

Water Catchment Protection Handbook

1 LEARNING AND EXPERIENCE SHARING SERIES



Learning and experience sharing series

Helvetas Cameroon publication, No 1

WATER CATCHMENT PROTECTION HANDBOOK

Experiences and Learning in International Co-operation in the Western Highlands of Cameroon
(Helvetas Best Practise Publications)

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Helvetas Cameroon**Learning and experience sharing series, No 1.****WATER CATCHMENT PROTECTION HANDBOOK****ABSTRACT**

Helvetas Cameroon has been active in Cameroon since 1964 and has supported the construction of more than 500 Village Water Supplies in the North West and South West Provinces of Cameroon. Water catchment protection aims to prevent water pollution while also conserving and increasing the water supply in the catchment area. Water catchment protection has been an integral part of the water and sanitation programme of Helvetas Cameroon and nearly one hundred catchment areas have been protected with Helvetas support. In this period Helvetas and her partners have gained invaluable expertise and the best practises are summarised in this document.

This document describes a more or less standardised approach for the organisational and technical implementation of water catchment protection. This approach consists of 8 steps:

- 1: Preparation**
- 2: Sensitisation of the population**
- 3: Feasibility study**
- 4: Water catchment protection plan**
- 5: Land demarcation and ownership**
- 6: Implementation water catchment protection**
- 7: Operation and maintenance**
- 8: Monitoring and evaluation**

In this document each step is explained in detail. This step-wise approach can be used by councils in Cameroon as a guideline for implementing water catchment activities in Village Water Supply systems.

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1. THE IMPORTANCE OF WATER CATCHMENT PROTECTION

WATER SUPPLY

Water is life, and access to clean and safe drinking water is one of the main issues in alleviating poverty. In the Northwest province of Cameroon, increasing population density and demand for land has led to widespread clearing of forested areas. The resulting farm bush landscape is poorly capable of retaining water, resulting in quick water run off, soil erosion and water shortages. Even though the North West of Cameroon lies in one of the wettest places on earth with an average rainfall of 2500 mm per year, water shortages in the dry season are now very common. Protection of water catchment areas, the areas that drain into the water source, is therefore crucial to retain water and to ensure sufficient water supply throughout the year.

Definition of water catchment protection: Precautionary actions, procedures or installations undertaken to prevent or reduce harm to the environmental integrity of drainage areas used to catch water, such as reservoirs or basins.

WATER QUALITY AND HEALTH

Human activities in the catchment area of a village water supply can lead to water pollution and negatively impact public health. Water catchment protection is therefore also important in securing clean and safe drinking water. Prevention of pollution is essential and a regular sanitary inspection, to detect any sources of contamination, will help in securing good quality drinking water year round [1]. Water catchment protection can save money through lower costs for medication for water borne diseases and less sickness in the working population.

HISTORY OF WATER CATCHMENT PROTECTION ACTIVITIES IN NORTHWEST CAMEROON

Helvetas Cameroon has been working in the water sector in Cameroon since 1964. More than 500 village water supplies have been constructed with Helvetas Cameroon support during this time. One of the aspects that was taken into account was catchment protection, as a means to sustain the durability of the implemented water schemes. It is based on this reasoning that Helvetas Cameroon has since 1993 supported and financed catchment protection as well as micro-watershed management mostly in the North West Province (NWP). To date, 2005, nearly one hundred water catchment areas have been protected with the support of Helvetas Cameroon.

PURPOSE OF THE HANDBOOK

This handbook is aimed at explaining the best practises in preparing, implementing and managing water catchment protection at village level. The handbook is primarily aimed at councils in Cameroon to assist them in implementing water catchment protection as part of village water supply systems. The handbook can be used for training of councils and as a reference document for those involved in water catchment protection. For Water Management Committees (WMCs) and caretakers of water supply systems Helvetas has prepared two additional handbooks [4 and 5]. For readers from outside Cameroon this document represents a good example of water catchment protection activities in Cameroon.

ABBREVIATIONS

DO	Divisional officer
LCB	Land Consultative Board
NRM	Natural Resources Management
NWP	North West Province
SDO	Senior Divisional Officer
VDA	Village Development Association
WMC	Water Management Committee
WRMP&S	Water Resources Management Policy and Strategy



Fulani children living next to catchment area

2. BEST PRACTISES IN WATER CATCHMENT PROTECTION

Water catchment protection follows a logical step-wise approach, as is shown below.

Step 1: Preparation

- Define water catchment protection objectives
- Check WMRP&S
- Identify needs WMC
- Update internal rules and regulations WMC

Step 2: Sensitisation

- Identify stakeholders
- Sensitise the population

Step 3: Feasibility study

- Define water catchment protection activities area
- Settle compensations
- Make technical design
- Calculate costs and income
- Determine technical and financial feasibility

Step 4: Water catchment protection plan

- Organise meeting with all stakeholders
- Bring water catchment protection plan to the vote

Step 5: Land title & demarcation

- Apply for the land title in the name of the WMC
- Place land pillars
- Make agreement on land use rights

Step 6: Construction

- Construct tree nurseries
- Install dead fencing
- Plant life fencing
- Dig storm water gutters

Step 7: Operation & maintenance

- Do fire tracing once per year
- Do tree planting once per year
- Repair damages
- Collect user fees

Step 8: Monitoring and evaluation

- Keep technical logbook (caretaker) and financial logbook (WMC)
- Hold meeting between WMC and council twice per year
- Hold meeting between WMC and stakeholders once per year

8 STEPS TO ACHIEVE SUCCESSFUL WATER CATCHMENT PROTECTION



Step 1. Preparation



Step 2. Sensitisation



Step 3. Feasibility study



Step 4. Presentation plan



Step 8. Monitoring



Step 7. Maintenance



Step 6. Construction



Step 5. Land title

STEP 1: PREPARATION

The objective of Step 1 is to set objectives for the water catchment protection activities and to identify the conditions for the water catchment protection activities to be successful. The following activities need to be carried out:

Define objectives water catchment protection activities

The objectives of the water catchment protection activities are defined. Why are the water catchment protection activities initiated, what is the aim of the water catchment protection activities, how will it be implemented and what will be the expected outcome of the water catchment protection activities.

