# SPRING IMPROVEMENT AS A TOOL FOR PREVENTION OF WATER-RELATED ILLNESSES IN FOUR VILLAGES OF THE CENTER PROVINCE OF CAMEROON

**By**

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This report “Spring Improvement as a Tool for Prevention of Water-Related Illness in Four Villages of the Center Province of Cameroon” is hereby approved in partial fulfillment of the requirements for the degree of MASTER OF SCIENCE IN ENVIRONMENTAL ENGINEERING.

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## Preface

Research for this report was conducted between April 2002 and April 2004, while I was serving as a Water and Sanitation Peace Corps volunteer in Cameroon. After three months of training, I was placed in the Community Development Office of the Departmental Office of the Ministry of Agriculture of the Lekie Department, in the Center Province. I was based in Monatélé, the departmental capital, and collaborated with my counterpart and supervisor, Martin Ekoe, to conduct projects throughout the Lekie Department.

This report is submitted to complete my master's degree in environmental engineering from the Master's International Program in Civil and Environmental Engineering at Michigan Technological University. The paper focuses on four springbox projects conducted during my two years of service. Although this was a major part of my work, I was also involved in latrine projects and guiding groups in the processes involved for applying for grants for a variety of community development projects, such as pig farms and community health centers.

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Thanks to students at Michigan Technological University, Peace Corps' Small Project Assistance Program, the British High Commission of Cameroon, and the Congregational United Church of Christ of Neenah-Menasha, Wisconsin for making these and other projects possible. Kristin Eastman paved the way for me by serving as the first water/sanitation volunteer in Monatélé and establishing a good working relationship with our office and Mr. Ekoe. Karen Kelley gave me constant support as the Health/Water/Sanitation Associate Peace Corps Director, and Sylvie Ngoube helped us out with Small Project Assistance and other grant proposals. Thanks also to Emanuel Eyike for his creative and interesting technical sessions during our pre-service training, and for his faith in his three engineer trainees.

Ruth Wo'o and Ernestine Kadafi helped me pass the time with their loving company, and Jacqueline Amba taught me to make all the most important Eton dishes. Odile Magna and my neighbors, Elise, Anne, and Yolande, kept me well fed and provided constant company, along with their children. Lastly, thanks to all the Peace Corps Cameroon volunteers who could always be counted on to provide small, but much-needed respites from Cameroonian life, and to my family and friends at home who never forgot about me.

## Abstract

Worldwide, diarrhea kills about 2.2 million people annually, most of whom are under the age of five. In Cameroon, as in much of the developing world, a major cause of diarrhea is the lack of improved water sources. Although water is plentiful in the southern regions of Cameroon, water quality is poor in rural areas, where water is rarely protected.

This paper covers four spring improvement projects serving a total of 1,306 residents in four villages, conducted during two years of Peace Corps service in the Center Province of Cameroon. Projects involved needs analysis, education in project design and management, hygiene education, construction of springboxes, and continuing evaluation. By conducting a complete yearlong health survey in two villages, the link between water projects and public health in the community was also studied. The study showed that springboxes are a cost-effective way to bring a simple, durable technology for providing improved water quality to small villages.

The springbox construction projects were determined to have a positive impact on the health of the communities one year after construction, determined by the average number of days a person suffers from diarrhea. One year after construction, two communities saw a significant (within 90% and 99.5% confidence levels) decrease in the number of days a person spent with diarrhea per month. The number of days a person spent with diarrhea per month decreased by 31% in one village and by 62% in another.

Evaluation of the springbox projects also showed that families with better sanitation practices (i.e. latrines and water storage methods) saw a greater improvement in their health. The incidence of diarrhea decreased more if the family had a latrine, however the state of the latrine (i.e. completely covered and not full vs. partially covered or full) was not important. One year after construction, families with latrines saw a 39% and 67% decrease in the average number of days a person suffers from diarrhea, whereas families without latrines in the same two studies saw a 129% increase and a 41% decrease, respectively. Likewise, families that kept all water in covered containers saw a greater change in health. One year after completion, families keeping all water in covered containers saw a 36% and 83% decrease in the average number of days a person suffered from diarrhea, whereas families in the same studies that kept only drinking and cooking water in covered containers saw only a 21% and 8% decrease, respectively.

# 1 Introduction

Water-related diseases are still among the principle causes of ill health among the world's poor (Cairncross and Feachem, 1993). In 1998, diarrhea was responsible for the deaths of about 2.2 million people, most of whom were under the age of five, and in Africa, 7.7% of all deaths are attributed to diarrhea (WHO, 2004). Although 89% of the world's population has access to improved water supplies, in Africa this number is drastically lower, with 62% of the population having access to improved water supplies. In comparison, 99.9% of Northern America's population has access. Globally, Africa accounts for 28% of the total number of people without access to improved water supplies. In rural areas, the situation is much worse, with 47% of the population having access, compared with 85% in urban areas (WHO/UNICEF, 2000). This holds true in the rural regions of Cameroon as well. In the year 2000, 62% of Cameroon's population had access to safe water. In rural areas, this percentage went down to 42% (WHO/UNICEF, 2000).

The objectives of my research in Cameroon were to:

1. Analyze the need for water projects in four villages located in the Lekie Department of the Center Province, Cameroon, including a review of historical water issues in the region and current health concerns.
2. Provide details on springbox design and construction and the fundamental processes involved.
3. Determine the importance of functioning water committees and list the steps required to implement such a committee at the village level.
4. Analyze the results from four completed springbox projects located in the Lekie Division of Cameroon, specifically providing information on how construction took place; whether or not the water committees were effectively trained to maintain their springboxes; and what has been the short-term impact of the project on the community's health.

These objectives are covered throughout the chapters of this report, and methods for accomplishing the objectives are described in Chapter 3: Research Methods.

# 2 Background

## 2.1 Geography

Cameroon is situated in the crook of Africa, just where West Africa bends down toward the South and East, becoming Equatorial Africa (Figure 1). Because of the great variety in climate, topography, and ethnicity, Cameroon is known as "Africa in Miniature." The springbox projects described in this report were all completed in the Lekie Department. The Lekie Department is located at the heart of the Center Province of Cameroon, about 4° north of the equator (Figure 2). Elevation is lowest at the Sanaga River, at about 335 m, and gets as high as 640 m. It is home to about 500,000 inhabitants with a population density between 100 and 500 persons/km$^2$ living in over 700 distinct villages (Tsanga, 2004). To the north lies the Sanaga River, serving as the border between the Lekie and the Mbam Departments. Other major rivers in the department include the Afamba River, the Ngobo River, and the Lekie River, and there are many other smaller streams that provide water to the department.


**Figure 1. A Political Outline Map of Africa, with Cameroon Highlighted.**

Cameroon is located East of Nigeria, North of Gabon, South and West of Chad. Map adapted from About (2004).


**Figure 2. Cameroon and the Center Province**

Left. Caermoon, showing the Center Province. Right. The Center Province, showing the location of the Lekie Department. Cameroon map adapted from ReliefWeb (1998), Center Province map adapted from the website of Musonge, Peter Mafany, Prime Minister of Cameroon (2004).

## 2.2 Ecology

As a result of Monsoon and Harmattan winds, the Center Province is characterized by 4 seasons, as shown in Figure 3. The light rainy season lasts from March to June, with the most intense rainfall during May. In July, the light dry season begins, and it lasts until the beginning of September, when the intense rainy season begins. The intense rainy season then lasts through November, with the most rain in October. From December to late February or early March is the intense dry season, the hottest part of the year in the Center Province. Temperatures in the Center are generally between 24°C and 40°C, but can get as low as 14°C and higher than 45°C. The meteorological service is only just beginning to record temperatures.

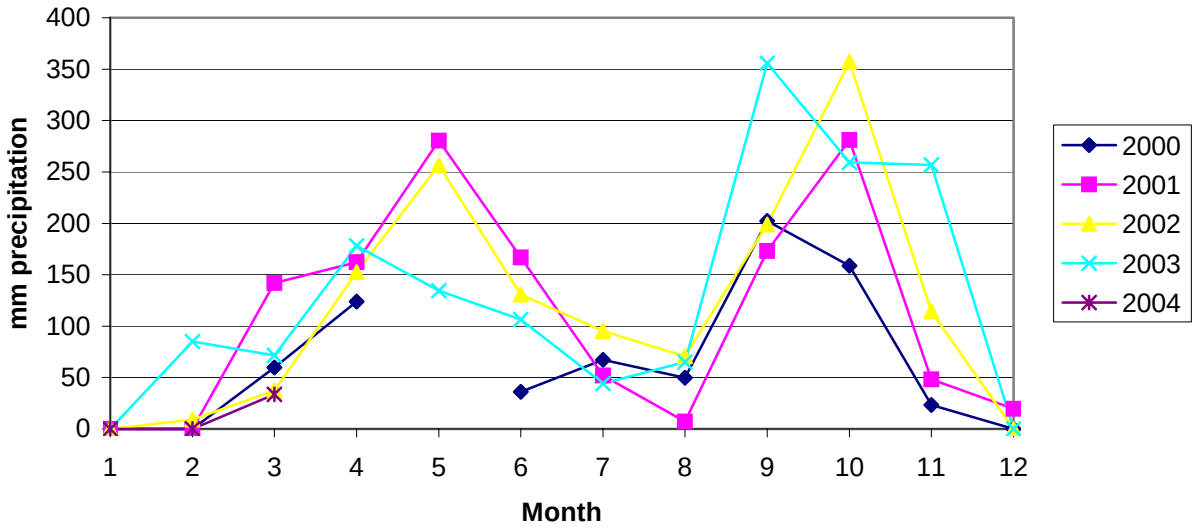


**Figure 3. Monthly Precipitation for the Lekie Department, Cameroon**

(Meteorological Service of Monatélé, March, 2004). Note: the department has only one rain gage, so data may not be accurate for the entire division.

The main ecosystems in the Center province are the semi-deciduous forest and wetlands, which are broken by transition zones between savanna and forest and plantations. Vegetation grows fast and is invasive, but the soil is old and heavily drained of nutrients after overexploitation by agriculture. Soils are iron-rich red and yellow, formed by the average 1,300 to 1,500 mm annual rainfall (Tsala Messi, 1996). The Lekie Department is located near the center of the province, and is more forested than other regions, although people remember there being more trees in the past. The department has no lack of water, even in the dry season. The Sanaga River, the largest in the country, runs through it, and there are many springs and smaller rivers.

## 2.3 The People

The population of the Lekie Department is dominated by the Eton ethnic group, a relative of the larger Ewondo group. The Eton came from the region East of the Adamaoua Plateau, chased out of their territory during wars with the Foulbe Muslim people at the end of the 18$^{th}$ century. They were installed at the confluence of the Mbam and Sanaga River in 1790. Soon after, they were once again forced to leave, this time by the Mboum people, and crossed the Sanaga to the region

now known as the Lekie. According to legend, they crossed in several trips on the back of a serpent named Ngang Medza (Tsala Messi, 1996).

In present times, although Cameroon is considered one nation, each of the approximately 250 ethnic groups retains at least a little of its ethnic identity. The Eton are known throughout Cameroon for their boldness, motivation, and work ethic. In villages, most people rely on agriculture for their livelihood. For example, more than 95% of the population in the rural commune of Monatélé relies on agriculture for their livelihood. Most of the income comes from their annual cacao harvest every November. In the rural commune of Monatélé, more than half of cultivable land is covered by cacao plantations (Tsala Messi, 1996). In addition to the cacao harvest pursued mainly by men, women participate in other smaller agricultural pursuits: tomatoes, peanuts, corn, okra, onions, etc. on a year-round basis, depending on the season.

