M.C.K.

WATER PROGRAMME

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1.1 PROJECT HISTORY

MCK. Meru, has in 1983 requested SNV-Kenya to assign a water engineer to the RDP to help rural communities with the installation of domestic water supply systems. The initial Rural Development Co-ordinator started some water projects in 1982. The SNV. water engineer started working in June 1984.
During three years he assisted about 20 communities in constucting their water supply system and made feasibility studies for an additional 15 communities.
He ended his contract and left the project in April 1987.
MCK applied for another SNV. water engineer, who arrived in July 1988.

1.2 PROJECT APPROACH TILL APRIL '87

Communities who applied for assistance, were approached by the MCK water engineer.
During several visits he gathered information about community ideas, population number, water needs, community organization etc..
To get a good view of the technical possibilities a survey was carried out with the help of some villagers.
Considering population growth, a design suitable for at least 10 to 15 years was made.
Together with the technical drawings, a report and cost estimate is sent to the water committee of that community.
Now it was up to the community to get a water permit and to look for funds. (The water engineer and/or MCK. assisted in some cases to find a donor).

The former engineer had no contact with the Ministry of Water Development. The MoWD. has never been informed about the projects he was involved in. Designs were never officially approved by the MoWD.

When funds were available, the community requested the water engineer to assist them with the execution of the project.
He assisted personally with:

- buying the materials
- transport of materials to community
- building intake constructions
- digging trench and joining pipes
- building tanks
- construction of tapstands

During execution some appointed community members (2 to 6) worked every day with him and received on the job training in:

- joining pipes
- construction of tapstands

Another purpose of this training was that those few members received a good idea of the functioning of the water supply system and will understand what kind of maintenance was needed after completion.
When the main parts of the system were constructed and some members considered sufficiently trained to continue on their own, the water engineer stopped his assistance.
A report about how to use and maintain the water supply system, was written and sent to the community.

1.3 TECHNIQUES USED

All but one project the MCK. water programme was involved in, are gravity flow water supply systems.
In one community 2 rainwatercatchment tanks were constructed at the local clinic, because gravity flow was not possible here.

2. EVALUATION

2.1 INTRODUCTION EVALUATION

The former SNV. water engineer left in April 1987.
Because he had no assistant during his three year contract and SNV. did not succeed in sending another water engineer in time, the MCK water programme came to an almost standstill.
Only some already promised financial aid was given to one project.
In this programme there has been an interruption in assistance for more then one and a half years.
For me it seemed a good opportunity to look at the results of the used approach in the programme during the first years.

Out of the 20 projects my predecessor worked with, I have chosen 11 projects in which he assisted from the beginning.
I spent about half a day on each project; talked with the project's water committee and walked around to see the intake,tanks and several tapstands.
I have decided to look at the following aspects of the different projects:

- Design
- Operation and maintenance
- Water collection and use
- Water quality & Health

For this purpose I made a questionnaire.
With the answers to these questions and my personal impressions during the project visits, I hoped to get a good view of the results of the "MCK. Water Programme" so far.
According to the findings I want to propose a project policy for the coming three years.

2.2 QUESTIONNAIRE USED

VISIT DATE:_____
COMMUNITY :_____
LOCATION :_____
DIVISION :_____

YEAR OF CONSTRUCTION : ____
POPULATION : ____
IS THE SUPPLY WORKING ? : ____

DESCRIPTION :
- SOURCE _____
- INTAKE _____ condition _____
- TREATMENT _____
- MAIN LINE length ____ material _____ condition _____

		nr.	material	capacity	condition
- TANKS	break-pressure	__	_____	_____	_____
	storage	__	_____	_____	_____
- AIR-VALVES		__	_____	_____	_____
- WASH-OUTS		__	_____	_____	_____

	nr	type	condition	drainage
- PUBLIC TAPS	___	_____	_____	_____
- PRIVATE TAPS	___	_____	_____	_____

- DISTANCE HOUSE/TAP (average) _____ m.

COSTS :
- MAIN LINE _____
- TANKS _____
- BRANCHES _____
- WATER POINTS _____
- HIRED LABOUR _____
- HOW MANY DAYS WORK ? _____ days.