Check Water Resource Management Policy and Strategy (WRMP&S)

The WRM Policy is a framework of guiding principles, goals and objectives made by the council and its partners within which water resources, water supply systems, hygiene and sanitation aspects are managed in a sustainable way. The WRM Strategy is a procedure and plan on how to implement this policy. This document forms since 2004 the starting point for any collaboration between Helvetas Cameroon and a council in the field of water supply and any proposed water catchment protection activities should be in line with this document. If no WRMP&S exists the water catchment protection activities can be a suitable starting point for drafting these documents.

Define actual or potential locations for water catchment protection

In most cases, the water catchment area has already been identified. In case of new projects or extensions, the location of the catchment area needs to be selected. There are basically two

Divisional officer Jakiri:
 "The need for water catchment protection is absolute and getting more urgent. However very few catchment areas have been demarcated. We need to sensitise the people, demarcate the catchment areas and protect these areas by fencing and planting".

types of water intake: spring water or river intake. Spring water intake has the preference since the quality of the water is easier to control than with stream intake. For spring catchment protection, an area around the spring is protected. In the case of river or stream intake, the riverbanks should be protected to prevent contamination of the water. If extension of the water project is foreseen, water catchment areas should be identified that may be used in the future and possibly can

already be included in the water catchment protection activities.

Check activities and composition existing Water Management Committees

The WMC is a group of people elected by the community to represent it in discussions and decision-making about all aspects of local water management. The WMC employs one or several caretakers who in turn are responsible for maintenance of the water supply system, including water catchment protection. It should be checked whether a WMC is in place, what the composition of this WMC is, what activities it carries out and whether the committee is capable of including water catchment protection activities within its tasks. Possibly the caretaker will need training in water catchment protection or an additional caretaker needs to be elected.

A meeting should be held between the council and the WMC to agree on roles and responsibilities in the water catchment protection activities. The WMC should check their internal rules and regulations and update these if necessary to include water catchment protection activities.

As a result of Step 1, it is clear where and what type of catchment protection is needed, if the WMC is capable of performing water catchment activities, and roles and responsibilities between council and WMC are clear.

Checklist Step 1. Water catchment protection activities

Objective	Action
<ul style="list-style-type: none"> • Limit water catchment protection activities area • Agree on objectives for water catchment protection • Agree on roles and responsibilities council and WMC • Work in line with council water policy • Have strong and capable WMC • Document procedures WMC 	<ul style="list-style-type: none"> • Identify suitable locations • Organise meeting between WMC and council • Organise meeting between council and WMC • Check WRMP&S • Identify needs for WMC • Update internal rules and regulation WMC



Large water catchment areas are more difficult to protect against grazing animals and bush fires!

STEP 2: SENSITISATION

The objective of Step 2 is to involve and inform all stakeholders about water catchment protection and to sensitise all stakeholders about the importance of this activity. The following activities are carried out:

Identify stakeholders

Stakeholders are people who will be affected by the water catchment protection activities or have an interest in the water catchment protection activities. Some landowners will have to give up their land. Graziers living and working in or close to the proposed protected catchment area may lose grazing land. Farmers working in or close to the protected area may have to leave

Grazier near Wainamah catchment: "Before the water catchment project, the cows could walk into the stream and contaminate the water. We would allow the water to settle in a bucket before drinking it. Now that the catchment is fenced off our water is always clean".

their land or change the type of crops that are farmed. Hunters will lose hunting ground. Water consumers will get access to a more continuous and better quality water supply for which they will have to pay a price. Traditional authorities should give consent to the water catchment protection activities and are needed to organise community work. Village Development Associations, churches and other social groups are equally important to organise community work. It is essential to identify all stakeholders, since any people who

are left out at this stage may cause delay at a later stage possibly resulting in higher costs.

Organise sensitisation meeting

In this meeting the idea for water catchment protection is presented to all stakeholders and the envisaged protected areas and protective measures are explained. The consequences of the

Mayor Kumbo rural council: "When you start your catchment protection activities, make sure that the WMC has informed the farmers that they have to leave their activities. It does not help to stop people by force. We do not pay compensation but we have to educate the people and help them with alternatives like beekeeping".

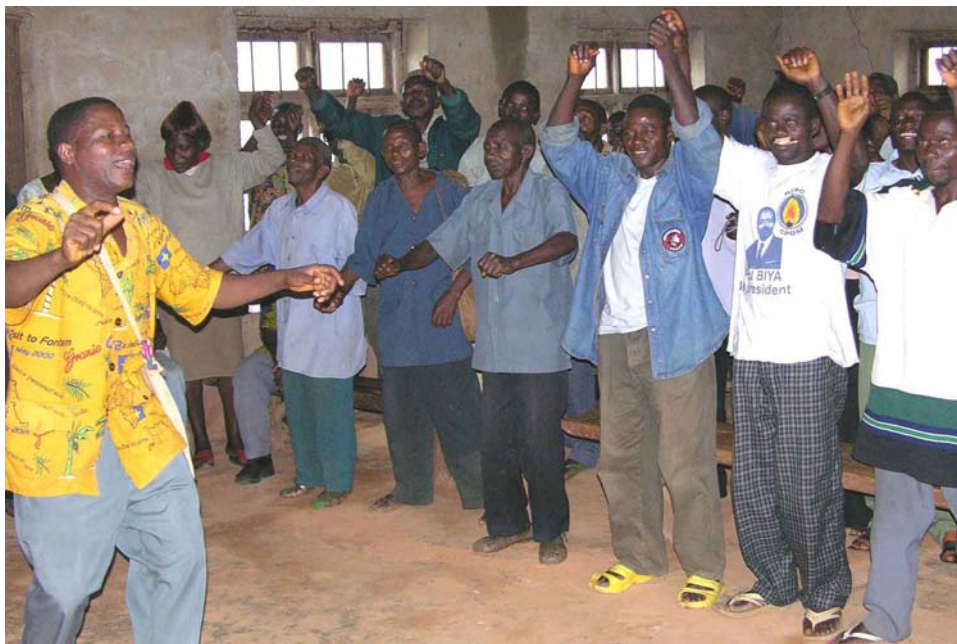
water catchment protection activities (better quality of water, more constant flow, possibly higher prices, and restrictions on land use) should be clearly presented. All stakeholders should be allowed to freely express their support, concerns and suggestions to the water catchment protection activities. In this meeting problems and conflicts are identified and solutions or other suggestions are collected in a participatory approach.