### 2.4 Water and Sanitation Issues in the Lekie Department:

In general, when talking about water quantity problems, the northern part of Cameroon comes to mind, as it suffers from desertification. Although water abounds in the southern regions of Cameroon where the Lekie Department is located, it is poorly used and poorly protected (Tsanga, 2004).

Larger cities generally take surface water and have distribution systems with chemical treatment. Villages, however, often have either hand-dug wells (rarely covered) or unprotected springs. Thus, water and sanitation development work is focused on rural areas. Women and children often walk through the forest up to three kilometers in search of water they deem clean. By developed world standards, however, this water is rarely potable. Usually, water is drawn from uncovered wells and unprotected springs. People bathe and wash clothes near water sources, and little regard is paid to nearby potential pollution sources such as latrines, domestic animals, and spray pesticides in cacao plantations.

Because water and sanitation are very important to development work, many governmental, foreign, and non-governmental organizations are involved in water projects. Seven ministries

are involved in some way in the execution, orientation, and control of water projects. Many water projects have been carried out by these governmental and nongovernmental organizations, but many have been unsuccessful. For example, a major project called Scanwater that was intended to bring water distribution systems to villages has twelve water towers and distribution systems in the department. Currently, only two of these systems are functioning. Two others are in good repair, but lack gasoline for the generators. The Office of Rural Engineering of the Ministry of Agriculture has tried similar projects. Of the four completed water tower systems, none are currently functioning (Tsanga, 2004).

When asked to summarize the availability of water in the Lekie, Faustin Ateba Tsanga, a former employee of the Ministry of Mines, Water, and Energy, listed the 12 villages with Scanwater installations, 4 villages with Rural Engineering water distribution systems, and 148 other wells and bore holes equipped with pumps by the Ministry of Mines, Water, and Energy, of which an estimated 100 function. He also estimated that there are about 50 other small water projects put in by other organizations or individuals.

The United Nations had set a goal for Cameroon to meet certain standards during the Decade of Water between 1980 and 1990. During the first phase of the decade, Cameroon was to have a water point for every 500 inhabitants, and by the year 2000, this was to be improved to 150 to 200 inhabitants per water source. Tsanga reasoned that if wells with pumps, improved springs, standpipes, private branchings from distribution systems, and all other small private well projects can all be considered water points, then there are an estimated 700 water points in the department. If this is the case, and if there are 500,000 inhabitants in the department, then the Lekie is currently up to 714 inhabitants per water source. These are all taken to be rough estimates, as time and money did not allow visits to every single village in the department. However, even this rough estimate speaks for the situation in the Lekie. Clearly, the department has come nowhere near approaching the goal set by the United Nations of having 150 to 200 inhabitants per water source (Tsanga, 2004).

Pumps break, filters clog, generators run out of gas, and the communities are left alone to deal with maintenance problems. Until recently (even now, in many cases), development work in

Cameroon has been project oriented, rather than skills transfer and capacity building oriented. Without trained and well-organized water committees, failed projects never recover. This is also a hindrance to community development workers, because people are so used to receiving projects without giving a community contribution. Village groups are not prepared to take ownership of their projects.

## 2.5 Springboxes as a solution

Water-related diseases include four classifications, and each classification requires different strategies of prevention, summarized in Table 1. The table also shows where a springbox can intervene in these strategies.

**Table 1. Classification of water-borne illnesses and strategies for their prevention.**

(Cairncross and Feachem, 1993). Springboxes are shown here as an appropriate method for prevention of several disease classifications.

| Classification | Definition | Prevention Strategies | Springbox can help? |
|---|---|---|---|
| Water-borne | The pathogen is in water ingested by a person or animal, who then becomes infected | Improve drinking water quality | Yes |
| | | Prevent casual use of unprotected sources of water | Yes |
| Water-washed | Results from inadequate bathing, depends on the quantity of water. | Increase water quantity | No |
| | | Improve accessibility | No |
| | | Improve reliability | Yes - stores water |
| | | Improve hygiene | No |
| Water-based | The pathogen spends part of its life cycle in a water snail or other aquatic animal | Reduce need for contact with infected water | Yes |
| | | Control snail populations | Yes |
| | | Reduce contamination of surface waters | Yes |
| Insect vector | The spread of the disease relies on insects breeding or biting in or near water. | Improve surface water management | No |
| | | Destroy breeding sites | Yes |
| | | Reduce the need to visit breeding sites | No |
| | | Use mosquito netting | No |

From Table 1, it is clear that a springbox project is an appropriate intervention strategy in the prevention of many water-related diseases. The table shows that springboxes are most effective at preventing water-borne diseases. Because the water is protected directly as it leaves the ground, instead of being allowed to pool up in an open pond, the quality of water is improved, and use is limited to drawing water from a faucet. Children can no longer play in the pond or dip

dirty buckets to draw water. When water in the spring was viewed before and after, an obvious improvement was visible, as water in unprotected springs is usually turbid and crowded with leaves and other debris, frogs, and aquatic plants.

Springboxes can have only a minimal impact on water-washed diseases. Because water-washed diseases result from insufficient bathing, their prevention depends on improving the accessibility and quantity of water. Although the actual quantity of water cannot be augmented, the reliability is improved by storing water in the reservoir. Springboxes generally fail to greatly improve the accessibility of water. However, if the spring is situated higher than the community, a water distribution system could easily be installed to improve the accessibility. Improved hygiene can only be achieved through education and behavior change. Although construction of a springbox alone will not improve hygiene, if education is included, improved hygiene can be achieved. This is, however, the same for all types of water projects.

Springboxes can have an impact on water-based diseases, because before construction, springs are often home to a number of aquatic animals including snails, frogs, and sometimes even small fish. Because the pond is drained and water is stocked in a protected reservoir, these animals can no longer exist in the spring. The addition of a faucet means that people no longer have contact with infected water.

Springbox construction may also have a small impact on diseases such as malaria transmitted by insect vectors. By eliminating stagnant water where children gather to draw water, mosquitoes lose their breeding grounds. This is an important consideration, as the Lekie Departmental Hospital cited malaria as the number one reason for consultations. Springbox construction can only minimally impact insect vector diseases, however, so focus is necessary on improved surface water management and overall reduction of breeding sites, as well as the use of mosquito netting.

Because springbox construction projects are relatively inexpensive, and a large proportion of the materials required are available at the community level (sand, gravel, rocks, etc.), springbox projects are generally feasible for village groups. A springbox requires minimal maintenance, as

there are no mechanical parts, and is durable to the abuse of children who are usually responsible for drawing water. Little behavior change is required, because usually the springs are already well used by the communities. These advantages, along with the effectiveness of springboxes in reducing water-related diseases made promotion of springbox construction in rural communities of the Lekie Department an important focus of my work with the Ministry of Agriculture.

# 3 Research Methods

This report covers four springbox construction projects, implemented in four different communities. When conducting these projects, the overall goal was to improve the health of the community members by improving the quality of water they had access to. In designing and conducting the projects, the following objectives were developed. The research objectives are described here, and are used in the development of chapters four through seven, detailing springbox design, implementation, project design and management training, and evaluation.

## 3.1 Objective 1.

**Analyze the need for water projects in four villages located in the Lekie Division of the Center Province, Cameroon, including a review of historical water issues in the region and current health concerns.**

Methods for determining the needs of the communities changed with time. In the beginning, I worked with groups who invited me to assist them specifically with water projects. The group's request and motivation seemed to be sufficient demonstration of the group's need for potable water in the communities. The fact that other communities focused only on large construction projects such as meeting halls in order to show their status contributed to the understanding that groups willing to ask for smaller, less-expensive, less-showy water projects must have felt a real need for potable water. The needs analyses are covered further in Section 5.1: Initial Contact and Needs Analysis.

Because my counterpart and I were anxious to have a physical project in the beginning, we did not focus sufficiently on needs analysis with the first communities involved. In Bilik-Bikot, for example, the only analysis was provided by the health statistics for water-borne diseases taken from the local health center. By the end of my two years of service, however, I had learned the importance of conducting needs analysis with the communities involved. Not only did community-based needs analysis give support to the project plan and proposal, but it also provided an excellent opportunity to help the communities involved understand the real importance of the project. They saw the springbox as part of a solution to their water-related diseases, in combination with improved personal and community hygiene practices.

Components of the needs analysis built up over the two years, until by the end, a complete analysis was done in Mvomekak. In Nkol-Edinga, the second village, the group sought statistics from the local health center, as Bilik-Bikot did, and they also answered questions, as a group, concerning their views on the health of the community, the quantity and quality of the water in the spring involved, and the total number of water sources available to the community. When work began with the third community, Nkol-Messe, we used the above components for analysis, with the questions improved and including a community map to show, visually, the community's access to water. The analysis in Mvomekak involved all of the above, plus a complete health survey of the community. This health survey had been conducted, or a previous version, in all three previous villages, but it had not been used as a tool for needs analysis. In these three villages, the surveys were completed after the project plan and proposal had been developed, simply as a tool for analysis of the project's impact on the health of the community. Details on how the surveys were conducted are covered in Section 5.1.2: Health Survey Techniques.

In order to review the historical water issues and the current health concerns of the region, statistics were unsuccessfully sought from the Lekie Department Hospital in Monatélé, the departmental capital, and from the Ministry of Mines, Water, and Energy. The departmental hospital had a doctor present who was not interested in collaboration. The current delegate of the Ministry of Mines Water and Energy in Monatélé is not effective, and the employees do not collaborate with him, so the office is essentially non-functional. Instead of the official Ministry of Mines statistics, I was able to interview a former ministry employee, who was able to provide

me with information on historical water projects and water issues in the Lekie Division. Unfortunately, no such substitute could be found from the divisional hospital. These historical water issues are described in Section 2.4: Water and Sanitation Issues in the Lekie Department.

### 3.2 Objective 2.

**Provide details on springbox design and construction and the fundamental processes involved.**

Design and construction of the springboxes was heavily reliant on the previous experiences of my counterpart at the Ministry of Agriculture, Martin Ekoe. He has had many years of experience in the field of rural engineering, and he is a qualified technician. He has also had two years of experience with a previous Peace Corps volunteer.

Ekoe has a general design for springboxes, which we used to guide our work. The actual final design of a springbox, however, varied slightly from spring to spring, depending on the surrounding topography, the output of the spring, and the number and placement of veins augmenting the spring. The design and construction of the springboxes will be described in further detail in Chapter 4: Springbox Design and Section 5.4: Springbox Construction.

### 3.3 Objective 3.

**Determine the importance of functioning water committees and list the steps required to implement such a committee at the village level.**

In the beginning, work was not focused on development of the water committees involved in the projects. The committees were formed, but had only minimal training. With time, it became evident that a water project could not succeed in the region without extensive training in project design and management and conducting committee meetings. In the end, I have developed a series of training sessions to be conducted with the management committees of projects. This information will be detailed in Chapter 6: Education in Project Design and Management.

### 3.4 Objective 4.

**Analyze the results from four completed springbox projects located in the Lekie Division of Cameroon, specifically providing information on how construction took place; wether or not the water committees were effectively trained to maintain their springboxes; and what has been the short-term impact of the project on the community's health.**

Steps for the implementation of the four springbox projects were developed over time, with the Mvomekak project having the most complete progression. These steps are outlined in Chapter 5: Implementation of Springbox Projects.

