Nepali staff of the RD is capable to do training work by themselves also for the future.

An interview

During the first village maintenance course which was conducted in the field, in Sirsekot, I discussed with a maintenance worker about his project and about the changes it has brought for him and the village.



**Community Water Supply and Sanitation Programme
Pokhara**

**Swiss Association for Technical Assistance
SATA**

And so Mr. Chandra Bahadur Thapa told me:

I am living in Dewa, Arghakhanchi District. Our project work for the drinking water system has been started in 1982. The work was finished only after one and a half year. We have built a very big water system, with 23 tapstands and 3 break pressure tanks. I did not work right from the beginning of the project work, because I am a farmer. But gradually I was getting motivated by Barath Ji (the water supply and sanitation technician, WSST who is building the project together with the villagers) to do also project work together with him. So I have learned all new things about the project while building it. Now since we have drinking water in the village, life has become far easier. Before we had a project, our women had a very strenuous worktime and only for drinking water collecting they have spent around 5hrs a day. Now the women can do more field work, because collecting water our children can do now. My wife can collect more grass for our two buffalos, so we are now also getting more milk from them, which makes us healthy. She also can collect more firewood, for which she has to go very far. The new water project has made life quite easier for us.

In 1974, we had made a meeting about a drinking water project. We requested the district for money to buy cement and pipe. But we did not know how to build such a project correctly. So we have taken the water from the nearest spring and have stored the water in a pond in the centre of the village. But we were getting sick from this brown water, because all animals have also taken water from the same pond as we did. Then, a politician from our village has requested on the official way, through the district assembly a new drinking water project from RD Pokhara. He did a very good work for our community. We all were very happy when you came and held a meeting with us about the new project. Then when the work started we have collected sand and stones and have dug the pipeline and have transported all material like cement and pipe from Phatrakot to the village. (a porter with one bag cement, 50kg needs 3 full days to reach that village) After I have learned to do project work, the village elected me for the maintenance worker. They will give me 100.- NC per month for this work but I think they should give me 200.- NC, because there is a lot of work to do. But this I have to discuss with them when I return home after this training.



**Community Water Supply and Sanitation Programme
Pokhara**

Swiss Association for Technical Assistance

SATA

MAINTENANCE ACTIVITIES IN RD POKHARA

1979 - first village maintenance worker course
Total 35 participants

1980 - second course
Total 26 participants

Local Development Ministry had agreed that proposals for maintenance management be formulated by the RD.

A two member team, W.Schramm, GVS volunteer and L.Bdr. Gurung, overseer took on the task of making a proposal. Monitoring of 45 previously completed water supply systems by these two people.

1981 - Third VMW course
total 15 participants

Maintenance management proposal completed by W. Schramm and L. Bdr. Gurung.

A few major observations and results:

- Water supply designs and construction standards which have been introduced by SATA engineers in 1976-77 and which are based on earlier experience by SATA in Africa, have in the main had a major impact on system maintainability; whereas schemes completed under the so-called regular programme exhibit failure of structures calling for major repairs. Failures in the systems built after 1976 and being based on the standards mentioned above, are of minor nature to a large extent.
- A proposal for stagewise implementation of a comprehensive maintenance management scheme is made indicating shared responsibilities for RD and District level offices and villages, specifying procedures eg Village Maintenance Agreement and listing manpower requirements, job descriptions, training and material needs as well budgetary requirements.

1982 - Fourth VMW course
Total 28 participants

Two rehabilitation projects completed, Ghachok and



**Community Water Supply and Sanitation Programme
Pokhara**

**Swiss Association for Technical Assistance
SATA**

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Seminar in Pokhara, MPLD/UNICEF setting up guidelines for maintenance and rehabilitation activities in the CWSS programme.

1983 - Fifth VMW course

First time training conducted in a rehabilitation project.
Total 22 participants
Total three maintenance projects finished; Tilahar, Dumre and Tharpu.