If water catchment protection activities make it necessary to include additional people into the WMC, members can be re-elected or new members added to the WMC through democratic voting at this meeting. A draft

agenda for this meeting is shown below.

Example agenda sensitisation meeting

1. Opening (mayor)
2. Background and goals water catchment protection (president WMC)
3. Technical aspects (consultant, council NRM specialist)
4. Financial aspects (consultant, council NRM specialist)
5. Questions and answers
6. Vote on WMC
7. Closing



Sensitisation meeting in Bifang, Widikum Council

Checklist Step 2. Planning and decision making process

Objective	Action
<ul style="list-style-type: none"> • Involve all stakeholders • Inform all stakeholders • Strengthen the WMC 	<ul style="list-style-type: none"> • Identify stakeholders • Organise sensitisation meeting • Democratic voting

STEP 3: FEASIBILITY STUDY

The objective of step 3 is to determine the technical and financial feasibility of the water catchment protection activities. The following activities are carried out:

Identify size and place of protected area

A specialist (consultant) is commissioned to define the exact position and required size of the protected area. As a rule of thumb, the protected spring catchment area should have a minimum size of 100 wide by 300 meter long but this can vary according to local conditions. Most successfully protected catchments are not larger than 5 hectares. Bigger areas are difficult to protect due to the high cost of barbed wire and large amount of work for the caretaker. For stream or river water intake, an area of 30 meters wide on both banks of the river should be fully protected upstream from the intake point. An additional strip of 50 to 100 meters wide can only be used for farming that does not involve soil tilling or the use of chemicals. The length of protected banks upstream of the water intake should generally be between 500 and 1000 meters, depending on local conditions.

Identify the necessary protective measures

The necessary protective measures for the catchment area are identified by the WMC in collaboration with the specialist. Several routinely used protective measures are described in detail under Steps 6 and 7. A sanitary inspection is carried out to identify actual and potential sources of water pollution in and near the catchment area.

Settle compensations

If farmers, graziers or others are denied use of the land, they may be entitled to compensation. The form and value of the compensation should be negotiated at this stage. It is important that the council is actively involved in these negotiations to facilitate the discussion. Each

Deputy Mayor of Kumbo Urban Council: "The catchment area was selected through a participatory process. The local Fulani grazier agreed to compensation for the loss of farming land and the access road to his grazing grounds. However, we have not been able to pay the compensation due to lack of funds, and now the grazier is frustrated and does not cooperate anymore. We should have settled the compensation before we started the construction of the water catchment".

agreement should be made in writing signed by the council, traditional authorities, WMC and the land owner/user. The agreement should specify what type of compensation is agreed, who is responsible for giving this compensation, to whom and when.

The council should check that the agreement is implemented. In many cases the water catchment protection activities should allow for a stand tap near the catchment area for the neighbouring grazier community and a cattle drinking trough to be placed. This will give the grazier community an interest in the success of the catchment protection and may help to win their support for the protection of the water catchment.

Expenses calculation

A cost calculation is made of the installation and the maintenance of the catchment protection activities. The installation costs have to be made only once and can be quite high. The maintenance costs have to be made every year and are generally low. The costs for catchment protection activities may include the following:

Implementation

- **Compensations.** Agreed compensation should be paid at the start of the water catchment protection activities as the negative impact of the protective measures are immediate for those involved and should be compensated likewise.
- **Consultant.** The consultant is needed to plan and guide the construction works and costs should be budgeted.
- **Contractor.** If a constructor is hired to perform the construction work the costs for the contractor should be budgeted. The benefit of hiring a constructor instead of relying on community work is that the work can generally be better planned and is of better quality. However, the costs are also higher.
- **Labour.** The costs of hired labour should be budgeted. In most cases all work will be done through community labour, but in some cases external labour will be needed, e.g. when the work is too specialised or when problems with community labour are foreseen.
- **Materials.** The costs of materials include barbed wire, poles, seedlings, seedling bags, spades, cutlasses etc. It is important that only good quality materials are used. Inferior materials, e.g. poor quality barbed wire, may require extensive maintenance by the caretaker and possibly lead to failure of the water catchment protection activities.

Maintenance

- **Labour.** Monthly payment of the caretaker.
- **Materials.** Replacement of damaged barbed wire, yearly buying of seedlings, replacement of poles, spades etc.

Income calculation

Income for water catchment protection can be generated both in cash and in kind.

- **In cash.** Money may come from the water users and the council. Typically there are two types of consumers: public tap users and users with a private tap. Private tap users pay a higher fee.
- **In kind income** may be materials supplied by the community and community labour. It is important not to count too heavily on this post, as the quality of given materials may not be sufficient and not all labour may show up at the agreed dates.
- The costs for implementation the water catchment protection measures may be generated by the council from their own budget or through donors. Money to cover maintenance may incidentally come from donors or fund raising events, but since these sources of income are very uncertain, they should not be included in the maintenance income calculations.

Yearly Budget

Mayor Kumbo Rural Council:

"The village should show their interest in the project and bring their own contribution in cash and in kind. Donors always want to see own contribution, and the council is like a donor to the community. We document this contribution in a written agreement before we start".