The success of the training and the effects of having a well-organized management committee were determined in the final month of my two year service by visiting the four communities where projects were completed and checking to see if the springboxes were properly maintained, as well as by interviewing members of the community and the management committee to determine their satisfaction levels. Results of this analysis are included in Chapter 7: Evaluation of the Projects.

The impact of the projects on the health of the communities was determined by using a health survey that I developed over the two years. The survey involved an interview asking the frequency of diarrhea in households and behavioral questions, such as covering latrines and covering drinking water. The format of the survey changed as I discovered better ways of phrasing questions, however the questions essentially remained the same. Methods of conducting the health survey also varied among the villages, and this will be discussed in Section 5.1.2: Health survey techniques. Before conducting the surveys, I asked the community at large what would be the best way of getting accurate information – conducting the interview myself with an interpreter for local language, training a member of the management committee to conduct the interviews without my presence, or training a group of women to interview without my presence. A sample survey is presented in Appendix 1. The surveying techniques are described further in Section 5.1.2: Health Survey Techniques, and the results are presented in Chapter 7: Evaluation of the Projects.

# 4 Springbox Design

## 4.1 Choice of spring

In the Lekie Department, the topography is very hilly, and the bedrock begins at shallow depths. Groundwater, therefore, is mostly found flowing in large fractures in the bedrock, and there are many springs in the valleys, where the fractured bedrock reaches the surface. These springs have the appearance of seepage gravity overflow springs, with water filtrating through the porous soil in the fractures. Often, villages have several springs from which to choose.

In some cases, the springs are already chosen by the groups. The villagers are already in the habit of using one specific spring for various reasons: the water looks cleaner and tastes better, it is closer to more people, the flow is constant and sufficient, or maybe they just use it because their ancestors did and they think that sorcerers may have poisoned other water sources. In any case, if the community has chosen a spring, it is good to use that one, because habits are difficult to change. Therefore, as was the case for the first three springbox projects, the work of choosing a spring may already be done, and the spring must simply be checked to make sure it will be appropriate.

If, on the other hand, the community has several springs from which to choose (which was the case in Mvomekak), all sources must be evaluated. The spring is then chosen based on surveying community habits, output of the spring (measured with a weir), quality of the water (based on appearance, odor, and opinions of villagers on taste), and accessibility of the source. Most springs are difficult to get down to, because they are in valleys, and it is difficult to imagine women and children carrying buckets full of water up the steep slopes.

In Mvomekak, the community had a choice between two springs. The first spring, where they were hoping to construct, was poorly chosen. The spring was located such that water was not allowed to drain, and the output was barely noticeable. It was only when they were told that a springbox could not be built there that they mentioned another spring. This other spring had a sufficient output of 1.7 L/min and was well used. The site was already well cared for, and

people were used to drinking this water. When asked why they had not mentioned this spring, they explained that they were afraid that if they had showed us a good spring, we would tell them that it did not need improvement. More information on the hydrology of springs and selecting a spring for a community water source can be found in the IRC Technical Paper Series, #18 (Huisman et al, 1981).

## 4.2 Design and Principles

The basic springbox design is shown in Figure 4 and Figure 5. My counterpart, Ekoe, designed the springboxes, as he is a rural engineering technician and has used his design for many earlier successful projects. Because it is a general design, however, small changes were made to accommodate each specific spring. Other springwater tapping schemes are described in the IRC Technical Paper Series, #18 (Huisman, 1981).

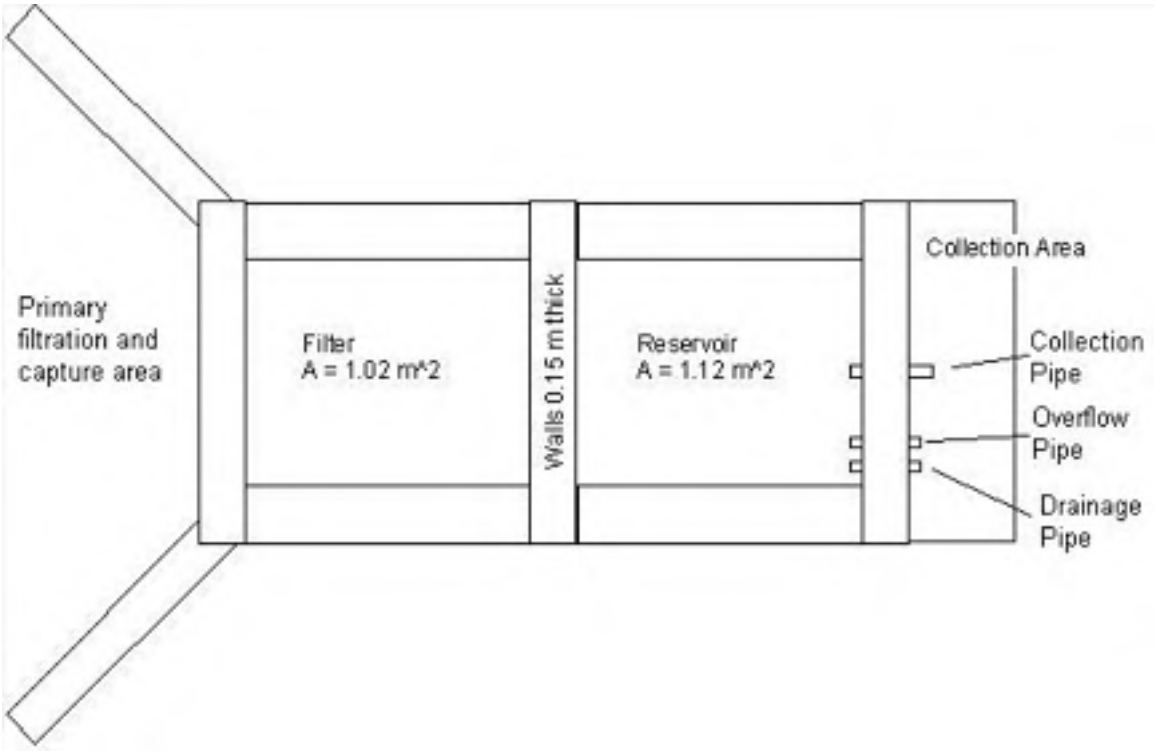


**Figure 4. Plan view of general springbox design**

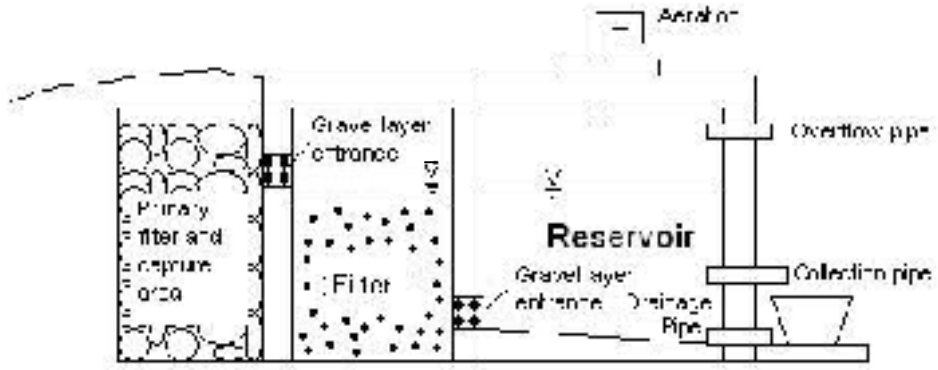


**Figure 5. Side view of springbox design**

### 4.2.1 Primary filtration and capture area

One advantage of springboxes is that the design is very simple. The primary filtration and capture area is built directly over the spring pool, after digging down to the impermeable layer of bedrock or clay. Water leaving the ground first enters the primary filtration and capture area, built with steel reinforced concrete walls angling into the surrounding ground, in order to capture the most water. The primary filtration and capture area is filled with rocks up to the level of the entrance to the next chamber, the secondary filter. The entrance to the secondary filter is a layer of gravel a few inches thick in the reinforced concrete wall, about 0.75 m up from the bottom of the wall.

The size of the primary filtration and capture area is dependent on the location of the veins augmenting the spring. If the veins are spread out wider, obviously, the capture walls must be built to spread out wider. Walls are built into the surrounding earth and extend about 30 to 50 cm into the dirt to provide stabilization and to assure that all water is guided into the springbox. There is no poured concrete floor for the primary filtration and capture area, so the floor is the impermeable layer of bedrock or clay.

### 4.2.2 Secondary filter

When the water leaves the primary filtration and capture area, it enters the secondary filter. Because the groundwater is considered essentially clean as it leaves the spring, the filter is only built to remove any dirt that may get caught by the water as it leaves the spring and moves through the primary filtration and capture area. In the initial design, the filter was to be a slow sand filter. For a slow sand filter to function, the sand should have an effective grain size of 0.15 to 0.30 mm and uniformity coefficient less than 5 (D60/D10, where D60 is the sieve size that lets 60% of the sand pass and D10 is the sieve size that lets 10% pass), the minimum thickness of the sand should be 0.5 m, and the rate of filtration should be no faster than 0.1 to 0.2 $m^3/m^2/h$ (Visscher et al, 1987). For a filtration rate of 0.1 m/h through a clean filter, the minimum head over the filter is 5 cm, based on the Rose Equation for head loss through granular porous medium (Tchobanoglous and Burton, 2003). Even with a small spring output like 1.7 L/min, the surface area of the filter must be 1.02 $m^2$. Again, a poured concrete floor is not necessary for the filter. The floor is essentially the impermeable layer of bedrock or clay.

Considering that the secondary filtration is only really necessary for the removal of any dirt picked up during movement through the springbox, and not for removal of chemical or biological pollution (assuming that the springbox is located far from any potential pollution source such as latrines), this relatively large surface area necessary for slow sand filtration was determined to be just an unnecessary expense in reinforced concrete and sand. In fact, in some springbox plans, filtration is ignored, with the understanding that the water is exiting the spring already filtered by the ground. The filters were therefore filled with very coarse sand or small gravel, so that filtration was rapid. The filters were built to be approximately 1.5m by 0.5 m by 1 m, depending on the construction site. Box 1 shows an example calculation for sizing of the filter. Water enters the filter through the gravel entrance built into the wall and moves down through the filter. At the bottom, the wall between the filter and reservoir contains another gravel entrance.

### 4.2.3 Reservoir

The reservoirs were supposed to be built based on the output of the source in order to maximize the amount of water that is stocked overnight. For example, if a spring has a maximum output during the rainy season of 6 L/min, assuming that no one draws water between 6:30pm and 5:30am (11 hours of filling), the reservoir could be built up to 3.96 $m^3$. This is, of course, limited by the means of the community to provide sand and gravel for the concrete and the budget for cement, rebar, and sikalite (a waterproofing admixture used because of placing concrete in wet conditions). Calculations are shown in Box 1. The reservoir walls are reinforced concrete, and the floor should be a sloped and smoothed poured concrete floors. All surfaces inside the reservoir should be smooth for easy cleaning.

At the other side of the reservoir is a concrete slab to place buckets on, and drainage canals dug to avoid stagnant water. The collection and overflow pipes were all PVC. They were cut short to avoid children standing on them and breaking them. Additionally, if the community wants it, a concrete table can be built a few meters downstream of the reservoir for washing clothes. Depending on the situation of the spring, small changes were always made: retaining walls, stairs, etc. The design differences for each spring are summarized in Table 2.