WHO OWNS THE SYSTEM ? _____

OPERATION AND MAINTENANCE :
- IS W.S DELIVERING SUFFICIENT WATER ?
- QUALITY ?
- PROBLEMS ?
- BREAKDOWNS FOR HOW LONG AND WHY.
- WHO IS RESPONSIBLE FOR MAINTENANCE ?
- WHAT MAINTENANCE IS DONE ?
- HAS ANYONE BEEN TRAINED FOR THIS ?
- ORGANIZATIONAL ARRANGEMENTS
- PROBLEMS / TRAINING NEEDED
- COSTS OF MAINTENANCE / YEAR
- WHAT DO PEOPLE PAY FOR WATER

WATER COLLECTION AND USE :
- HOW MUCH WATER DOES 1 FAMILY USE PER DAY
- HOW MUCH FOR NON DOMESTIC USE
- WHERE DO PEOPLE WASH THEIR CLOTHES

WATER QUALITY / HEALTH :
- HOW IS WATER QUALITY COMPARED TO FORMER WATER SOURCES
- HOW DO PEOPLE COLLECT WATER
- HOW DO THEY STORE IT

HYGIENIC SITUATION :
- INTAKE
- TAPS
- COLLECTION BUCKETS
- WATER STORAGE
- ARE THERE ANY LATRINES (% POPULATION)
- HEALTH PROBLEMS RELATED TO WATER ?

REMARKS :

TABLES 1 & 2

COMMUNITY NAME	FAMILY NR. DESIGN	FAMILY NR. ACTUAL	SOURCE TYPE	INTAKE FLOW l/s	MAINLINE LENGTH m'	STORAGE TANKS NR.	STORAGE TANKS TOTAL m³ CAPACITY	TAPS COMMUNAL	TAPS PRIVATE
AMETHO I	300	55	stream	2	3000	2	30	1	55
AMETHO II	250	50	stream	4	2500	1	15	-	50
AMUGAA	100	24	stream	3	1150	1	15	1	24
GAITU KAGUNA	1200	450	river	5	7500	2	115	4	450
KAANDU	60	25	stream	1.5	1650	1	25	-	25
KALIMBALA	40	6	stream	1.2	650	-	-	-	6
KATHALE	100	27	stream	3	1650	1	15	-	27
KATHINA	120	98	spring	2	1500	2	50	-	98
KAUNA	150	53	spring	1.5	3000	3	50	-	53
LANYIRU	1200	800	stream	3.5	12000	4	55	3	-
MUKINE	200	160	stream	4	3700	2	30	7	52

COMMUNITY NAME	WATER SHORT-AGE	HEALTH PROBLEMS RELATED TO WATER	WATER CONSUMPTION PER FAMILY / DAY (litres))*	COSTS MATERIALS ksh.	DONOR AID %	DONOR NAME
AMETHO I	yes *	intestinal problems	-	165,000	30	CARE
AMETHO II	no	intestinal problems	-	86,000	0	-
AMUGAA	yes *	intestinal problems	-	60,000	50	MCK / Coffee factory
GAITU KAGUNA	yes	intestinal problems	735	600,000	50	ICCO
KAANDU	yes	intestinal problems	3600	58,000	-	-
KALIMBALA	no	intestinal problems	-	10,000	-	-
KATHALE	yes	intestinal problems	5350	82,000	-	-
KATHINA	yes	-	1390	247,000	-	-
KAUNA	no	-	-	178,000	20	CARE
LANYIRU	no	-	-	450,000	100	MCK
MUKINE	yes	intestinal problems	1265	120,000	-	-

)* in case of water shortage in a community, I assumed that all the available water (according to the design) was used by the members who are actually allowed to use the system.

f.e. KAANDU : flow intake = 1.5 l/sec.
= 5400 l/hour = 64800 l/12 hours
storage capacity = 25000 l
available per day = 89800 l

actually 25 members => 89800/25 = 3592 l/day/family.

* because the actual intake flow is different from the design flow, it was not possible to estimate the water consumption per family/day.