1984 - Sixth VMW course

Total 49 participants
Second time training conducted in a rehabilitation project.
HMG for the first time included a separate budget item for maintenance in the construction budget.
Total 8 major maintenance projects finished.
Total 18 maintenance surveys done.

1985 - Seventh VMW course.

Total 37 participants
Third time training conducted in a rehabilitation project.



Community Water Supply and Sanitation Programme Pokhara

Swiss Association for Technical Assistance

SATA

CHAPTER 4 Ferrocement

In 1979 the first ferrocement water tank has been constructed in the Western development region. In the following years, slowly and very carefully, this new type of tank construction was tried out. Carefully, because nobody was willing to take the risk of a leaking tank.

At this time nobody had any real experience and it had to be tried with the manual nearby. Initially the technicians and the villagers were very sceptical towards the new type of water tank. The WSST were used to build the solid and long lasting type of masonry water storage tank of which the designs had been worked out in Cameroon.

For many reasons, this impressive looking solid water tank is in reality not so strong and carries a great risk of leaking very soon. An other important factor is, that a 38m³ masonry storage water tank is consuming a huge amount of material in stones, sand and cement.

In order to cover the tank, an arch is constructed. To build this arch a special frame has to be transported to the village and after its use transported back or to the next drinking water project. This transport for the archframe as well as for the cement, was paid from HMG. This transport was on the one hand a fairly expensive affair for HMG and on the other also a management headache in the sense that the archframes often seemed to be there where they were not supposed to be. All the above mentioned reasons made it imperative to look for an other solution for tank construction.

The SATA engineers in Pokhara through their trials had gained the confidence that ferrocement would be a viable option. In addition the fact that a ferrocement reservoir as compared to a stone masonry built storage tank is a cheap as well as a solid construction method, that it requires less material on the part of both the government and the villagers, that it can be completed within three weeks and that it does not require a "imported" shuttering were reasons enough to push the changover to ferrocement water tank construction in the programme.

The first designs have been redesigned in 1983 and a new standardisation has been made. At the same time the first batch of technicians received a practical training in ferrocement construction in Sirsekot/Syangja.

In the construction season 1983-84 all new storage tank were constructed in ferrocement. A few old type, masonry storage water tanks were still under construction in that construction season. This construction season, 1984-85 storage tanks are being built exclusively in ferrocement. The quality is very good. And the WSST are convinced about the quality and possibilities of this construction method.



Community Water Supply and Sanitation Programme

Pokhara

Swiss Association for Technical Assistance

SATA

Still the villagers have their doubts about the new technique.

- ? The only 5 cm thick wall is too thin, it will break when it is filled with water?
- ? The haircracks in the cement roof is proof for the villagers that this construction method is not as solid as the masonry type of water tank?
- ? Bad people can damage the water reservoir too easy?
- ? If the tank needs maintenance, the village maintenance worker does not know how to maintain or to repair it properly?

These doubts about the ferrocement water tank are understandable, because the average villager believes only in a proven and very strong (say thick) construction.

The doubts of the villagers are in themselves important but can be overcome through good communication and good constructionwork by our technician! For our overseers and engineers a few questions posed themselves when we started with ferrocement.

- What influence does underground or overground construction have on the life of the ferrocement tank?
- What damages can occur when acidic earth is touching the cement wall, and how can this be avoided?
- What sand quality is necessary to build a good and long lasting water tank?
- What is the minimum reinforcement when taking into consideration the relatively poor quality of steel bars, plain wire and chicken wire?
- How to make the shuttering for the wall and the roof construction so that the material can be used for all sizes of ferrocement tanks?
- How to keep the water cool in the storage tank?



Community Water Supply and Sanitation Programme
Pokhara

Swiss Association for Technical Assistance

SATA

These are only a few questions which we faced when we designed the standardisation for the new ferro-cement tanks. Designs from other regions of Nepal gave us some good and useful suggestions for our revised standardisation designs.