Based on expected income and expenses, a yearly budget must be made. An example is shown below. The yearly expected income should be at least as much as the expected expenses. A system should be agreed and set up for collection of user fees, e.g. how much should each user pay, when should payments be done, who collects the money etc. Measures against free riders should be agreed, e.g. closing of private or public taps. Payment arrangements for the caretaker should be agreed, with amount and time of payment. Finally a book keeping system should be set up, with a cashbook, receipt archive etc.

Feasibility of the water catchment protection activities

Once all the technical and financial requirement for the water catchment protection activities have been identified, the feasibility of the water catchment protection activities is determined. The technical feasibility is determined by the specialist and the WMC and should be based on e.g. the chances of success for a life fence to grow effectively on the designated area and the effectiveness of dead fencing to keep cattle out. The financial feasibility of the water catchment protection activities is determined by the WMC with support from the council. Important factors are the capacity of the council to finance the installation and pay the yearly contribution and the capacity of the consumers to pay their yearly fees. A decision is taken about continuation or changing of the water catchment protection activities.

Example of a yearly maintenance budget (amounts are hypothetical)

Budget Year 2006 (in F CFA)							
In				Out			
	N°	Fee	Total		N°	Fee	Total
User fees public	500	500	250.000	Caretaker 1	12	20.000	240.000
User fees private	45	10.000	450.000	Caretaker 2	12	20.000	240.000
Council contribution	1	100.000	100.000	Barbed wire	1	40.000	40.000
Poles	100	0	0	Poles	100	0	0
			0	Seedlings	1.000	150	150.000
			0	Equipment	3	3.000	9.000
			0	Transportation	5	1.000	5.000
			0	Pipes, taps etc	1	100.000	100.000
Community work fire tracing	1	0	0	Fire tracing	1	0	0
Community work tree planting	1	0	0	Tree planting	1	0	0
				Unforeseen			16.000
Total			800.000	Total			800.000

Checklist Step 3. Feasibility study

Objective	Action
<ul style="list-style-type: none"> • Define protected area • Settle compensations • Determine work load • Determine budget • Take go-no go decision 	<ul style="list-style-type: none"> • Determine location, type and size protected area • Involve council • Select protective measures • Calculate costs and income • Determine technical and financial feasibility

Dangerous influences on protected catchment areas:



Bush fire



Animal grazing

STEP 4: WATER CATCHMENT PROTECTION PLAN

The objective of step 4 is to present the final technical and financial details of the water catchment protection plan to all stakeholders and to reach agreement on go/no go for the water catchment protection activities. The following activities are carried out:

Organise meeting with all stakeholders

This second meeting with all stakeholders aims to present the details of the water catchment protection activities and to get commitment from all stakeholders for the water catchment protection plan. Commitment is needed at this stage since costs are going to be made for the water catchment protection activities and it should be ensured that no major obstructions are foreseen and all stakeholders will support the water catchment protection plan. The technical and financial aspects are presented in a way that can be understood by all. The caretakers, WMC treasurer and councillor responsible for natural resources management should be involved in the presentations. If agreed upon, the water catchment protection plan shall be used as a guideline during implementation and management of the water catchment protection activities. The final layout of the water catchment protection activities is presented, the amount of community work that is needed, the compensations that will be paid, the fees that will be charged to the users etcetera. This meeting can also be used to explain to the stakeholders what has been done with their earlier suggestions and concerns. The water catchment protection plan is brought to the vote. This meeting should result in an approval or rejection of the water catchment protection plan.

Checklist Step 4. Water catchment protection plan

Objective	Action
<ul style="list-style-type: none"> • Inform all stakeholders • Obtain commitment from all stakeholders for water catchment protection plan 	<ul style="list-style-type: none"> • Organise meeting with all stakeholders • Bring water catchment protection plan to the vote



Information exchange during field visits with the concerned stakeholders assures full commitment

STEP 5: LAND DEMARCATION AND OWNERSHIP

The objective of step 5 is to obtain the land title for the catchment area in the name of the WMC and to settle the user rights on this land. The following activities are carried out:

Application land title for WMC

The land title of the area on which the catchment protection activities take place should be acquired in the name of the Water Management Committee. In this way the WMC is free to manage the catchment area according to the best interest of the water consumers while no one can perform any activities on the land without the approval of the WMC. The mayor typically initiates this activity, and the council should assist the WMC in the process of acquiring the land title.

Mayor of Jakiri: "The council is there to facilitate work for the WMC. Sometimes the authority of the council is needed to take certain actions like acquiring the land title. The WMC appreciates the efforts from the council".

Land user rights

Once the land title has been obtained, the user rights of the land should be defined. Everything that is present within the land pillars falls under the authority of the WMC but it is still good to describe who is entitled to income that may originate from the area, e.g. fruits from trees, bark from *Prunus africana*, honey from beekeeping etc. Sometimes tapping of wine from *Raffia* palms in the catchment can be used as a form of compensation for farmers who had to abandon the catchment or for people who were already involved in wine tapping. Sometimes income from the catchment area can be used as an additional incentive for the caretakers. Agreements should be made in writing signed by the council, traditional authorities, WMC and the land owner/user.