2.3 COMMUNITIES VISITED

For some data about these communities, see "table I" and "table II"

2.4 SHORT EXPLANATION:

AMETHO I : - Because of silt blocking the intake, the actual flow is less than the design flow.
They requested to change the place of the intake to a better place in the same stream. In the future they wished to construct an intake in a bigger stream, which would allow them to use the water also for irrigation.
Broken taps are the reason for some members in the upper part of the system to be without water.
They had already started digging up a part of the line, to look for the place where silt may have blocked the pipe. After closing some taps (by using the gate valves) in the lower part of the system, water started flowing at taps in the upper part where people had been without water for several weeks.
In this community, the livestock kept on the compounds causes very unhygienic situations.
This should get a lot of attention, in case the programme proceeds with assisting this community.

AMETHO II : - A beautiful intake construction under a waterfall, provides this community with clean water.
Nevertheless intestinal problems are numerous (according to the community people suffer from amoebae)
They requested assistance to construct a second tank, so the remaining 30 members will also get water at their homes.

AMUGAA : - Contradicting information in the beginning of the project seems to be the reason for the actual intake flow being smaller than the design flow.
A coffee factory takes up a large share of the available water.
These are the reasons for water shortage at the moment, although only 24 out of 100 families are connected.

GAITU KAGUMA :- Before this community asked for assistance from the MCK water engineer, they had already built 2 storage tanks.
They also built an intake , but this one, like a former one, was swept away.
They have spent ± ksh. 250,000 on the above mentioned constructions and some pipes.
The project assisted them in constructing a strong intake and connecting this intake with the largest storage tank, from which the water is distributed into the community.
This was financed by ICCO (a Dutch donor).
The distribution system(6 to 7 km PVC pipes !!!)was made by the community themselves without any survey or design.
As a result, pipes were put in places where the water cannot reach.
Also some branches are without taps.
Although not allowed by the water committee, people are using the water for irrigation. With ± 450 taps, it seems obvious that some people are not getting water at all.
Their own idea of solving this problem, is to build a bigger intake.

KAANDU : - Reasons for the high water consumption (see table I) are broken taps and irrigation.
They also want a second intake to increase the water quantity.

KALIMBALA : - This community wants to change the location of the intake to a higher point, so pressure will be enough for their "Sprinkler" irrigation system.

KATHALE : - Because of irrigation by people in the lower parts of the system, people in the higher parts were continuously without water.

KATHIMA : - A very well organized community. They are ready to build two more storage tanks, which will be the solution for their water shortage.
Small irrigation was allowed, but they know the limits.

KAUMA : - As Kathima, a very well organized community and as it seems no problems at all.

LANYIRU : - By its size (12 km of mainline) and potential beneficiares (± 8000 persons), the most important project of the MCK water programme.
The water comes from very far, because sources closer to the community have a very high Fluoride percentage.
This caused children's teeth to turne black.
They started in August 1985, but so far the mainline is not yet completed.
The organization is in the hands of the "Lanyiru women group"; women pay ksh.300/= to become a member.
With this money, small expenses in the project are covered (e.g. paying a person to clean the intake).
Organization seems to be the biggest problem; only a part of the population was willing to assist in the execution of the project.
On working days, only 30 to 40 people showed up.
Nobody feels responsible for the few (3 !!) public standposts.
Answer to my question "who owns the system?" was, "the MCK.".
They asked financial assistance to complete the project.

MUKINE : - Also in this community, broken taps and irrigation were the main causes for the water shortage.
They have some small technical problems caused by the design. (e.g. washouts are completely blocked by silt because they were made too small).

2.5 GENERAL OBSERVATIONS

.1 DESIGN :

All the water supply systems have been designed according to the "Kenya Design Manual".
Population growth over the next 10 to 20 years has been taken into account.
Estimated water consumption was based on "domestic use" only.
I assume that because in theory water consumption is related to the number of users and not to the number of taps, the former water engineer did not look into this problem.
Although in some designs a tapstand flow of 0.23 l/s was used, in reality there are no globe valves at the tapstands to adjust the desired flow.
In most communities, water for irrigation is as (if not more) important as water for domestic use.
Almost every project received after completion a written explanation about their system and maintenance needed.
In a few cases it was in this document that people were told not to irrigate more than one hour, or to irrigate only at night.
In some projects, a number of members (with private taps) are irrigating 24 hours a day; the community organization is often not able to stop this.
According to the designs, 1 family uses:

10 (persons)	* 50 l	= 500 l
2 cows	* 75 l	= 150 l
	total / day	= 650 l

In table II, we can see what in some cases is used in reality.
Taking these facts into account, it is wrong to design mainly for domestic use, especially when no attention is given to community organization.
In all the projects, the different constructions (intakes, tanks) are still in very good condition, exept for some tanks in the Lanyiru project which have been constructed after the departure of the former water engineer.
Silt blocking the intake was also a major problem in some projects.