On the other hand, while designing the new standardisation I also realised that there are some few, but nevertheless important disadvantages like:

- The reinforcement material is not yet manufactured in Nepal and therefore sometimes also not available in the local market.
- In the case of any damages, the village maintenance worker is dependent on the help of our office. We have to train these village maintenance workers also in this subject to make sure that the VMW can do maintenance by himself in future.
- The normal cement work, the Nepali skilled labourers are used to making is not good enough for a ferro-cement tank. The WSST therefore has to bring skilled labour from Pokhara to the village.
- Although the WSST knows how to build a ferro-cement tank he needs supervision. A few of the supervisors unfortunately still do not really know how to build a ferro-cement tank. Especially the lack of hands-on experience on the part of the overseers is an impediment for good supervision.
- For ferro-cement fresh cement should be used, or at least the best cement that is available.
- Exact work is essential for the ferro-cement tank.
- The sand quality must be very good and for that the villagers have to collect the sand sometimes from very far away.

These are some of the disadvantages of the new ferro-cement tank. Or rather not so much disadvantages but rather factors that influence not so critically other methods of construction.

But the advantages are far more, so that the introduction of the ferro-cement tank is more than justified.



Community Water Supply and Sanitation Programme Pokhara

Swiss Association for Technical Assistance

SATA

- The construction of the tank takes only three weeks which is very short compared with a masonry tank.
- It is a very cheap type of reservoir, because a lot less cement is necessary and therefore the portage charge is also less.
- The contribution of the villagers is far less than for a masonry tank.
- Arch-frames are not any more necessary for the roof construction.
- The 32mm HDP pipe used for the shuttering of the tank can be used afterwards for the water distribution network of the project.

These are the advantages of the ferrocement tank. Certainly the cost (refer to table) and the transport of the material have been decisive in introducing the ferrocement tank construction in the Western development region.

COST OF VARIOUS TYPES OF TANKS

cost in Nc.	4.5 m ³ bamboo	5 m ³ ferro	10 m ³ ferro	9 m ³ stone	22 m ³ stone	20 m ³ ferro
CWSS-Progr.	4500	13500	19000	23000	40700	24800
Village	1200	1300	2100	5500	10500	3200
Total	5700	14800	21100	28500	51200	28000

From the table it can be seen that the construction cost of the ferrocement tank is considerably lower than the stone masonry type. For example the cost at the roadhead of the 10 m³ tank is 19% less than the 9 m³ (compensated for volume/cost ratio), and the 20 m³ even 35% less than the 22 m³. The differences between the community contributions for the various tanks are even greater.

The cost of a bamboocement tank are estimated at Nc. 5700 if all the cost have to be borne by the agency. In case the villagers are putting in their own labour and locally available materials the bamboo tank can already be made for roughly Nc. 3000.

In fact, about 98% of our programme is located at hilly regions which means that more or less all the required project material has to be carried by people to the project side. Only 10% of our drinking water projects can be reached by road. The



Community Water Supply and Sanitation Programme Pokhara

Swiss Association for Technical Assistance

SATA

rest of the projects are as far away as 1 to 5 days walk. Hence ferro-cement construction makes a big difference in transport cost for our programme. In addition it also means a reduction in *Dukha* for the villagers who have to collect less sand and stones from often far away.

In the last two construction seasons-1983/84;1984/85-a total of 35 ferro-cement tanks have been constructed. An achievement much liked by Nepali villagers with their penchant for tanks.

But not only water tanks can be built with this new technology, also ferro-cement squatting slabs and water break pressure tanks are being constructed successfully in Nepal. Ferro-cement allows a very flexible kind of work. In the long run I believe that the ferro-cement construction will be an integrated part of developing work in Nepal, because it saves material and money for the government, as well as strenuous work for the villagers.

CHAPTER 5 BAMBOO REINFORCED WATER TANKS

This type of new technology was introduced in 1982. In order to find again a cheaper method to build, or even to repair ferro-cement tank leaks, we started research work on bamboo-cement.