**Box 1. Example Calculations for Springbox Design**

*Primary filter and capture area:*

Sizing the primary filter and capture area depends on the placement of the veins, so no calculations are required. To find the veins, open the spring by digging a channel that allows the spring to drain. Once the spring is empty, the veins are visible. The ground is dug down to the impermeable layer of rock or clay, and the walls are then built into the surrounding ground in order to capture water coming into the spring from all veins.

*Slow Sand Filter:*

In order for filtration to be slow, sand should have an effective grain size of 0.15 to 0.30 mm and uniformity coefficient less than 5, with the filtration rate no faster than 0.1 to 0.2 $m^3/m^2/h$ (Vischer et al., 1987). This filtration rate is achieved by having a head of at least 5 cm over the clean filter, based on the Rose Equation for head loss through a granular porous medium (Tchobanoglous and Burton, 2003). The uniformity coefficient is defined as D60/D10, where D60 is the grain diameter for which 60% of the sand is smaller and D10 is the grain diameter for which 10% is smaller.

For a spring with a measured output of 6 L/min during the peak of the rainy season
6 L/min = 0.36 $m^3/h$

For a filtration rate, *v*, of 0.1 $m^3/m^2/h$,

$$v = \frac{Q}{A} = \frac{0.36m^3/h}{A}$$

$$A = \frac{Q}{v} = \frac{0.36m^3/h}{0.1m^3/m^2/h} = 3.6m^2$$

Equation 1. Calculation of filter area.

In some cases, where space or materials are not available to build a large slow sand filter, gravel can be substituted, assuming that water is sufficiently filtered by the ground before it enters the spring.

*Reservoir:*

Assuming that no one collects water between 6:30pm and 5:30am, the reservoir can be built to hold the amount of water that can be stored after 11 hours of filling. For 11 hours of filling during the peak of the rainy season, the maximum volume, *V*, that can be stored overnight can be calculated, using:

$$V = Q \times t$$

$$V = 0.36m^3/h \times 11h = 3.96m^3$$

Equation 2. Calculation of reservoir volume.

### 4.2.4 Design differences and cost estimate

Table 2 includes design features for each of the four springbox projects. Although in theory designs should be more based on the output of the spring and the demands of the community, in practice, designs varied only slightly among the villages.

**Table 2. Design features for the individual springboxes.**

Variations were, on the whole, minor, and were generally not entirely planned.

| Village | Q (L/min) (end of dry season) | Population served | Capture Area Size ($m^2$) | Secondary Filter size ($m^2$) | Secondary filter material | Reservoir Size ($m^3$) | Other details or additions | Estimated Cost in CFA |
|---|---|---|---|---|---|---|---|---|
| Bilik-Bikot | 2.62 | 80 | 1.5 | 0.75 | Sand & gravel | 1.5 | Low retaining walls, clothes washing bench, small bottle faucet | 1,210,770 |
| Nkol-Edinga | 2.94 | 407 | 4.0 | 1.0 | Sand & gravel, switched to gravel | 2.9 | High retaining walls, steps | 1,236,730 |
| Nkol-Messe | 15.9 | 574 | 3 | 1.0 | Gravel | 2.25 | Low retaining walls, plastic tarp over capture area, channeling from reservoir | 1,529,330 |
| Mvomekak | 0.6 | 245 | 1.0 | 1.0 | Gravel | 1.5 | Extra capture area around newly discovered veins, channeling from reservoir, low retaining walls | 1,427,300 |

Table 3 includes a typical budget estimate for a springbox project. Although ideally, the reservoirs and filters should be sized according to the output of the springs, in reality, construction ended up being a function of the amount of materials at hand, so there is little difference among the sizes despite the large differences (especially in the case of Nkol-Messe) in output. All the materials are readily available, if not in the village itself, then in Monatélé, the

departmental capital. Maintenance and repair costs are minimal: cement to reseal the reservoir lid after cleaning (less than half a sack per cleaning) and replacement faucets and pipes in case of breakage. The system is durable to the effects of everyday use by children and has few parts that can break.

**Table 3. Typical springbox budget estimate.**

This budget is taken from the Nkol-Messe springbox project. All costs are in Cameroonian CFA, where 1 USD ranged from about 750 CFA to 580 CFA during 2002 and 2004.

**Springbox Construction Budget for NKOL OSSAN, Quartier NKOL MESSE**

**Small Project Assistance Request**

| Designation | Unit | Quantity | Unit Price (CFA) | Total (CFA) |
|---|---|---|---|---|
| | | | | |
| Cement | sack | 50 | 5000 | 250000 |
| Rebar 8 mm | bar | 25 | 2500 | 62500 |
| Sikalite, a powdered waterproofing admixture | kg | 50 | 3000 | 150000 |
| PVC pipe, diameter 40 mm | pipe | 2 | 6000 | 12000 |
| Saw blade | pack | 1 | 8000 | 8000 |
| Binding wire | Reel | 1 | 2000 | 2000 |
| Nails 70 mm | kg | 10 | 700 | 7000 |
| Elbow | U | 4 | 2500 | 10000 |
| Faucet 20/27 (inside/outside diameter) | U | 1 | 3500 | 3500 |
| stop valve 20/27 (inside/outside diameter) | U | 1 | 4800 | 4800 |
| Galvanized pipe 20/27 (inside/outside diameter) | U | 1 | 7500 | 7500 |
| Sleeve 20/27 (inside/outside diameter) | U | 2 | 500 | 1000 |
| Tangit glue | U | 1 | 2000 | 2000 |
| Transport of materials | | | | 45000 |
| Technicien - mason | | | | 200,000 |
| Technicien - plumber | | | | 50,000 |
| Total Project Cost | | | | 815300 |
| Unexpected Costs (10%) | | | | 81530 |

**Total Small Project Assistance Request** **896830**

**58.6%**

**Community Contribution**

| Designation | Unit | Quantity | Unit Price (CFA) | Total (CFA) |
|---|---|---|---|---|
| | | | | |
| Cleaning and Digging site | days | 2 | 25000 | 50000 |
| Stocking rocks and gravel | $m^3$ | 4 | 15000 | 60000 |
| Stocking sand | $m^3$ | 5 | 3000 | 15000 |
| Framing wood | boards | 15 | 2000 | 30000 |
| Nonspecialized Labor | man-hours/day | 80 | 3000 | 240000 |
| Meals for workers | Meal | 16 | 5000 | 80000 |
| Technical supervision | day | 20 | 5000 | 100000 |
| Total | | | | 575000 |
| Unexpected Costs (10%) | | | | 57500 |

When construction was complete, maintenance was left in the charge of the management committee. A typical maintenance schedule is shown in Table 4.

**Table 4. Typical schedule of maintenance for a springbox.**

| | |
|---|---|
| Monthly or more | Cleaning around the site (i.e. raking of leaves, clearing the drainage canal, clearing brush from the access trail) |
| Every six months or when water does not look clean coming out of the reservoir | Open the reservoir and filter. Clean reservoir walls and floor, wash with bleach. Rinse or remove the top layer of the filter material and clear debris from gravel layer entrances. Replace covers with cement mortar. |
| Unexpected maintenance costs | Replace broken pipes, repair cracks and leaks. |

Typically, the committee set up a collection of water dues at the beginning of the project. The president of the committee was then responsible for monitoring the quality of water coming out of the springbox and notifying Ekoe if there were any problems that needed attention. The president was also in charge of organizing cleaning of the reservoir and filter when he/she noticed that the water was not coming out clear, as well as arranging periodic cleanups in the area around the spring.

## 5 Implementation of Springbox Projects

The steps for the implementation of springbox projects outlined in this section were developed over two years of working with community groups. The phases described are those realized during the execution of the final project after learning from experience with the previous projects. Differences in implementation of the previous projects will be noted where appropriate.

In order for all components of the project to be well integrated, the total project cycle would take at least a year and a half, provided that funding is readily available. Unfortunately, a Peace Corps volunteer has only two years to work. By the time the complete project design and management scheme was developed, it was impossible to complete the entire cycle, including evaluation.

## 5.1 Initial contact and needs analysis

### 5.1.1 Initial visits, gauging motivation, and planning

During my two years working with the Ministry of Agriculture of the Lekie Department, many groups contacted our office in order to receive aid for a variety of development projects, including health centers, community meeting halls, cacao warehouses, pig and chicken farms, bridges, roads, water distribution systems, pump installations or repairs, and spring improvement. In all cases, we began our work the same way - by conducting an initial meeting with the community to determine whether the project was, indeed, the priority project of the entire community.

Of all of these 43 initial visits, 14 groups asked for spring improvement projects. Of these groups, only five communities continued to work with us in order to conduct springbox projects. Four of these were able to complete construction. The last project, in a village called Nkol-Kosse, involved construction of six springboxes, and was therefore too large to be funded through Peace Corps' Small Project Assistance Program, and so they have applied for funding from other sources and are waiting for the replies.

In all five cases, the groups had already decided, before our arrival, that the biggest concern in their communities was the lack of potable water. During the initial contact meetings, their reasoning was always the same. They explained, simply, that they were often sick with diarrhea, and that without clean water, they could not achieve good health, and would therefore not be able to work as much in their fields. "Water is life," they all told us - the catch phrase for groups hoping to receive funding for water projects. This statement could be considered the beginning of the needs analysis for the project, as it demonstrates a real felt need of the community.

After discussing the possibility of doing a springbox project, the groups were given some homework to prove that they were motivated enough to provide the labor required for a construction project. In the beginning, this involved simply getting health statistics from their local health centers on water-related illnesses and doing a census of the population that would

benefit from the project. At first, this seemed to be an adequate evaluation of the community's needs and motivation.

By the time meetings began in the fourth village, Mvomekak, however, a better system for needs analysis and gauging motivation was established. In the analysis, the same statistics were sought, along with a community map, and a complete health survey to determine the incidence of diarrhea in the community and to discover the personal hygiene habits of individual families. Davis et al. (1993) also covers methods for community-based needs analysis, including techniques that can be used to collect important information for water projects such as community mapping, surveying households, involving women, and gathering information on water quality, water availability, and household sanitation practices.

Project planning also became more in-depth at the community level, and included many educative sessions on project design and management, described in Chapter 6: Education in Project Design and Management. This educational component became an important tool for building community ownership of the project and understanding of the reasoning for the project. As mentioned by Huisman et al. (1981), a major difference between an urban water distribution project and a small scale community water project is the understanding of ownership of water. In urban settings, water users are accustomed to the idea of paying for water, and they often see their water tap as the only acceptable source of water available to them. In a small village, on the other hand, water is seen as communal and free, and households may have a choice among several sources of water (perhaps from several springs). Water availability and accessibility are more of an issue to households in rural settings than water quality. This demand for higher quality water can only result from a strong educational component in the project. During the planning of the projects, the communities involved had the opportunity to identify the real causes of the problems in their village, which gave them an interest in ownership of the project.

When planning the water projects, the villages were asked to identify the problem and its causes, propose a solution to the problem (amelioration of the quality of water, accompanied by changes in hygiene habits), and define clearly the goals and objectives of the project, including educational components. A project goal may be to improve the health of a community, with the

objectives detailing how this would be done, including construction of a springbox, hygiene education, and education in project design and management.