.2 WATER QUALITY AND HEALTH :

As shown in table 2, in many communities the people suffer from intestinal diseases (according to them "amoebae").
This can be caused by:

- polluted water at intake
- water pollution between collection and consumption

Although I didn't test the quality of the water, I think that in several projects the quality of the water at the intake is doubtful.
In most projects, water is taken from a stream or a river; several other communities are situated upstream from those intakes.
Not one of the projects has any kind of water treatment.
In most of the projects the tapstand design is very simple, G.I. pipe surrounded by some big stones.
No special attention is given to the tapstand design, so that in most cases drainage is very poor.
Only very few families treat water before consumption (< 1%).

Although MCK. and Foster Parents Plan International have very important Basic Health Care Programmes in a part of Meru District, no links are made.

.3 COMMUNITY ORGANIZATION & FINANCES :

All projects have a water committee, appointed by the community.
They are responsible for: - organization during execution
- project finances
- maintenance

In a few cases there is a special maintenance committee.
The persons trained in maintenance, are often a member of one of these committees (chairman and/or secretary).
In all the projects (exept Lanyiru) people have to pay a membershipfee before they get water.
This amount varies between ksh.1500/= and ksh.3000/= for one family. Plus ksh.30/= to ksh.50/= for every day that they did not send members of the family to work during implementation.
It can be paid in instalments, but they don't get their connection before the full amount has been paid.
(This means also that poorer families never get a connection).
Only in Kauma and Kathima was thought about payment for maintenance, (ksh.100/= to be paid on the day the member receives his tap).
Not one of the visited communities had a reliable maintenance organization.

.4 OPERATION AND MAINTENANCE :

In most projects the community organization was the biggest problem.
People are willing to pay and to work to get water on their compound; once they have water, they don't think anymore about the functioning of the water supply system as a whole.
Although the few people of water committee are spending a lot of time and energy to change this attitude, they are often not able to stop people from misusing (too much irrigation) the water supply.
It seems that in most cases these problems were not expected or thought about before starting the project.
Many people think that once there is a watersystem, there will be enough water for the rest of their lives without any problems.
That a tap can break and has to be replaced, is something not counted on. As taps are expensive and of a very poor quality, this is often a big disappointment.

Althouh maintenance is the most important factor in the success or failure of a water project, it had almost no attention from the the MCK. water programme so far.

.5 FINANCIAL AID :

As shown in table I, this aid varies between 0% and 100% of the amount spend on materials.
Financial aid depends on :
- knowledge in the community about how and where to find it.
- willingness of the water programme to help finding it.

2.6 CONCLUSIONS :

The short term results of the programme, like the number of implemented projects and the number of people who got water, are very impressive.
Long term objectives, like feasible operation and maintenance systems, improvement of health situation, are not taken into account sufficiently.

DESIGN : The assumed water consumption in the design is far to low, because of irrigation.
When in the design a certain tapflow is used, adjustment of tapflows in reality is essential.
To prevent blockage of the intake because of silt, a different design for some of the intake constructions is needed.
Because most of the visited taps were surrounded by pools of mud and stagnant water, a better design for the tapstands is needed for hygiene reasons.

WATER QUALITY AND HEALTH : The main purpose of the programme was, to bring more water into the communities and within shorter distance.
To forget the health aspects in such water project is a big mistake.
First of all the possibilities of water treatment at the intake should be considered. "Slow sand filtration" can be a solution, but needs also a good community organization.
The implementation of a water project, is a very good opportunity to start hygiene education activities in the community.
In fact, a water project should not go without such education.
Collaboration with the two existing health projects is probably the best solution.