The first experiment was made with two ready-made baskets. We plastered the inner and outer side with mortar. The containers were filled with water to test its water tightness. They have been filled for the last two years and still are not leaking. One of them was partially destroyed, to see how the bamboo looks but no deterioration was found.

The second experiment took place during the village maintenance worker course in 1983 in Sirsekot, Syangja District. A 500lt. container was built and since two years no leaks have been seen. In Sirsekot we made the first experiences on how to construct a *pukka* bamboo cement tank.

The success encouraged us to conduct a special training with a few WSST. In 1984, during this training a total 5 bamboo reinforced water tanks were built. The capacity was ranking between 1000 lt and 4500 lt. Different type of bamboo were used for the reinforcement in order to find out the best and most appropriate bamboo type. The bamboo type is an important factor for the life-span of the tank. Together with the WSST I gained quite a lot of experience and I feel it is worthwhile to train all our WSST in this new type of work.

Many of our WSST are requested in the village where they are building a water project, to help the villagers to build private



**Community Water Supply and Sanitation Programme
Pokhara**

Swiss Association for Technical Assistance

SATA

water tanks or even water tanks were the district has given the necessary material like pipe and cement. Mostly the villagers do not have the money to buy expensive steel-bars, chicken-wire and plain-wire to make a ferrocement tank. A bamboo reinforced tank is much cheaper for them, because bamboo is available everywhere.

It has come into praxis that were we have build a school latrine that instead of a expensive water drum, a bamboo water container is being built. These small containers are easy to build and very cheap. A farmer, living near by a school latrine were we also have built a bamboo cement container, adopted the new idea and has built his own bamboo reinforced water container of 200 lt.

If villagers start copying such technologies it shows me that we are on the right track. Still some tricks how to make a bamboo reinforced water tank or container must be known.

The main problems with bamboo reinforced containers are associated with the proper bonding between the mortar and the bamboo net. Also when building a bigger sized tank the joints of the bottom and roof with the wall requires attention. One should not be too much fixed using only local materials. It is better to put a few meter chickenwire in the joint between the bottom and the wall. Smaller size containers do not require this "to be on safe side" measure.

What effect does it have when one makes the bamboo reinforced tank underground? I do not know what will happen when the tank is in contact with mud, without protection. But I assume that it will affect the shrinkage of the bamboo. The bamboo is always wet and the damage could be that the bamboo will too soon decay. If the tank is built overground, this may not happen so soon. That the bamboo once will rot I think is unavoidable. Therefore the lifetime of a bamboo tank will be not more than say 8 to 10 years, which is quite acceptable relative to the cost of construction, which is about 3000.- NC or 180.- US\$ for a 4500 lt. tank.

During the bamboo cement tank construction, we were trying to use the local knowledge on bamboo as much as possible. Local people told me, to cut the bamboo used for that kind of special activities only by full moon and at midnight. Local people know a lot about the best use of bamboo, and they are familiar with its weaving technique. It therefore should not be too difficult for them to learn to build bamboo reinforced water tanks for their own use.



Community Water Supply and Sanitation Programme
Pokhara

Swiss Association for Technical Assistance
SATA

Bamboo cement activities

- 1982 The first two bamboo cement containers were made on the compound of RD Pokhara.

- 1983 During the village maintenance worker course at Sirsekot the first bamboo cement tank was constructed, 500lt.

One of our WSST built a 2500lt. tank during a training for new peace corps staff.

For a school latrine at Phul-Bhari, Pokhara two water drums were constructed, 2x300lt.

For two private latrines at Pokhara two small containers were made of each 50 lt.

One latrine superstructure, similar to the type built in Zimbabwe, was made at RD Pokhara.

- 1984 The first bamboo reinforced water tank training was conducted with 10 WSST. During this training, the following tanks were constructed:

- One 4500 lt tank at Nadipur Pokhara.
- One 4500 lt tank at Arwa CWSS.
- One 4500 lt tank at Naya-Bazar primary school.
- One 1000 lt tank at Naya-Bazar primary school
- One 1000 lt tank at RD Pokhara.