Checklist Step 5. Land demarcation and ownership

Objective	Action
<ul style="list-style-type: none"> Secure land for water catchment protection 	<ul style="list-style-type: none"> Council obtains land title of the catchment area in name of the WMC
<ul style="list-style-type: none"> Settle user rights catchment area 	<ul style="list-style-type: none"> Sign agreements for use of catchment area and its products

Demarcation of catchment area



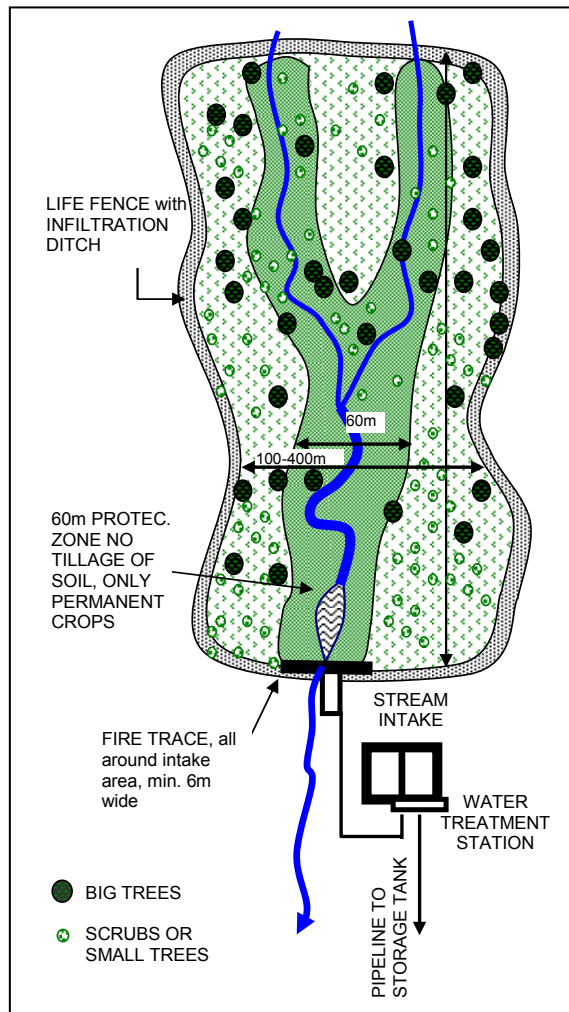
STEP 6: IMPLEMENTATION WATER CATCHMENT PROTECTION

The objective of Step 6 is to implement the water catchment protection measures. The following activities are carried out:

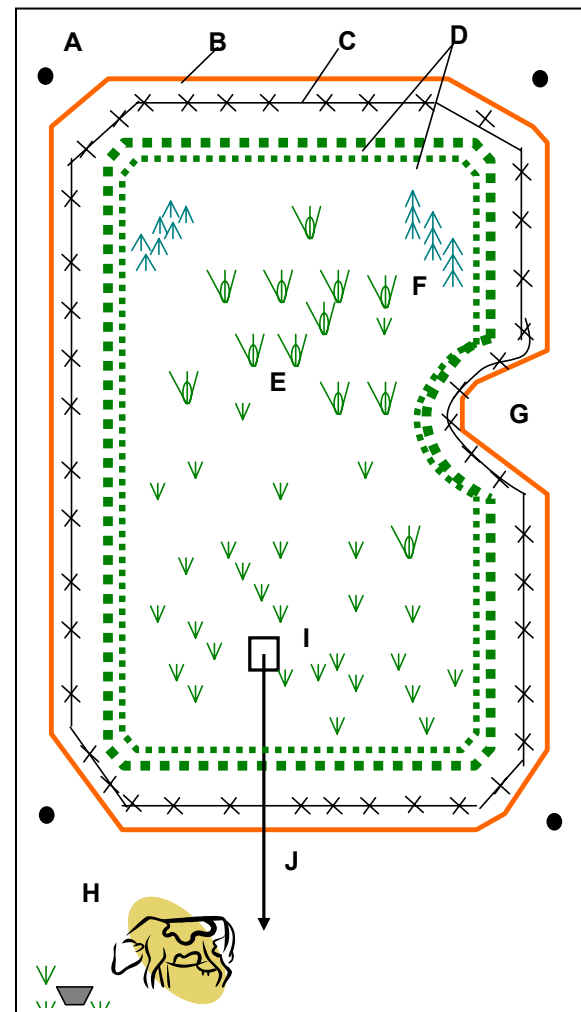
Catchment area layout

The catchment area can contain several protective measures as is shown in the figures below.

Water catchment protection measures



River catchment



Spring catchment

A: land pillar; B: storm water gutter; C: dead fence; D: life fence; E: trees and grasses; F: Vetiver rows; G: deviation around rocky area; H: cattle drinking trough; I: collection chamber; J: water pipe to village.

Tree nurseries

Trees are needed for the life fences but also within the catchment area to provide soil cover and retain water. The plants and trees to be planted in a catchment area can be pre-grown in a tree nursery.

Caretaker Mah catchment: "First we made a tree nursery close to the village. At the time of planting, we needed to hire a car to transport the seedlings to the catchment. Since the catchment is much higher on the hill than the village, not all the trees grew well. Now we made the tree nursery inside the catchment. The results were much better and we saved money".

Ideally, the tree nursery is close to or even inside the catchment area. This will ensure that the trees are used to the local environment and there are no transportation costs for the trees at the time of planting. Tree nurseries should be well protected from fire and grazing by fencing and fire tracing. Fruiting trees or *Prunus africana* can be planted to provide extra income to the WMC. A good caretaker will experiment with different types of trees and scrubs to find the best local mix.

Dead fencing

Dead fencing is needed to keep cattle out of the water catchment protection area while the life fence is still too small. The poles should be planted at maximum 1 meter distance. If life poles (e.g. *Ficus*) are included, for example every fourth pole, this will increase the strength of the fence.



Life poles in dead fence



Community work

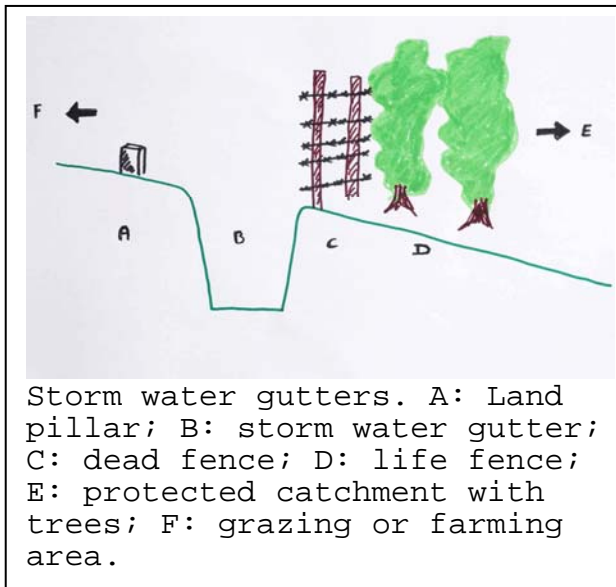
Use only good quality barbed wire to prevent frequent need of repair. Place the fencing only on soil that will support growth of trees, not on rocky or stony areas.