Because the whole process of planning the project from the initial visit to the submission of a project proposal could take up to eight months, the educational sessions involved were also used as a method for gauging motivation. If a community is willing and able to participate in these sessions and complete the required "homework" accompanying the sessions, it is probably motivated enough to provide the necessary community participation for the project.

When considering the amount of time necessary for a complete project cycle, it is also important to bear in mind the frustration a community and development worker may feel when conducting a simple water project over a long period of time. Community members may lose confidence in the project or feel that they have been abandoned if, during the project planning stage, so much time lapses that the finished project is too far in the future to imagine. This is discussed further by Davis et al (1993). As described in this book, I have also witnessed community members walking out of meetings, disgusted by the fact that several months after deciding to do a water project, the group is still in the planning stages. If the correct balance is found between a complete planning process and a timely project implementation, however, the planning can be a valuable experience for the community and can also be a gauge for motivating groups.

### 5.1.2 Health survey techniques

In the beginning, health and water use surveys were used simply as a method for evaluation of the springbox projects. In the end, however, beginning with the community of Mvomekak, the surveys were also used as a way to evaluate the needs of the community, in addition to the baseline information required for evaluation of the project. When designing the survey, I first considered the type of information I was hoping to obtain. In order to keep the survey as simple and short as possible, only the following information was deemed important enough for the questionnaire:

- Most common illnesses
- Frequency of diarrhea or digestive problems

- Who gets sick the most often
- Number in the family
- Conditions of latrines and water storage
- Amount of water used
- Water collection point used

Other information that was not collected here, but may be important to the project, is given by Davis et al. (1993), such as:

- Individual willingness to contribute to a project
- Financial capabilities of individuals
- Knowledge of water-related diseases and their prevention
- Attitudes toward handling of water
- Beliefs that may affect hygiene and sanitation behaviors
- Time of day water is collected
- Who collects water

The questionnaire is written to be understood by someone who has completed at least primary and early secondary education, and is written in French, an official language of Cameroon. Unfortunately, French is not usually the principal language spoken in homes. Much of the older population does not even speak French, especially older women in small villages. The local language becomes a barrier to accessing sensitive information, because not only does fluency improve overall communication, but it also builds trust between interviewer and interviewee (Bernard, 2002). Language was not the only barrier. Because many of the interviewees had little to no formal education, the reasoning behind the surveys was difficult for many people to grasp. The questioning process required creative improvising, cross-questioning, and active listening during the interview. Therefore, the exact phrasing of the questions changed with every interview. The questionnaire is included in Appendix 1.

The question of how best to conduct the health survey was a difficult one to answer. It was important that the information be accurate and unbiased. Because people are often embarrassed to discuss family health problems such as diarrhea, they may give different answers based on

who is asking. When questioning, a local person may be better at communicating, and may have a certain level of trust in the community. This person may also be regarded as more likely to use sensitive information against the families (Devereux and Hoddinott, 1993). Additionally, thought was given to who in the household knows best the health status of each family member. In most cases, this person was a mother or a grandmother. Because girls generally do not frequent schools as long as boys, and the oldest women may not have even made it through primary school, it is often difficult to impossible to conduct the health survey in French. Thus, the question of who conducted the interview posed several issues. In all cases, the villages were given an explanation of these issues and given the opportunity to decide for themselves how best to obtain this sensitive information.

In the case of Bilik-Bikot, the secretary of the project management committee was selected to conduct the interviews. The community felt that he could be trusted to keep their personal information private, and he proved to be a good interviewer, because he understood the purpose of the survey, and he was very tedious in repeatedly rephrasing the questions so that even very uneducated, non-French speaking, old women would understand.

When the survey was to be conducted in Nkol-Edinga, the community decided that it would be best to train women to do the interviews. Their reasoning was that, because women are often the family members most concerned with health issues, the women interviewers would be better able to pose questions in a way that would be understood, and they would be better able to detect when the full truth was not being told. Because the village was large, five women were trained to interview. These women had to be somewhat well educated in order to translate the questions and understand the reasoning behind the questions. Often, when conducting the interview, straight answers were hard to get, so the question had to be posed in a variety of ways, turning each question into a kind of improvised guided conversation. The women had to be able, therefore, to improvise without changing the meaning behind the questions.

When it came time to conduct the final survey in Nkol-Edinga, however, things became more difficult. I returned to the village three or four times in hopes of finding the surveys finished, until finally, the president of the management committee informed me that the women had

refused to conduct the survey again unless they were paid. Instead, I conducted the final survey myself, using as a translator a woman interning with us. When we conducted the survey, only nine families were available to be interviewed, so the sample size decreased drastically.

This same system was again used in Mvomekak, where the community also felt that women would be more trusted and better able to understand family health concerns. In Nkol-Messe, however, the community felt that the truth would come out easier if an outsider were doing the questioning. They reasoned that people might be more willing to tell me about their sicknesses, in the hopes that I would be able to help them. Thus, I conducted the interviews myself, with the help of a local woman to translate. Because I did not want to give them false hopes, however, and I did not want them to change their responses just because they knew I wanted to hear that they were sick, I had to be very careful to explain the purpose of the survey.

In addition to these changes in methods of interviewing, the actual survey questions were revised to make the interviews more efficient. The surveys done in Bilik-Bikot and Nkol-Edinga were the first edition, which contained the same questions in a slightly different format, and the surveys for Nkol-Messe and Mvomekak used the new version, described in Appendix 1. A summary of survey techniques used for each village is shown in Table 5.

**Table 5. Summary of health survey techniques.**

Note: the average household size ranged from 4 to 17, so although the sample sizes were small, the actual populations being surveyed were much larger.

| Village | Construction period | Interviewer | Sample size (n= number of households surveyed) | Survey Edition | Hygiene Education conducted |
|---|---|---|---|---|---|
| Bilik-Bikot | November, 2002 | Male secretary | 9 | First | 1 animation |
| Nkol-Edinga | February, 2003 | 1st – 5 women 2nd – myself and a non-local Eton woman intern | 9 | First | 3 animations |
| Nkol-Messe | November, 2003 | Myself with local translator | 9 before 7 after | Second | Informal conversations |
| Mvomekak | April, 2004 | Five women | 40 | Second | Informal conversations |

Because the health information sought may have been considered slightly sensitive, there was always the possibility of encountering answers that may have been distortions or lies. By allowing the communities to choose the interviewer, this could be minimized, however these distortions and lies were always a possibility. A visit to the family latrine was also included with the health survey. While the original purpose of these visits was to use the data to determine whether the presence of latrines had an impact on the results of the springbox projects, they also provided an informal cross-check for the interviews. Without going into gruesome detail, in many cases, where a latrine is open or nearly full, it is easy to tell whether or not there is anyone in the household suffering from diarrhea. Because one of the questions asks whether there is anyone currently suffering from diarrhea, this is a useful way to show that there was interview bias. While conducting the surveys, very few families answered that someone currently had

diarrhea. However, on closer examination, many latrines showed the opposite. When analyzing the survey results, answers were not changed, but this fact can be used as proof that people may have been giving answers biased in the healthier direction. These observations were only informal, however, as observations could not be made in every case.

Including women in the analysis of the needs of a community may be achieved through the health survey, considering that when conducting the survey, the majority of questioning was done with women of the households. Other ways to involve women in surveying the community may be to question women at water collection points, while they are drawing water (Davis et al., 1993)

### 5.2 Project design and management education

Over time, a series of educational seminars was also developed to train the project management committees. Because there had been a previous volunteer who had done springbox projects with other groups, and my counterpart seemed to have a system already developed, in the beginning, we used his program. After completing the first two projects, however, I realized that there was great need for more thorough education of the management committees. The sessions developed by the time work began in Mvomekak numbered a total of eight short sessions that could be combined into a few longer sessions. These sessions will be described in Chapter 6: Education in Project Design and Management.

### 5.3 Project Funding

After the community approved the plan proposed by the management committee, the next step was to find funding to implement the project. In all four cases, the communities chose to ask for funding from outside sources. The communities were able to provide locally available materials such as sand, gravel, rocks, and wood, as well as unskilled labor, room and board for the employed technician, and meals and drinks for all workers. We preferred to hire a non-local

technician, because from Ekoe's past experience, he has found that if a technician from within the village is paid to work everyday, the unskilled labor will not work unless paid. Material costs were evaluated by visiting our local hardware store before the project, and values for the community contributions were taken from standards used by the Ministry of Agriculture.

With the project plan and budget, a proposal could then be written to an appropriate financing organization. In the beginning, I wrote the proposals myself, using information provided to me by the management committees. Later, however, to increase the capacity of the groups to do projects on their own, the management committees themselves were asked to write the proposals. This turned out to be very tedious, and I had a difficult time teaching writing skills in a foreign language to people for whom French was a second language. In the end, however, it seems to have paid off, as the groups have expressed a greater confidence in their ability to plan and carry out a project. An example project proposal is included in Appendix 2. Funding was provided by three different sources, shown in Table 6.

**Table 6. Outside Funding sources for each springbox project**

| Village | Outside Funding Source |
|---|---|
| Bilik-Bikot | United Church of Christ of Neenah-Menasha, Wisconsin |
| Nkol-Edinga | British High Commission of Cameroon |
| Nkol-Messe | British High Commission of Cameroon |
| Mvomekak | Peace Corps Small Project Assistance Program |

## 5.4 Springbox construction

Once funding was received, construction could begin directly. In order to avoid questions of management of funds, I kept all money, and all materials were purchased before construction began. A typical construction schedule is summarized in Table 7. Photos of construction and the final product in Bilik-Bikot are included in Appendix 6: Pictures of Springbox Construction.

**Table 7. A typical springbox construction schedule.**

| | | |
|---|---|---|
| Preparation of the spring | 1.Drain pond<br>2.Clear brush<br>3.Improve path<br>4.Measure output | 1 to 2 days |
| Primary filter and capture area | 1.Dig to impermeable layer<br>2.Place walls to capture all water.<br>3.Fill with large rocks | 2 days |
| Filter | 1.Place walls<br>2.Fill with sand up to about 0.5 m | 2 days |
| Reservoir | 1.Place walls<br>2.Pour floor<br>3.Smooth inner walls and floor | 2-4 days |
| Finishing touches | 1.Placement of concrete covers<br>2.Placement of drainage, collection, and overflow pipes<br>3.Retaining walls, if necessary<br>4.Collection area<br>5.Any other additions | Up to 4 days |

### 5.4.1 Preparation of the spring

Construction continued in five phases. To begin, the spring pool was drained completely by removing any barriers that the community had put in to dam the water. This also involved digging a channel down from the spring and clearing leaves, branches, and grass from the immediate area. Once the spring was drained, the veins augmenting the spring became visible. This showed where the primary filtration and capture area needed to be built and determined the size of the capture area. The output of the spring could then be measured using a weir, shown in

Figure 6, in the drainage channel. This output could then be used to determine the size of the reservoir.