Not during the training was built:

- One 2000 lt tank at Arwa CWSS.

- 1985 One 2000 lt tank at Sunpandeli.

This list shows the bamboo cement construction activities during the last three years within the CWSS programme in Pokhara. To include all activities our WSST have done in their private time is not possible and I think also not necessary. It shows enough that this activity is likely to increase in the next years. I feel that bamboo reinforced water tanks will turn out to be a quite attractive and possible alternative to solve water storage problems in the villages in the hilly regions of Nepal.



**Community Water Supply and Sanitation Programme
Pokhara
Swiss Association for Technical Assistance
SATA**

CHAPTER 6 SMOKELESS CHULO PROGRAMME

Since 1983, SATA Pokhara is involved in a smokeless chulo programme. The programme aims to introduce a type of stove which is a lesser burden for the environment and beneficial for the people that use them. As less firewood is needed for cooking (50-70% of the quantity of firewood needed for traditional stoves) an important decrease in firewood consumption can be achieved. This in turn will lead to a reduction in the present rate of deforestation. It is obvious that the conservation of wooded hills is in the interest of the CWSS programme, because sufficient vegetation in watershed areas increases the reliability and yield of our sources and reduces the risk of landslides in higher areas. This will enhance the continuous proper functioning of the drinking water projects.

Afforestation as a rule being beyond the capacity of our programme, the introduction of smokeless chulos in our project areas is the least that can be done to conserve the forest and make the yield of drinking water sources more reliable. Forest conservation is obviously a major reason why the CWSS-programme is engaged in the introduction of smokeless chulos. However, next to the supply of water, the main long-term goal of any water project must be the improvement in health and well-being that can be generated by an adequate provision of water of good quality.

The installation of smokeless chulos will lead to a direct improvement of well-being and health of the users because the smoke now disappears through the chimney and does not enter the house any more. In this way it contributes considerably to reaching the general goal of health and well-being.

The programme employs presently total 4 smokeless chulos technicians (SCT) and their work is coordinated by SATA Pokhara.

TRAINING

We started to train local potters for our programme since two years. The first training was held in Pokhara, where 5 potters have learned how to make the new MAGAN chulo.

Since they are producing the new chulo in Pokhara, we are independent from Kathmandu from where we got the first stoves for our programme. The potters have gradually improved the quality of the chulos, but not without pressure from our side.

Another training took place in the month of January and



Community Water Supply and Sanitation Programme Pokhara

Swiss Association for Technical Assistance

SATA

February 1985 at Bhar-Khola, Syangja district. There total 9 potters received training and are now producing a very good quality of stoves.

In preparation for next potter season one Smokeless Chulo Technician (SCT) is doing survey where a next training can be conducted. This work is time consuming and it needs an experienced and flexible technician.

QUALITY CONTROL

The quality control is a very important part in our programme. In Pokhara, as well as in Bhar-Khola the work of the potters must be supervised and checked by our technicians. Only the stoves that pass our fairly rigid quality standards will be used for the programme.

To make sure that we are measuring with the same yardsticks, all potters have measurements and forms for all important openings and measurements for the stove and the chimney pipes. It still can happen that the SCT has to refuse chulos and chimney parts because of the incorrect measurements. The measurement and quality control will take place before the stoves are being fired, so that the refused parts can be used again by the potters. This relatively strong checking is absolutely necessary, and our SCT have been specially trained in this direction.

One potter fired 50 sets of chulos without the quality control mark on his chulos from our SCT a few months ago. The SCT refused the whole batch of chulos, which was quite a shock for the potter.

Still the damage was not too big for him, because the UNICEF field officer in Pokhara (who is absolutely not cooperating with our programme, although we are working in the same office-building) has bought all 50 sets of chulos for his own smokeless chulo programme.