Fence around these areas, but stay inside the land pillars. Trees should be planted in two rows, inside the barbed wire, on earth ridges 50 cm high. The two earth ridges should be placed 1 meter apart.

Plant trees and shrubs in the earth ridges at close distance, e.g. 50 cm. The trees should be local, not Eucalyptus, Cypress or pine. Plants should be well adapted to the environment. Prickly bushes and sisal hemp are especially effective to keep cattle out.

Gutters

Storm water can enter the catchment and silt up the water intake. Therefore gutters should be dug on eroding slopes leading into the catchment. Gutters should be 100 cm deep and 50 cm wide and dug outside the life fencing but inside the land pillars.



Gutters also prevent cattle from eating the life fencing and entering the catchment.

Vetiver rows

Vetiver grass has very good soil stabilisation characteristics and can be used in addition to storm water gutters to prevent surface water run off and soil erosion. Vetiver is usually densely planted in two rows perpendicular to the flow of water along the slope where water flows are expected.

Checklist Step 6. Construction water catchment protection

Objective	Action
<ul style="list-style-type: none"> Obtain sufficient supply of trees Make sustainable barrier to cattle Protect life fence Keep storm water out 	<ul style="list-style-type: none"> Install tree nursery in or close to the catchment Install life fencing Install dead fencing Dig storm water gutters and plant Vetiver rows



STEP 7: OPERATION AND MAINTENANCE

The objective of step 7 is to ensure proper and continuous functioning of the water catchment protection. The following activities are carried out:

Organisation

Operation and maintenance relies on the work of the caretaker and community work. The user fees pay for the salaries for the caretaker and costs of materials and these should be collected by

Mayor Jakiri council: "I think people are willing to pay for water catchment protection. A big challenge for the WMC is to gain confidence from the community. Poor communication by the WMC may lead to suspicion with the community that the money is not spent wisely".

the WMC regularly. Continuous sensitisation on the importance of paying the user fees is important and should be supported by the council when needed. The community work in the catchments can best be divided among the village quarters by making each quarter responsible for a designated part of the catchment. The community work should be announced timely using the various social organisations in the village, e.g. the traditional authorities, the VDAs and the churches.

Tree planting

Trees are planted inside the catchment area once a year, typically in August. The villagers through community work perform this activity. The number and types of trees to be planted depends on the availability of seedlings and preferences of the WMC. Fruit trees or *Prunus africana* can help to generate income from the catchment when the trees are fully-grown. Trees should be planted at a minimum distance of 10 meters from the collection chamber and pipes to prevent damage of these by the roots of the trees.

Fire tracing

Fire tracing is a measure to protect the catchment area against bush fires coming in from the surrounding fields. The villagers through community work perform this activity. Once a year, typically in November, a 3-6 meter wide area around the catchment area is cleared from vegetation.

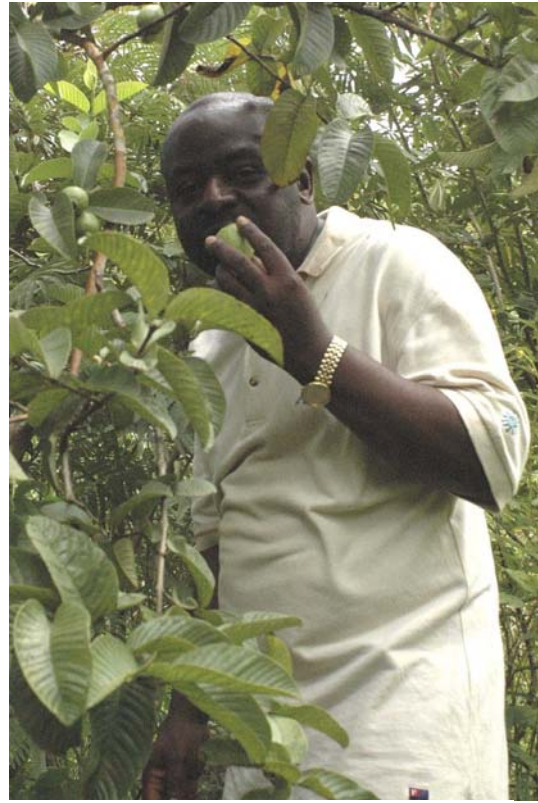
Forbidden activities in the catchment

Several activities are harmful to the catchment area or the water quality and should not be allowed. Therefore the following rules should be followed inside the protected areas:

- No farming. It results in soil erosion, water losses and water contamination.
- No grazing. Animals pollute the water and destroy the trees and grasses.
- No bush fire, no cutting of trees. It destroys the grass and trees and leads to erosion.
- No latrines, no use of chemicals: it leads to water pollution.



Cashew nut tree planting is a good investment



Fruit harvest in catchment 10 years after planting

Checklist Step 7. Operation & maintenance

Objective	Action
<ul style="list-style-type: none"> • Obtain good soil cover in catchment 	<ul style="list-style-type: none"> • Plant trees once per year
<ul style="list-style-type: none"> • Prevent fire in catchment 	<ul style="list-style-type: none"> • Perform fire tracing once per year
<ul style="list-style-type: none"> • Prevent damage to the catchment or to the water 	<ul style="list-style-type: none"> • Monitor for forbidden activities in the catchment area
<ul style="list-style-type: none"> • Maintain protective measures 	<ul style="list-style-type: none"> • Repair damages to the fences and gutters

STEP 8: MONITORING AND EVALUATION

The objective of Step 8 is to monitor the water catchment protection activities and identify and implement necessary changes to the water catchment protection plan. The following activities are carried out:



Monitoring growth of planted trees

Monitoring by MWC

The WMC is responsible for all activities carried out in the catchment area and should monitor these activities. Typically the caretaker will keep a logbook with record of all activities and the WMC will keep a cashbook with all financial dealings regarding the catchment protection. Monitoring should include sanitary surveying [2], status of the dead fence and growth of the live fence and planted trees. The caretaker should also check for any illegal activities in the catchment area and report on these matters to the WMC.