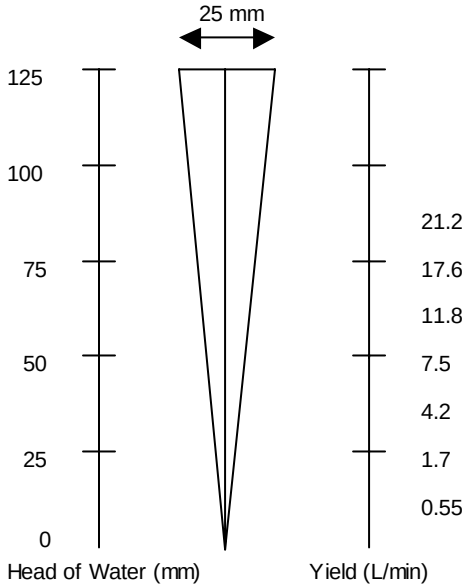


**Figure 6. Weir used to determine the output of the springs.**

A welder in Monatélé was commissioned to produce this weir from a flat piece of metal roofing material. All yield and head markings were also engraved on the metal (Mann and Williamson, 1973).

### 5.4.2 Construction of primary filtration and capture area, filter, reservoir, and finishing touches.

After the source was drained and cleared of debris, construction could then begin on the three walls of the primary filtration and capture area. First, it was necessary to dig down to the impermeable layer of rock or clay just below the pool. Walls were then put into place by building wooden forms and tying the rebar (roughly 20 cm spacing) and placing the tied rebar in the form. After the rebar was placed, then the concrete could be placed into supported wooden forms. The walls extended into the ground around the spring in order to assure that all water was guided into the springbox. The construction of these walls generally took days.

After the capture area was in place, the filter could be added. Filter construction generally took place during another two days, and was followed by construction of the reservoir. Construction of the reservoir took three to four days - two days for the walls, and then another day or two to

place the slanted floor and smooth the walls. After the reservoir was complete, covers were made for the filter and reservoir, rocks were placed in the capture area, and the filter was filled with sand or gravel. Any finishing touches and reinforcement of surrounding earth was also done at the end of the project, and could take up to four days.

### 5.4.3 Education during construction

During the construction phase of the projects, we were present almost every day. On days when we could not be there, the technician was left in charge. We also used these days to do educative sessions with the children of the communities on personal and communal hygiene, environmental education, and use of the springbox. These sessions were focused on the children, because children are usually sent to draw water and are often the most sick with water-related diseases. Children also speak French well - often better than their parents - and were encouraged to share what they learned with their families. A sample lesson plan is provided in Appendix 3.

## 5.5 Evaluation of the project

Evaluation has been lacking for many Peace Corps Cameroon projects in the past. Once a volunteer completes construction on a project, the final report is written, and the file is rarely opened again. This means that the impact of the project on the community's health and the capacity to carry out projects remains unknown in many cases.

In an attempt to determine the impact of the springbox projects on the communities involved, more attention was foci on evaluation. The evaluation conducted for these springbox projects was small, compared with the evaluation conducted in an ideal situation, where participants are willing and able to commit time and energy to a part of a project that may not seem very important on the surface. In the IRC Technical Paper Series, #18 (Huisman et al., 1981), four possible focuses for project evaluation are considered: technical, administration, health, and village level. In the evaluation for the springbox projects in this report, the most emphasis was

placed on the impact of the project on the health and the effectiveness of the trained water committees. Other aspects were evaluated informally with visits to the springboxes and conversations with community members. According to Cairncross et al (1980), an evaluation team could consist of up to six different experts: a civil/environmental engineer, a public health engineer, an epidemiologist, a sociologist or social anthropologist, an economist and an administrator. The team evaluating the projects in this report, however, was less than ideal, consisting of myself, an environmental engineer, and my counterpart, a rural engineering technician. Unfortunately, it seems that this is often the case, as funded projects rarely have any evaluation component.

Evaluation of the impact on health was done by conducting the same survey used for needs analysis before and after construction. Ideally, this survey would be done during a variety of seasons and would continue into the long-term picture. Practically, however, this was not possible. In Bilik-Bikot, we were able to conduct the survey three months and one year after completion. In Nkol-Edinga, the survey ended up being done only one year after completion, and the survey for Nkol-Messe was only done at the three-month mark. Because construction at Mvomekak began only two weeks before my departure, a health survey after construction was not even possible. The survey will be completed by my counterpart, but the results are not available for this report.

Evaluation of the impact of the project on the group's capacity to conduct and manage water projects is more difficult, and is done even less by volunteers. In order to evaluate the group's capacity to manage projects, visits were conducted at the end of the two years to each of the three communities where construction was complete. Unfortunately, the community that had the most training in project design and management was Mvomekak, and evaluation there was minimal, because of the delay in construction. The results for the evaluations of each project will be analyzed in Chapter 7: Evaluation of the Projects.

# 6 Education in Project Design and Management.

## 6.1 Why bother with training?

In all four project plans, one of the objectives of the project was to build the capacity of the group involved for conducting future projects. In theory, Peace Corps volunteers should be phasing themselves out of development work in their regions. By giving groups experience in project design and management, a development worker can assure that development will continue even after he/she is gone.

In the past, emphasis in development in Cameroon has been placed on project completion. After many years of having projects arranged and finished for them, village groups are now having difficulties maintaining such projects and making further improvements on their own. They have become reliant on external structures for project planning, financing, implementation, and maintenance. Much of this reliance is placed on the Cameroonian government. When the government lacks the resources, however, the communities are at a loss. According to Davis et al. (1993), the development and management of community water supplies are inseparable. Without the proper preparation for management integrated in the development of the project, a community will be unable to keep the project running once it is completed (Davis et al. 1993).

## 6.2 Seminars

Our project design and management educational component of the projects consisted of seven half-hour to two-hour long sessions plus continual management committee meetings after completion of the seminars. As mentioned earlier, these sessions were developed and improved over my two years of service, so they were not all used for every project. The only project described in this report to use all the sessions, if in a first-draft form, was Mvomekak. Just before leaving, one other community, Nkol-Kosse, had completed all seven sessions as printed here, and this group has applied and is waiting for funding. The group has demonstrated a much better understanding of project design and management, and has also had much higher

participation in community work days and management committee meetings. The group has even raised over 200,000 CFA on its own for the project, proof that education plays an important role in a group's ownership of the project.

The seminar topics are listed in Sections 6.2.1 to 6.2.8, with a brief description of their purpose and design. Sessions were conducted as much as possible in Eton, to encourage participation from all members of the community. The seminar session plans are included in Appendix 4.

The community groups generally determine the meeting schedules themselves, and usually they end up meeting one to two times per month, so this seminar schedule can take up to eight months. Some groups choose to move more quickly and combine certain sessions. This both accelerates their schedule and allows them to pay less for our transportation to the village. If possible, however, it seems to be a better gage of motivation to let the seminars draw out longer. If a group is willing to put in six months before even having a project proposal, this group is more likely to stick through the tough times of project implementation. Therefore, if a development worker has time (as we did with Mvomekak and Nkol-Kosse, and my counterpart now does for every project), it would be better to not rush through these important educational sessions.

### 6.2.1 The seven questions for good project planning.

This was the introductory session that was conducted during the first meeting. Often, we were invited to visit community groups by an upper class person from the village or some other important member of the community who had heard that we were conducting water projects in villages in the region. Usually, these people came with the idea that we would simply come visit the village, see the need for water projects, and directly give them funding to put in a well or springbox, all the while giving the individual who sought us out credit for bringing water to the community. One major objective of this first introductory session was to dispel this belief.

Because it is the first time meeting the group, the session is considerably shorter than some others. The main activity during the session is asking the community the seven questions for good project planning, shown in Table 8.

**Table 8. The seven questions for good project plannning.**

| | |
|---|---|
| What? | What is the project we want to do? |
| Why? | Why is the project important to us? What do we want to accomplish by doing the project? |
| Who? | Who will participate in the project? |
| When? | When do we want to start the project, and how long will it take? |
| Where? | Where will the project take place (i.e. what spring)? |
| How? | How will we conduct the project – what steps are involved, and will we work together in teams or as a whole community? |
| How much? | What will the project cost, in terms of locally available materials, labor, and money? |

These questions were posed as a way to determine whether the project was indeed what the community wanted, as opposed to what the elite wanted. They also become a major theme in all following sessions as a way to get the group used to writing action plans, an important organizational skill that is often lacking in community groups working with us.

We also used this session to begin evaluation of the group's resources. One activity is for the group to list all resources in the village – whether physical, financial, or human. Before this activity, groups often believe that they are unable to contribute to a physical project or that it is the responsibility of the development agency to implement the entire project. Example community resources are sand, gravel, shovels, wheelbarrows, wealthy community members' donations, village collections, meals and housing of workers, a car or motorcycle for the transport of the supervision team, etc. In general, in my experience, communities have much more to contribute than the 15-25% often required by a grant.

Finally, the community is asked to create a project management committee. This requires a brief description of the qualities necessary for each committee member to help the community form

the best possible committee. Committees created for the springbox projects included a president, secretary, treasurer, dues collectors (with the number depending on the size of the village), financial auditor, and animators. Sometimes, it may even be necessary to suggest that the community be wary of electing public figures such as the village chief, a pastor, or a wealthy community member who no longer even lives permanently in the village. All three examples may be people who are well respected and trusted. However, they may also be people who have little time for a project or who are so powerful in the village that other members of the community may resent their role in the project or be subdued into agreement with everything the community leader says.

The second session was not planned until the group had sent a member to our office to return the required "homework," used as a way to "weed out" the less motivated groups. Homework included answers to the seven questions for good project planning, a list of community resources, and some baseline information about the village, such as a community census or a village map showing all public places, water sources, houses, roads and paths, and farms.

### 6.2.2 The characteristics of an effective project and an introduction to project planning

A good project plan is difficult to come by in a place where people are used to paying for a house one brick at a time. Because families often do not have a reliable income, when money arrives, a family may simply lay a foundation for a house until the next cacao harvest brings more money. Although this leads to long-term thinking, it does not seem to lead to long-term planning, so when asked to plan a community water project, many groups are at a loss. In this session, the community gets an introduction to project planning that guides them through the process in the sessions to come. The session gives the group a guideline for writing a project plan, with specific necessary components.

The first activity is to create a list of characteristics for an effective project. This includes community participation, needs analysis, goals and objectives, roles of the community members, an action plan, supervision, communication, a plan for evaluation, a structure for management, and training for the maintenance of the finished project. Many of these components are obvious,

even to people unused to planning large projects, but having a list of necessary components allows the group to be better organized when putting the plan on paper. Certain things, such as goals and objectives, evaluation, and needs analysis are not so obvious as others, and require much more discussion in order for their importance to be understood.

After obtaining a list of the characteristics of an effective project, the community is then put to task to write a preliminary global project plan, including all of the above-mentioned components. This becomes part of the "homework" for the next session. At the end of the meeting, as in all subsequent meetings, the group writes a short-term action plan that will get them through until the next meeting. For a springbox project, activities to include are dues collection, stockpiling sand, gravel, and rocks, and clearing the spring of debris and digging a channel to drain the spring. This action plan should be posted where at least all the members of the management committee can see it to check their progress. By the end of this session, the group has a very good idea of how to write and use action plans. This is also another gauge of motivation. If, when the next meeting occurs, the group has completed all the activities on the short-term action plan, they are demonstrating strong motivation for the project.

### 6.2.3 Meeting agendas for the project management committee

This is a short session designed to get the management committee members accustomed to playing their specific roles during committee meetings. During the session, the committee follows an example order of the day posted where everyone can see. By this time, there will already be activities to report and issues to discuss, usually revolving around participation in the community work days or the dues collection.

Once again, at the end of the meeting, the group creates a new short-term action plan to last until the next scheduled meeting. This action plan may simply be added to the previous, creating a continuous action plan.