OPERATION AND MAINTENANCE : Because the communities are not properly explained why and how to organize maintenance, many problems occur.
As long as the water programme has no intention of assisting the communities in setting up a reliable organization, operation and maintenance system, it is wrong <u>not</u> to limit the number of taps.
In most of the visited communities, more public taps instead of all the private taps could be a solution to the encountered problems.
But even then, a reliable organization (e.g. tapcommittees) is essential.
Not explaining how the gravity flow water system works, is in most of the projects a reason why some members are without water (e.g. Ametho I).
Knowing the importance of irrigation for the community, a better explanation about the possibilities of the water supply system is needed.
Although it is the most important part of a water project, to little attention was given to maintenance.

COMMUNITY ORGANIZATION & FINANCES : Lack of organization seems to be the main cause of problems in most projects.
Communities cannot foresee problems in connection with a complicated water supply system; therefore they have to be explained why to organize.
Taking new water committees around at existing (good and bad organized) projects, is a very effective way of giving communities ideas about how they can organize their own project.
An appropriate financial system, to cover maintenance expenses, should be introduced.

FINANCIAL AID : To avoid big differences in financial aid between the different projects, aid percentage limits should be fixed.
This may also stimulate the poorer communities of the district to apply for assistance.
If the Water Programme can promise every community a certain percentage of financial assistance, this can stimulate these groups.

GENERAL : The MCK. water programme has been some kind of an "expatriate one man show", with some classical mistakes.
As a result, all the visited projects need supplemental assistance.
To prevent that an expatriate engineer is needed as long as the design period for the various projects, some Kenyan assistants are badly needed.

3 PROPOSAL MCK. WATER PROGRAMME

3.1 INTRODUCTION

When we look at the results of the Water Programme, we can see that changes are needed.
A proposal for an improved Water Programme, the personnel assistance and the finances needed to implement such a programme, will be explained below.
The most important changes in the programme are :

- Kenyan assistants
- extra training in gravity flow systems
- tank programme
- more attention for water quality

3.2 WORKING AREA

The programme should cover the whole of Meru District, consisting of 4 synods.
All the implemented projects are in only 2 out of these 4 synods.
Although all the new applications are coming from the same 2 synods, this doesn't mean that there are no water problems in the other parts of the district; on the contrary.
By explaining the MCK. circuits in these areas the possibilities of the Water Programme, applications for assistance can be expected.

3.3 APPLICABLE TECHNIQUES

In all but one project, gravity flow was used to get water into the community.
These systems are relatively cheap and "easy" to maintain.
It is the best technique to be used in the district, but requires important side-activities as training in organization and maintenance.
In the parts of the district where this technique is not applicable, the construction of rainwater tanks is a good solution.
So far I have not seen any communities where other techniques would help to diminish the water problem.
If certain areas ask for the use of different techniques, the Water Programme should be flexible enough to deal with these cases.

3.4 WOMEN AND WATER

Although the women groups in this District are often the initiators of the water projects, the Water Programme will see to it that women are sufficiently represented in the various committees.
In the tank programme, the training of women in the construction of these tanks will be discussed with the various groups.

3.5 ORGANIZATION OF THE WATER PROGRAMME

1 Expatriate Water Engineer - responsible for all parts of the Programme

1 Assistant - assisting the engineer :
- at meetings with communities
- in supervising the employed artisans.
- in training "tank artisans"
- in organizing workshops

- apart from all these specific tasks, a very important task will be to help the engineer in getting a better view on the needs and possibilities of the various communities.

2 Artisans - Assisting the communities with the implementation of their Gravity Flow Water System.

... Artisans - constructing rain water tanks.

1 Tank co-ordinator - will be employed from the moment there are more then 10 tank artisans in the field.

3.6 GRAVITY FLOW PROGRAMME

.1 INTRODUCTION

During the first year an important part of this programme will consist of the rehabilitation of the already implemented projects.
Apart from some technical assistance, training in organization, maintenance and financial management will be very important.
The new projects will be assisted according to the methods explained below.
The water quality at the proposed sources will be tested.
The programme will not assist in implementing a water supply system in case a good waterquality at the taps cannot be guaranteed.
The programme will strongly advise the communities to construct only public taps, to prevent private irrigation.
When communities manage to maintain a system with public taps without any problems, assistance can be given to install private taps.