PROMOTION OF CHULOS IN THE VILLAGE

During the construction season 1984-85, the promotion of chulos has started in very far located areas of the Western region. In Arghakhanchi district we made a special fieldtrip, together with the mobil communication team. The communication team is well equipped with all necessary facilities to show films and slide shows in remote areas. In a total of 4 drinking water projects we presented a special programme about water and sanitation, maintenance and smokeless chulos. Around 5000 people came to see the various programmes. At the same time we carried a chulo with us and demonstrated the use of the new chulo. Also discussions about the advantages as well as the disadvantages of the chulo were held. Altogether 40 sets of chulos



Community Water Supply and Sanitation Programme

Pokhara

Swiss Association for Technical Assistance

SATA

were stored in Phatrakot, the nearest roadhead of the district. Within a few days the chulos were transported to the village by the people themselves. Our WSST, who is working in this region, made sure, that the chulos are being correct installed. The 40 sets were by far not enough for this region. A potter training feasibility study, was also conducted.

Maybe the Arghakhanchi district is an exception, in the sense that there is hardly any forest left. The need of a firewood saving stove is beyond all imagination.

Not only in the Arghakhanchi district the promotion of the new stove has been taken place. In total 19 drinking water projects in 8 districts smokeless chulo were promoted through our communication programme.

Finally, the hope behind our smokeless chulo promotion programme is, that the new chulo is going to be well known by the villagers and that the stove is made locally in the hilly regions of the Western Development Region. If this is to happen, the demand for the new Nepali stove will likely also require their availability in the market.

A first step towards commercialization has been realised. A smokeless chulo selling shop has been opened since one month in Pokhara. In the first time the shop is being supported from our programme, but within a reasonable timeframe the shop has to be independent from our programme.

Our programme aims to benefit the villagers, and for a proper implementation a good management must be organised. To transport of smokeless chulos to remote located villages is not easy and many logistic problems had to be solved.

Chulo transport

The transport of the chulo is indeed a very delicate affair. Often when the chulos are not well packed breakages are unavoidable while carrying it to the village. Since we made a special bamboo basket, where we can fit in a full set of chulo parts, packed and upholstered by straw the breakage of chulos during the transport has become to a negligible.

Transport money

We are anxious to bring the pre-fabricated chulo to the roadhead of a village where we are implementing a drinking water project. Very often the village is far away from the roadhead and the villager have to carry the chulo by their own to the village. If the project is too far away from the roadhead, a poor



**Community Water Supply and Sanitation Programme
Pokhara**

**Swiss Association for Technical Assistance
SATA**

farmer can not afford the cost of the transport. Even if he is carrying the stove by himself, the expenditures for food on the way is too much for him. Hence only relatively rich people can collect the stove. I think this situation is largely unavoidable because we are not able to pay the transport cost for the chulo. We can however alleviate the problem by ensuring that local potters are receiving training in the making of chulos. Only if the production of the chulos is near by will the poor farmer also be able to benefit from the new chulo.

Other smokeless chulo promoting agencies

There are many agencies working in promoting new smokeless chulo stoves in Nepal. Mostly they have targets set in their programme which they somehow have to fulfill. I have seen many chulos from other agencies, and mostly they are of a poor quality. But in order to fulfill the annual target the output may be more important for them than the quality. This also is valid both for the installation work as well as for the monitoring of the stoves. Their programme mostly covers only those regions, where a motorable road is existing.

It unfortunately has come to the situation, that the chulo programme has become a big development business in Nepal and that the first priority, to protect the forest is only the keyword to justify the programmes. The managers of these programmes are mostly posted in Kathmandu, the capital of Nepal, and they hardly ever work in remote regions. The bad quality of their chulos is very much contraproductive for our programme, which is not output oriented, but nevertheless is quite active in producing, installing and monitoring of chulos in the Western Development Region of Nepal.