During all subsequent meetings, the management committee runs the meeting according to either the order of the day suggested here or their own. The educational sessions only come into the meeting as a specific activity in the order of the day on invitation by the committee.

### 6.2.4 The roles and responsibilities of the management committee and the community

During this session, the specific roles of everyone involved in the project are defined more precisely. This is the longest session, often taking up to two hours to come to agreement on the specifics, but it is also one of the most important. After this session, the committee members have a written description of their responsibilities that can be referred to for reference or for accountability if someone is not performing to the community's expectations.

The main activity during this session consists of filling out a chart based on the seven questions for good project planning. In order to expidite the session, I come to the session prepared with a flip chart of the table, with all "what" and "why" column filled out. For every "what," the community is to determine who does it, when, where, how, and how much it will cost. After completing the table, the group is left with the homework task of writing a summary description of the responsibilities for every member and for the community. Once again, the meeting should finish up with a short-term action plan.

### 6.2.5 Financial and material management

Because corruption is such an omnipresent problem, many projects fail due to the lack of trust among members of the communities. Many of these trust issues can be resolved by implementing good accounting practices. After the first three springbox projects, I had come to realize that, although communities had defined the roles of their treasurer, dues collectors, and financial auditor, these people did not have the basic understanding of accounting and documentation necessary to keep records that could be useful to anyone other than themselves.

The main activities of this session are going through make-believe financial accounting on an example accounting table for the treasurer and collector. Going through the steps in front of all

parties involved allows the treasurer and the collectors to have compatible accounting and allows the auditor to understand how to read the accounting books. In addition to the educational benefit, the activity also improves trust between the community members and the management committee – as they witness just exactly how the books will be kept.

After going through example financial accounting problems, the group then does the same thing with a material accounting example register on a poster. For all the springbox projects I did, all grant money was handled by me, and all materials were bought as soon as the check came. After that, though, the materials had to be stored and managed by the community. By keeping track of all materials used each day, the group could be held accountable for any missing materials.

### 6.2.6 Final project planning and application for funding, if necessary

After completion of the first five sessions, the group was then prepared to write a final global project plan, using the same formula that they had used during the second session for the preliminary global project plan. By this time, however, all the details should be ironed out, and can be described in detail. One activity for this session is to write a global action plan, starting from the activities that are already completed and continuing through completion, evaluation, and maintenance of the project.

Once the final plan is written, the community should have all the information necessary for a grant proposal if it is found necessary. In all four springbox projects, the communities did apply for outside funding, and the last two groups actually wrote the proposals themselves. When working with Nkol-Kosse, the group that is still waiting to begin the project, however, the community found that they could raise a large amount themselves from the dues collection and donations from elite members of the community. They were not able to raise the entire project amount, but by contributing much more financially, the village already has a much higher sense of ownership of the project.

### 6.2.7 The management committee proposes the final plan to the community and the community votes to accept the plan

Before submitting the plan and proposal to a funding agency, or before beginning implementation if funded internally, the management committee should first propose the plan to the community. This way, the community is fully aware of its responsibilities, the challenges it will face during implementation, and the expected outcomes of the project. When the community agrees to these conditions, a project is much more likely to succeed through community participation.

Village approval of the project plan was not done formally, except in the case of Mvomekak and Nkol-Kosse. This was after we had realized that just because a project management committee says the members of the community will contribute 100 CFA per week, it does not mean that the collection will actually add up to anything. We found that in Mvomekak and Nkol-Kosse, the villages had no problem accepting the plan. The people simply needed to be included in the decision making process.

### 6.2.8 Continual meetings of the management committee.

These meetings are to be run by the committee, and they are encouraged to report back to us or invite us and ask for further training. If we have the schedule of meetings, we can also simply show up to see how things are going for the group.

## 7 Health Evaluation of the Projects

### 7.1 Bilik-Bikot Springbox

Evaluation of the springbox project in Bilik-Bikot consisted of three health surveys: just before the project in November 2002, three months after completion of the project in February 2003, and one year after completion of the project in November 2003, using the health survey

described in Section 5.1.2 and Appendix 1. The data from these surveys are summarized in Table 9. All data collected for all projects are summarized in Appendix 5. Throughout the analysis, the sample size, n, is very small. This is because the survey was done for the households in the villages, not the individuals. The actual population being surveyed is actually much larger, as the average number of people in the households in the three villages ranged from four to seventeen.

**Table 9. Overall health change in Bilik-Bikot.**

The change in the average number of days with diarrhea/person/month after one year is considered the best indicator of the change in health of the community. The sample size, n, is the number of households surveyed. The average household size in Bilik-Bikot is 6.4 persons/household.

| | | | | Percent Decrease | |
|---|---|---|---|---|---|
| | Before Project (n=9) | 3 months after completion (n=9) | 1 year after completion (n=9) | 3 months after completion | 1 year after completion |
| Percentage of population with diarrhea during time of survey | 6.9 | 8.6 | 3.4 | -25.0 | 50.0 |
| Average number of days with someone sick with diarrhea in the household per month | 10.1 | 7.6 | 6.9 | 25.3 | 31.9 |
| Average number of days with diarrhea/person/month | 1.7 | 1.3 | 1.2 | 21.3 | 30.9 |

Table 8 shows that the incidence of diarrhea decreased after the construction of the springbox. Three months after the construction, the percentage of the population with diarrhea at the time of the survey increased. In general, however, the health of the families has improved, judging by the average number of days that a household contains a person with diarrhea per month and the average number of days per month a person spends with diarrhea. One year after completion, all statistics show improved health. It should be noted that the first health survey and the construction of the springbox took place during the intense rainy season. The 3-month survey took place at the end of the intense dry season, and the 1-year survey was again during the intense rainy season.

In order to show confidence in the data, the average number of days a person suffers from diarrhea per month before the project and after the project were compared using the independent t-test (Berthouex and Brown, 1994). At a 95% confidence level, the values after one year did not

prove to be significantly different from the values before construction. However, the difference proved significant at the 90% confidence level. In other words, there is 90% certainty that these results are not due to chance. This analysis was only completed for the 1-year interval for the average number of days that a person suffers from diarrhea in a month, as that is considered to be the best indicator of overall change in health of the community.

Although these data did indicate significant improvement in health, it should be noted that, with the small sample sizes and the nature of the interview surveys, the data should not be over interpreted. The statistics did indicate improvement, and the results do demonstrate the success of the project. However, the evaluation presented here should not necessarily be taken as a perfect representation of the community's health.

**Table 10. Health change relating to sanitation in Bilik-Bikot.**

The data presented here show how the presence of latrines or keeping water in covered containers can affect the impact of a springbox project.

| | | | | | | | Percent change | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Before Project (n=9) | | 3 months after completion (n=9) | | 1 year after completion (n=9) | | 3 months after completion | | 1 year after completion | |
| | Percentage | Average number of days with diarrhea/person/ month | Percentage | Average number of days with diarrhea/person/month | Percentage | Average number of days with diarrhea/person/month | Percentage | Average number of days with diarrhea/person/month | Percentage | Average number of days with diarrhea/person/month |
| Households with latrines | 88.9 | 1.8 | 77.8 | 1.2 | 88.9 | 1.1 | -12.5 | -34.2 | 0.0 | -38.6 |
| Households with sanitary latrines | 22.2 | 2.0 | 33.3 | 1.1 | 44.4 | 1.5 | 50.0 | -47.5 | 100.0 | -26.2 |
| Households with unsanitary latrines | 66.7 | 1.7 | 44.4 | 1.3 | 44.4 | 0.7 | -33.3 | -26.2 | -33.3 | -58.8 |
| Households without latrines | 11.1 | 0.7 | 22.2 | 1.8 | 11.1 | 1.6 | 100.0 | 157.1 | 0.0 | 128.6 |
| Percentage of families who keep all water in covered containers | 11.1 | 1.7 | 33.3 | 0.7 | 33.3 | 1.1 | 200.0 | -60.0 | 200.0 | -36.0 |
| Percentage of families who keep only drinking and cooking water in covered containers | 55.6 | 1.5 | 44.4 | 2.1 | 66.7 | 1.2 | -20.0 | 39.2 | 20.0 | -21.5 |
| Percentage of families who keep only drinking, cooking, and bathing water in covered containers | 11.1 | 2.0 | 0.0 | n/a | 0.0 | n/a | -100.0 | n/a | -100.0 | n/a |
| Percentage of families who keep no water covered | 22.2 | 1.9 | 22.2 | 0.7 | 0.0 | n/a | 0.0 | -64.4 | -100.0 | n/a |

Table 10 shows how the change in health seen after springbox construction could have also been affected by the behavior of the families. The table is not meant to compare the value of a springbox project to a latrine project. Instead, it is meant to show that good household sanitation, combined with the springbox project, can produce a bigger improvement in health.

In Table 10, sanitary latrines are defined as fully covered (with a board, piece of metal, or other lid that completely covers the drop hole) and not full. All other latrines are considered unsanitary. The data indicate that families who had latrines, whether sanitary or not, were much more successful at decreasing the incidence of diarrhea. After a year of drinking springbox water, the number of days a person suffered from diarrhea per month decreased by almost 40%,

whereas in families without any latrine at all, this number increased by almost 130%. The difference in percent change of diarrhea incidence was smaller when comparing sanitary to unsanitary latrines. In fact, after one year, while families with sanitary latrines experienced a 26% decrease in the average number of days per month a person would suffer from diarrhea, the families with unsanitary latrines saw a 59% decrease.

It is interesting to note that before the project had even started, the two families with the sanitary latrines had the highest incidence of diarrhea per person. Perhaps these two families had other habits that worked against them. When looking at the data on how they kept water, I saw that one family kept all water in covered containers, and the other kept all drinking and cooking water in covered containers, so there must have been other factors influencing their health, such as hand washing, eating uncooked or unwashed food, or going barefoot.

In addition, the decrease of diarrhea was greater if the family kept all water covered, as opposed to keeping only drinking water and cooking water covered. Families who kept no water covered, however, saw a greater decrease in incidence of diarrhea than families that kept all or some water covered. This category had a much smaller sample size, however (only 2 families during the first two surveys and none during the 1-year survey), so this may not be an appropriate indicator.

The table also is meant to reflect any changes in behavior that could be the result of education during the project. By using water cycle animations and explaining the oral-fecal routes and barriers, I attempted to show project participants how health depends not just on drinking water quality at the source, but also on their personal habits and latrines. According to the data, the number of households with latrines remained the same, but the quality of the latrines improved. In the beginning, only two of the eight latrines were sanitary. By the end of the year, there were four sanitary latrines among the eight. The data also show that, although in the beginning, only 11% of the families kept all water in covered containers, while after three months and after a year, 33% covered all water. In the end, all families kept at least their drinking and cooking water covered. This could be a result of my own education, other sources of education like schools or NGO's, or simply improvements that come with time as families are able to spend money they earn on improvements.

The other component of evaluation consisted of visits to the springboxes at the end of my two-year service. The visits included questions to the project management committees and visual inspection of the springbox to know how the springbox was being maintained and whether the water was still coming out clear. In Bilik-Bikot, the management committee did not go through any of the sessions described earlier except for the first session, and this lack of training was clearly evident. Even though a meeting had been scheduled, no one was there to meet us except for the wife of the president of the committee. She had not been informed of the meeting. She also informed us that since the project was finished, the dues collection had stopped, and only her husband and the secretary of the group were taking responsibility for any upkeep of the springbox area. Every other household was empty, as people had left for their farms.