Monitoring by the council

The WMC and the council or the council representative for natural resources management meet regularly, but at least twice per year. In this informative meeting the functioning of the water

Mayor Jakiri: "The graziers were against the catchment protection and would not stop their cattle from damaging the fence. We talked again and again. I had to make them understand that it is the cattle that can leave the place. The water source cannot leave the place. Now they understand and collaborate".

supply system including water catchment protection activities is discussed. Any problems are identified, e.g. conflicts around the catchment area, and the way to solve them are discussed. Since the WMC is a self-standing body that reports directly to the village, the council can only advise the WMC during these meetings. Likewise, the WMC is responsible to solve any identified problems. The council should however give support to the WMC where needed in good partnership.

Monitoring by the stakeholders

Mayor Kumbo Rural Council: "The WMC brings each year a list of people who refuse to pay their user fee. I invite a few of them to my office to educate them on the need to pay their fees. Usually this is enough and I do not need to talk to them or the others again. They rather stay in the village and pay their fees".

The WMC reports to all stakeholders in their public meetings, which are held once per year. During these meetings the WMC reports on the activities undertaken in the previous period and gives an account of the finances. Any changes that may be necessary to the management of the water supply system are presented. Decisions are made during this meeting through democratic voting.



A stand tap and cattle drinking through near the catchment area can win the support of the grazier community

Checklist Step 8. Monitoring and evaluation

Objective	Action
<ul style="list-style-type: none"> • Monitor water catchment protection activities • Ensure proper functioning of WMC • Inform stakeholders and maintain support for the water catchment protection activities 	<ul style="list-style-type: none"> • Caretaker keeps logbook and WMC keeps financial logbook • Organise meetings between council and WMC twice per year • Organise public meeting between WMC and stakeholders once per year

3. COMMON MISTAKES IN WATER CATCHMENT PROTECTION

POOR COMMUNICATION

Water catchment protection involves many stakeholders and incorrect or insufficient communication can easily damage the collaboration between stakeholders. The water catchment areas are usually up in the hills in areas populated by graziers. If the graziers support the catchment protection, they can help by warning the caretaker in case of accidents (bush fire, damage to the fences etc). If the graziers do not support the water catchment protection activities they may let their cattle damage the catchment and ignore any damages or risks to the catchment. Frequent communication with the people who live and work in the area neighbouring the catchment and respect of each others interests will help in gaining their support and preventing obstruction of the work.

POOR QUALITY MATERIALS

One way of keeping the costs of water catchment protection low, is to use cheap materials and to rely heavily on in kind donations from the users. In the short term this will save money, but in the long term this will cause problems that may seriously damage the protection activities. The life fence will typically need 5 years to grow to a level that cattle can no longer pass through it. All this time the dead fence should be strong enough to keep cattle out. Poor quality barbed wire will rust and break before this period, allowing cattle to enter the catchment. The cattle will eat the planted trees and plants, thus preventing the life fence from reaching the necessary thickness. This will put an unacceptable workload onto the caretaker to repair the life and dead fencing, endangering the success of the water catchment protection activities.

POOR USER FEE COLLECTION

Water is for free but consumers should pay for maintenance of the water system. User fees are sometimes very low and are not collected regularly. Consumers who do not pay are sometimes not punished. This results in a very low income to the WMC, who then can not pay the caretaker, which in turn leads to neglect of catchment protection. The user fees should be high enough to cover the expenses of the WMC and they should be collected. People who do not pay the user fees should be excluded from using the water.

POOR CARETAKER SUPPORT

Some water consumers see the task of caretaker as a form of community work that the caretaker should do for free. Other consumers think that since the caretaker is paid they do not have to show up for community work. The caretaker is the key person in water catchment protection, and should be both capable of the job and motivated to do it. The capacity of the caretaker should be increased through training, which is a responsibility of the council. Work that the caretaker cannot do alone, like fire tracing and tree planting, should be done through community work. The motivation of the caretaker should come in the form of appreciation of the work by the WMC and consumers but also through regular payment of the salary.



500 francs CFA can buy 1 year of drinking water or 1 beer

4. THE NOI EXAMPLE

Preparation water catchment protection activities and land title: Noi is a small village in the hills above Jakiri in the North-West Province of Cameroon. The local WMC had fenced off catchment areas but this led to conflict with graziers and even the police had to be brought in to solve the conflict. At this moment the council intervened and restarted the process to bring the catchment protection activities within the framework of the Cameroonian law. The mayor visited the divisional delegate of lands, then the SDO and finally the DO as chairman of the Land Consultative Board. The LCB visited the area in the presence of the WMC, the Ardo (head of the grazier community) and other stakeholders and land pillars were placed. With the land title now secured for the community, the WMC again started installing protection activities in the catchments.

Information stakeholders: The village was assembled during a one-week training course, supported by Helvetas, and the villagers were sensitised about the importance of water catchment protection and the protective measures to be installed. A total of 6 villagers were trained as caretakers.

Feasibility study: The installation costs of the catchment protective measures were calculated and paid for by Helvetas. However, the community did all the work. The graziers were not entitled to compensation. In one catchment a local person was allowed to keep on tapping a raffia bush for palm wine as he had planted the trees in the past, the tapping did not harm the water and there was no money for compensation.