Cooperation

I have participated in a one day national workshop on the promoting of smokeless chulos at RECAST (Research Center for Applied Science and Technology) Kathmandu. There I have got the bitter taste of disappointment because (except a few organisations) all of them are only output oriented, and were absolutely (maybe also not capable?) not willing to make a nationwide smokeless chulo promotion policy, which at the same would allow for small differences between the programmes. Too much private interests are involved in the various smokeless chulos programmes in Nepal, and obviously a cooperation is not desired.



Community Water Supply and Sanitation Programme

Pokhara

Swiss Association for Technical Assistance

SATA

The GATE (German Appropriate Technology Exchange) publication, " Helping people in poor countries develop fuel-saving cookstoves " states:

" In Nepal, where 15 000 demonstration stoves are projected in the early 80's many prototypes will be used in the tea houses which are found along every road and walking path. This way travellers who stop for tea will have the opportunity to closely examine a stove which will always be in use.!!

These 15 000 demonstration stoves are projected and automatically A TARGET. Till now ,I have not seen a single demonstration chulo on the walking paths I used to go. May be I am walking the wrong paths? Where are they? Laying behind the house of the few receivers, mostly broken (even at the road side) and never installed by the supplying organisation, who may be has projected those 15 000 stoves for only! demonstration purposes.

That especially the tea shop owners are not willing to install the new Nepali chulo, the installers of those 15 000 chulos did perhaps not know. The new Nepali chulo is too slow in heating up a pot of tea for the travellers who want to have the tea as soon as possible or else they go to the next tea shop were the tea is ready.

HAAMRD SAMASYA

Officially the so called caste-system is not any more existing. In reality, the different castes are many times a problem in the implementation of drinking water projects. The so called low caste people are some times like slaves for the high caste people and do hardly have any rights. It therefore is clear that the high caste people are also using these people to construct a water project for the village. Good enough, water is also coming through the tap for the low caste people, but sometimes they even are not allowed to take water at the same time together with the high caste people. The high caste people will only try for their own benefit and are discriminating the low caste people. It therefore is our duty to give special attention to these underprivileged people in our project areas.

When I made a detail survey in Dikhura Village Panchayat, in Arghakhanchi district, the following happened.

In Dikhura, mainly high caste people are living. At the



Community Water Supply and Sanitation Programme
Pokhara

Swiss Association for Technical Assistance

SATA

end of a detail survey, I met a low caste man. I started asking him from where he is getting his drinking water. He told me, that just by his house a spring is existing which never dries up.

People from near by were trying to stop our conversation, and were sending the low caste man away. There I interrupted and tried to continue the talk. High caste people loudly started complaining that these low caste people have access to clean drinking water, and that they do not face the problems that the high caste people have.

I asked the man whether he needed a tapstand near by or not. He first hesitated to answer, the pressure from the high caste people was too much for him. Then he refused a tap with the reason that a perennial source was just in front of his house. I requested him to show me the source. The high caste people warned me not to go, but when they realised that I was not listening to them, a few of them also accompanied me. When we came to the so called clean watersource I asked a high caste man: "Do you drink that so called clean water?" He quickly answered "Am I a low caste". (Nepali language: *Ma Sarki ho?*)

There were total 8 houses and it was horrible dirty. The biggest shock for the high caste people was when I visited also the other nearby located source. On the way to it there was the open latrine for those people living there, and it was smelling like anything.

I started talking with people living there. I asked a man how many children he had. He told me: "I have no children, because all 13 have died!". Why?..... What do I know, because:

Baghwan le dieko, Baghwan le lieko

God has given, God has taken

These people are kept well away from any informations and they do not know anything about the relation between clean water and health. Till now they were thinking that their water was clean, and after a long discussion they agreed to build also a tapstand for their own.

The above example illustrates that there is still along way to go before all Nepali citizens will be able to enjoy the fruits of development in equal measure.



**Community Water Supply and Sanitation Programme
Pokhara
Swiss Association for Technical Assistance
SATA**

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