.2 DESIGN

All designs will be based on water consumption in case of private taps.
This of course only when the water quantity at the source is sufficient.
A proper construction for a public standpost will be designed.
The water flow at the standposts will be adjusted according to the design.
For the construction of storage and break-pressure tanks, the rain water tank design will be used.
In case the desired storage capacity is bigger than 13500 litres (biggest tank), two or more tanks will be constructed.
The site of the intake will be at the best place possible in relation to the water quality.
The construction of sedimentation tanks will be considered in every project, to prevent silt to enter into the system.
To improve the quality of the water in the systems, water treatment at the intake is a possibility.
"Slow Sand Filtration" is in most communities the most applicable technique. This requires however very good community organization.

.3 COMMUNITY PARTICIPATION

The community is responsible for :

- contributing a part of the total project costs.
- obtaining the necessary permits
- assisting the engineer with the survey
- all the required labour during implementation
- providing all the required local materials (sand, aggregate, hardcore)
- appointing members who will be trained : - water committee
  - maintenance committee
  - health committee
- maintenance of the system

.4 FINANCIAL AID

The two mountain masses in the district, Mount Kenya and the Nyambeni Hills, have a heavy impact on agricultural potential.
Precipitation rates and soil fertility differ a lot from place to place.
In the higher areas there are many cashcrops, in the lower areas there are no cashcrops at all.
This makes it difficult to fix a percentage for local cash contribution.
In every project, the Water Programme has to take into consideration the socio-economic situation of the community involved.

A 100% finanacial aid should be avoided in all cases (see Lanyiru project)

.5 TRAINING

A. ORGANIZATION : Before the actual implementation of the project, the members of the appointed water committee are shown around one or more already completed projects.
By talking to committee members of that project, they can learn about problems to be expected and how to solve them.
The Water Programme advises the communities in how to organize properly, according to experiences.
Workshops are held for committee members to give supplementary training in financial and community organization.
In all Synods, every three months a meeting is organized for members of the different water committees, to exchange experiences.

B. OPERATION AND MAINTENANCE : A maintenance committee will be appointed, to look after the proper functioning of the water supply system.
The members of this committee will work together with the Programme artisan during implementation.
The same persons get a thorough explanation on how the system works exactly.
They'll also be trained on how to do some minor repairs.
The Water Programme gives advise on how to organize after completion of the implementation.
Taking them to already completed projects is, also in this case, a very easy but good way of teaching.

C. HEALTH AND SANITATION : A number of health technicians have to be appointed by the community. (e.g. 1 person per 50 to 100 families) For these persons a training will be organized in collaboration with the existing Primary Health Care Programmes.
These persons would be able to train the community in how to treat water before consumption and how to create a hygienic situation on the compounds.
With communal taps, the appointment of a responsable for each tap can be considered.
These persons will be responsible for cleaning the site of the tapstand, and for reporting any defect to the maintenance committee members.

3.7 RAIN WATER TANK PROGRAMME

.1 INTRODUCTION :

A tank programme is wanted where:
- no water sources are available for gravity systems.
- community organization, needed for a gravity system, is difficult.
- the present water quantity or quality is not sufficient.

The Water Programme will train local masons in a simple construction technique.
Communities who have asked for rainwater tanks are already requested to look for one or more persons in their area, who want to learn this technique. After training, the Programme assists these masons in becoming completely self-reliant.

.2 DESIGN :

The programme will introduce a concrete tank, according to a design by Mr. A.C. Thiadens.
This design is used by the Machakos Diocese Rain Water Tank Programme. They started the introduction of this design in 1983, and now there are already more than 2500 families in that District who have a tank.
Advantages of this design:
- 3 different sizes (4000, 5400 and 13500 litres)
- solid construction
- relatively cheap
- easy to learn technique

.3 IMPLEMENTATION METHOD :

The programme will only assist groups, which have more than 5 tanks to build in a small area (because of transport of materials).
When there isn't an already trained person in that area, the group has to look for a person who wants to be trained in tank construction.
Purchase and transport of materials except sand,aggregate and hardcore, will be organized by the Water Programme.
Costs of materials and transport have to be paid by the group members.
An extra payment of ksh. 150/= per tank will be used to pay the salary of a water tank co-ordinator..
The artisan will be paid by the Water Programme.
The group members have to provide 2 persons to assist the artisan.
Every new group receives a 4000 litres tank free of charge, to be built at a communal point.