Caretaker inspects fencing

production yet, it is an investment for future use. Protective measures in all catchments include fire tracing (grass is removed up to the barren soil), storm water gutters, life and dead fencing and planting of trees inside the catchment area. Noi has five caretakers. The main caretaker loves plants and tries any plant or tree he sees for planting in the catchments. He is able to motivate both the villagers and some of the graziers to work on the catchments.

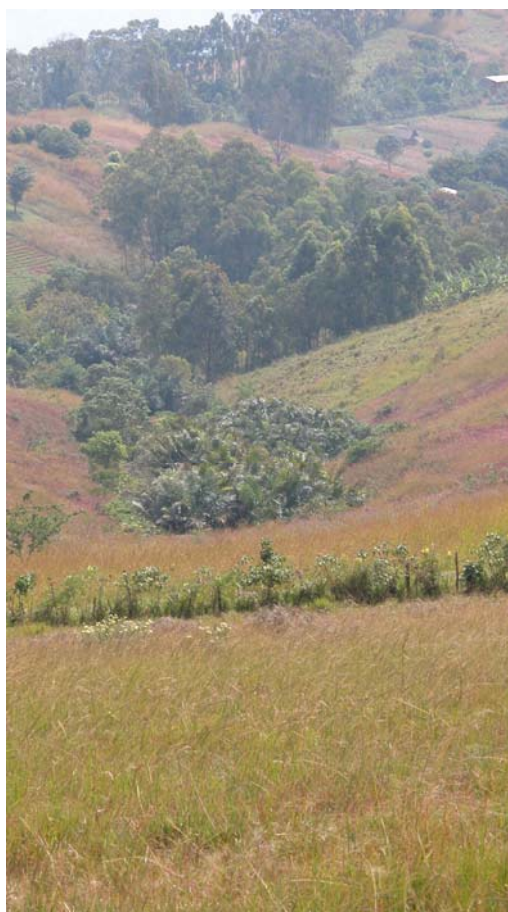
The villagers have all come out to extinguish a bushfire in Catchment A and they will work in the catchment when asked.

Construction: The villagers were working in groups and installed all the protective measures including life and dead fencing and storm gutters.

Maintenance: Each village quarter has its own quarter WMC that is responsible for user fee collection in the quarter. This makes it more difficult for individual quarter members not to pay their fees. If the quarter stand tap is damaged, the quarter WMC is responsible for repairs, thus making people more careful with the stand tap. Each quarter is responsible for a part of the catchment, which reduces the workload for the caretakers and gives the villagers more flexibility to plan their community work. The caretaker is friendly with the local grazier who will repair damages his cattle may make to the fences. Farming activities in one catchment have stopped and the catchment is protected but not in

Monitoring and evaluation: Catchment B is higher up the hill and was only an erosion infested field at the start, one year later most erosion gutters have overgrown and the vegetation in the catchment looks much better than outside the protected area. The dead fencing is of good quality, life fencing grows well. Two rows of life fencing are planted, plants are planted at high density. In some stages the life fencing is already sufficiently strong, a good result after only 1 year. Before the catchment areas were protected, the village had shortage of water in the dry season, now water is flowing year round.

The women in the village mention they have learned from catchment protection and now also prevent erosion at their farms with storm gutters and planting of Vetiver rows. The village health clinic now spends 350.000 CFA per year less on medication for water borne diseases. This is clearly due to the fact that the water sources are now protected and the water is clean and safe. The user fees are very low and not always paid. The WMC tries to keep on sensitising the population to pay their fees, in the meantime the caretakers get some financial support and all work is done with local materials. The council does not financially support the WMC. The mayor is very supportive of the water catchment protection activities and has settled problems with graziers when cows entered the catchment. The caretaker plans to plant Guatemala grass in the catchment, which can be harvested and fed to the cattle of the graziers. This could possibly increase the support from the graziers for the catchment protection activities and raise some additional income for the WMC.



What is achieved should be protected and maintained



5. DO AND DO NOT'S IN WATER CATCHMENT PROTECTION

Do	Do not
<ul style="list-style-type: none"> <input checked="" type="checkbox"/> Inform and involve all stakeholders in the water catchment protection activities <input checked="" type="checkbox"/> Settle compensations <input checked="" type="checkbox"/> Obtain catchment land title for WMC <input checked="" type="checkbox"/> Train caretakers <input checked="" type="checkbox"/> Use life poles in dead fence <input checked="" type="checkbox"/> Plant trees <input checked="" type="checkbox"/> Dig storm water gutters <input checked="" type="checkbox"/> Plant Vetiver rows against erosion <input checked="" type="checkbox"/> Do fire tracing 	<ul style="list-style-type: none"> <input checked="" type="checkbox"/> Upset people by not including them <input checked="" type="checkbox"/> Make the catchment too big <input checked="" type="checkbox"/> Use force on unwilling stakeholders when there is room for talk <input checked="" type="checkbox"/> Allow farming in the catchment <input checked="" type="checkbox"/> Allow grazing in the catchment <input checked="" type="checkbox"/> Allow fire in the catchment <input checked="" type="checkbox"/> Allow hunting in the catchment <input checked="" type="checkbox"/> Allow excreting in the catchment <input checked="" type="checkbox"/> Let the caretaker do all the work alone <input checked="" type="checkbox"/> Let people use the water if they do not pay the fee <input checked="" type="checkbox"/> Wait for the WMC to contact the council, but be proactive <input checked="" type="checkbox"/> Give money without monitoring the result <input checked="" type="checkbox"/> Think the council's tasks are finished when the catchment protection is installed
<ul style="list-style-type: none"> <input checked="" type="checkbox"/> Collect user fees and pay caretaker 	
<ul style="list-style-type: none"> <input checked="" type="checkbox"/> Meet with the WMC at least twice per year <input checked="" type="checkbox"/> Give support to WMC when necessary <input checked="" type="checkbox"/> Communicate regularly with stakeholders 	



6. LITERATURE

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Helvetas Cameroon library codes between brackets []



Water catchment protection increases sustainable access to safe drinking water

Learning and experiences sharing series publications:

1. Water Catchment Protection Handbook



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