.4 TRAINING

When a person wants to learn the technique, he will assist an already trained artisan with the construction of several tanks.
If such a person is able (according to the judgement of the Water Programme) to build tanks himself, he will be provided with the necessary tools and a mould (for the small and the medium tank).
From then he will be paid for every constructed tank by the Water Programme. A part of the value of the tools will be deducted from his salary in instalments.
The artisan receives: ksh. 250/= for the 4000 litres tank
ksh. 300/= for the 5400 litres tank
ksh. 450/= for the 13500 litres tank

When there are a number of trained artisans, a workshop will be organized for exchanging experiences. Also supplementary training in finances and organization will be given.

Payment of the artisans by the Water Programme instead of having them paid directly by the groupmembers, has the following advantages:

- quality control
- labour price control
- knowing how many tanks are being build
- contact with the artisan for advise and/or extra training

.5 MATERIALS AND TOOLS

ITEM	UNIT	Size (litres) 4000	5400	13500	Unit Price Kshs.(1989)
Cement	bags	9	11	28	98
Waterproof cement	kg	1	1	3	50
Welded mesh sheets (8'x4',6mm-150mm)	nr	2	2	-	180
Barbed wire 16G	m	160	200	-	0.95
Barbed wire 12½G	m	-	-	200	2.25
Reinforcement bars 6 mm	m	-	-	252	3
Bailing wire	kg	-	-	3	35
Fittings (tap, nipple, socket, elbow) ½"	nr	1	1	-	110
Fittings (tap, nipple, socket, elbow) ¾"	nr	-	-	1	120
G.I.pipe threaded ½"	m	0.6	0.6	-	30
G.I.pipe threaded ¾"	m	-	-	0.6	42
Nails 2"/3"	kg	3	3	3	40
* Timbers 6"x1"	m	20	20	40	10
* Timbers 3"x2"	m	30	30	20	10
* Poles 2.55 m	nr	-	-	8	20
Local Materials:					
Sand	tons	2	3	5	235
Aggregate ½"	tons	2	3	5	300
Hardcore	tons	1.5	1.5	3	
Labour	days	7	7	9	
* Mould 4 sheets 24G diam. 1.65 m	nr	1	1	-	1400
* Mould 6 sheets 24G diam. 2.60 m	nr	-	-	1	2000

* Items which can be re-used

TOOLS

Shovel	50	Hammer	50
Jembe/Mattock	90	Sisal twine	40
Mason's trowel	140	Plumb bob	50
Steelfloat	300	Plier	45
Steel trowel	300	Measuring tape	80
Sand sieve	200	Spirit level	140
Chisel	15	Karais	35

3.8 REQUIRED BUDGET FOR 12 MONTHS

Funds for operation and maintenance of the project car DAIHATSU pick-up are available, so not included in the budget below.

GENERAL

Salary assistant	: 12 months @ ksh.2000/=	=	24.000
Transport assistant :	motorbike YAMAHA 175 incl. tax etc.	=	75.000
	insurance	=	2.500
	operation and maintenance	=	12.500

GRAVITY FLOW PROGRAMME

estimated material costs : ksh.700,000/=	=> Average aid 50%	=	350.000
Training general (Workshops etc.)		=	30.000
Salary 2 artisans	: 2 x 12 months @ ksh.1500/=	=	36.000
Tools		=	8.500

TANK PROGRAMME

4000 litres tanks to be given to the groups	: 15 @ ksh.2100/=	=	31.500
Tools and molds for tank artisans	: 15 @ ksh.3000/=	=	45.000
Salary artisans, each 10 tanks of 5400 litres	: 15 x 10 x ksh.300/=	=	45.000
Training general (Workshops etc.)		=	25.000
	TOTAL	ksh.	685.000