The springbox itself, however, was in pretty good condition, considering the lack of attention paid to it. The faucet stopper was cracked, but someone had fixed it well with tape. There were lots of dead leaves around, and some stagnant water, but the water was clear and good, and the wife of the president said it has always been good. There were no major cracks in the concrete, and the pathway down to the springbox showed that it was well-used. The president's wife did mention that the output is strong in the morning, but that in the afternoon, it falls to a slow stream. This misunderstanding was a common problem we had everywhere we went, no matter how many ways we describe the fact that a springbox does not create water – it simply stores water. When water is drawn from the reservoir, and there is less water stocked in the afternoon, the output cannot be as high as it was in the morning. Water still comes out, however, and since that is the only complaint she had, the project seems to have been successful. She also reported that since construction of the springbox, she feels that the health of the community has improved.

The fact that a springbox construction project can survive a year and a half without any maintenance and still provide clean water is notable. We have heard many stories of well projects where a pump breaks within the first three months of use. Although the project cannot be viewed as a complete success, because when a repair is finally necessary, it will be difficult without the organization of the management committee, the project is also not a complete failure. When considering the advantages of a springbox project, the lack of necessary maintenance is a

big factor. This springbox was built to last through the abuse it would take from the weather, children, and time, and so far, it seems to be doing quite well. We have encouraged the group to seek out my counterpart to properly train the management committee, as that is the most important next step for improvement in Bilik-Bikot.

## 7.2 Nkol-Edinga Springbox

Table 11 shows that the springbox in Nkol-Edinga improved the health of the families even more than the springbox in Bilik-Bikot. While the percentage of the population suffering from diarrhea during the surveys decreased by only 32% after a year, the average number of days with someone in the house suffering from diarrhea as well as the average number of days a person suffers from diarrhea per month both decreased by over 60%.

**Table 11. Overall health change in Nkol-Edinga**

The change in the average number of days with diarrhea/person/month after one year is considered the best indicator of the change in health of the community. The sample size, n, is the number of households involved in the survey. The average household size in Nkol-Edinga is 17.3 persons/household.

| | | | Percent Decrease |
|---|---|---|---|
| | Before Project (n=9) | 1 year after completion (n=9) | 1 year after completion |
| Percentage of population with diarrhea during time of survey | 4.5 | 3.1 | 31.8 |
| Average number of days with someone sick with diarrhea in the household per month | 16.2 | 5.7 | 65.1 |
| Average number of days with diarrhea/person/month | 1.1 | 0.4 | 62.4 |

When analyzing the difference in the average number of days a person has diarrhea per month before and one year after the project, the difference is significant, with greater than 99.5% confidence. Again, despite the statistical significance when analyzing the data, the results presented here have potential for misinterpretation. Therefore, although the evaluation can present a general trend in the community's health, the results may not be definitive.

The data in Table 12 show, as did the data from Bilik-Bikot, that families with latrines saw a greater improvement in health after the springbox was built than families without latrines, although the results are not quite as conclusive. Households with latrines, either sanitary or unsanitary, experienced a 67% decrease in the average number of days a person would suffer from diarrhea, while households without any latrine at all saw only a 41% decrease. Unlike the Bilik-Bikot project, the date here show that families with sanitary latrines had a slightly better improvement of their health, with a decrease of the average number of days with diarrhea of 81%, compared with families with unsanitary latrines, who saw only a decrease of 61%.

Table 12 also shows that families covering all water in the household experienced a much greater decrease in the average number of days a person suffered from diarrhea. A person in a family that kept all water in covered containers had an average decrease in number of diarrhea-days per month of 83%, whereas a person in a household that kept only drinking and cooking water covered saw a decrease of only 8%. Whether this is a result of some pathogen entering the water during storage, or whether water storage is simply an indicator of overall family hygiene is difficult to know. To understand this better, the data revealed that the two families that did not cover all water did not have sanitary latrines. In fact, one family had no latrine at all. Perhaps a family who does not care enough to keep water covered or keep a latrine drop hole covered takes other shortcuts in cleanliness as well.

When looking at the data in Table 12, it is also evident that the education gained throughout the project had a small impact on household hygiene. While the percentage of families with latrines overall decreased, one more family improved their latrine to make it sanitary during and after the project. The number of families storing all household water in covered containers also increased by 17%. As mentioned previously, these changes could be the result of many things other than the education they received while planning and implementing the project.

**Table 12. Health change relating to behavior change in Nkol-Edinga.**

The data presented here show how the presence of latrines or keeping water in covered containers can affect the impact of a springbox project.

| | | | | | Percent change | |
|---|---|---|---|---|---|---|
| | Before Project (n=9) | | 1 year after completion (n=9) | | 1 year after completion | |
| | Percentage | Average number of days with diarrhea/person/month | Percentage | Average number of days with diarrhea/person/month | Percentage | Average number of days with diarrhea/person/month |
| Households with latrines | 88.9 | 1.2 | 77.8 | 0.4 | -12.5 | -67.0 |
| Households with sanitary latrines | 11.1 | 1.2 | 22.2 | 0.2 | 100.0 | -81.4 |
| Households with unsanitary latrines | 77.8 | 1.2 | 55.6 | 0.5 | -28.6 | -61.2 |
| Households without latrines | 11.1 | 1.0 | 22.2 | 0.6 | 100.0 | -40.6 |
| Percentage of families who keep all water in covered containers | 66.7 | 1.2 | 77.8 | 0.2 | 16.7 | -83.2 |
| Percentage of families who keep only drinking and cooking water in covered containers | 22.2 | 1.4 | 22.2 | 1.3 | 0.0 | -8.3 |
| Percentage of families who keep only drinking, cooking, and bathing water in covered containers | 11.1 | 0.6 | 0.0 | n/a | -100.0 | n/a |
| Percentage of families who keep no water covered | 0.0 | n/a | 0.0 | n/a | n/a | n/a |

At the time of our final evaluation visit to Nkol-Edinga, the springbox seemed to be in good shape. Although there were lots of leaves around and some stagnant water, the construction was still solid. The water was clear and tasted good. When we talked with the management committee members, they told us that they believe that their families have improved health since the springbox was constructed.

Slightly more training was given to the project management committee during the project implementation (they did the session on roles and responsibilities as well as the seven questions), and it showed. The site was slightly better maintained than Bilik-Bikot – if not completely well-maintained. The president of the committee, in particular, has taken responsibility for keeping

the area clean and making sure that people use it properly. The committee reported, however, that they have not had a successful dues collection since shortly after the project was completed.

The performance of the Nkol-Edinga springbox was puzzling over the two years. After it was first built, water poured out of it, but after the rainy season ended, the output slowed to almost nothing, a drop that could not be accounted for by the lack of rain alone, when other springboxes in the area seemed to be doing just fine. Water was coming out from the ground around the springbox, so we knew that the problem was in capturing the water, not in the actual water source itself. The first solution was easy – when we opened the reservoir, we saw that the mason has closed almost the entire gravel layer entrance from the filter by covering the layer with concrete. After opening the entrance by chiseling the concrete away from the gravel layer, flow started up again. When it slowed drastically again, we dug down to the rocks in the capture area and put more rocks in and sand on top before covering it with the dirt that we suspected had been blocking the entrance to the filter. After filling the capture area higher with rocks, flow started up again. Once again, the flow went down. This time, we recommended that the group open up around the reservoir walls to see if there are any leaks going through. The problem with this, though, is that it will require some cement to repair the leaks, and the committee is not getting help from the community. Again, we see the importance of proper training before a project is implemented.

According to the health statistics, this project was successful, but as in Bilik-Bikot, the project could have been greatly improved by more extensive training with the project management committee.

### 7.3 Nkol-Messe Springbox

Table 13 shows that in Nkol-Messe, while the number of people reporting current diarrhea during the surveys increased after three months, the data do show that the overall health of the participants improved. A person suffered from diarrhea 88% fewer days per month than previously, and the average household saw 67% fewer days with a person suffering from diarrhea.

When looking at the statistics before the project and three months after, however, it is only possible to state with 60% confidence that the difference is significant, because of the great variance in the data before the project started. As for the evaluations of Bilik-Bikot and Nkol-Edinga, the results presented here should not be considered a perfect representation of the community's health, due to the small sample size and possibility for misinterpretation.

**Table 13. Overall health change in Nkol-Messe.**

The change in the average number of days with diarrhea/person/month after one year is considered the best indication of the change in health of the community. The sample size, n, is the number of households involved in the survey. The average household size in Nkol-Messe is 4.9 persons/household.

| | | | Percent Decrease |
|---|---|---|---|
| | Before Project (n=9) | 3 months after completion (n=7) | 3 months after completion |
| Percentage of population with diarrhea during time of survey | 4.5 | 6.5 | -43.5 |
| Average number of days with someone sick with diarrhea in the household per month | 13.1 | 4.3 | 67.3 |
| Average number of days with diarrhea/person/month | 4.3 | 0.5 | 87.9 |

As shown in Table 14, in Nkol-Messe, it was impossible to determine how the presence of latrines could affect the health change, because all of the households visited during the survey had latrines. The data do not show any significant difference in health change between sanitary and unsanitary latrines.

The survey did show, however, that households that kept at least their drinking and cooking water in covered containers saw a much larger decrease in the average number of days a person would suffer from diarrhea: 93%, as opposed to 75% for the families who kept no water in covered containers. The two families who kept all water covered, however saw only a 7% decrease. This could be explained by the fact that the two families covering all water at first had relatively low incidence of diarrhea to begin with.

Hygiene education proved to be lacking in Nkol-Messe, which was no surprise, considering the jealousy and participation issues faced during the implementation of the project. This lack of education was evident in the data. Although one more sanitary latrine was added, the overall number of latrines decreased. The percentage of families keeping all water in covered containers remained the same, while the number of families keeping no water covered actually increased. This lack of improvement is strong evidence for the importance of hygiene education during a project. Education during this particular project was next to impossible, as almost the entire community refused to participate in the project after funding was received. They refused because they were jealous of the group's president, who also happened to be the chief's brother. All of this was kept secret until after the project was funded, and even after funding was received, straight answers were hard to get. Knowing that the president was the chief's brother may have made this problem avoidable. As it was, the project had a positive impact on the health of the community, but the impact could have been more had hygiene education been possible.

**Table 14. Health change relating to behavior change in Nkol-Messe.**

The data presented here show how the presence of latrines or keeping water in covered containers can affect the impact of a springbox project.

| | | | | | Percent change | |
|---|---|---|---|---|---|---|
| | Before Project (n=9) | | 3 months after completion (n=7) | | 3 months after completion | |
| | Percentage | Average number of days with diarrhea/person/ month | Percentage | Average number of days with diarrhea/person/ month | Percentage | Average number of days with diarrhea/person /month |
| Households with latrines | 100.0 | 4.3 | 77.8 | 0.5 | -22.2 | -87.9 |
| Households with sanitary latrines | 22.2 | 7.0 | 42.9 | 0.7 | 92.9 | -90.5 |
| Households with unsanitary latrines | 77.8 | 3.5 | 57.1 | 0.4 | -26.5 | -88.4 |
| Households without latrines | 0.0 | N/A | 0.0 | N/A | N/A | N/A |
| Percentage of families who keep all water in covered containers | 22.2 | 0.3 | 22.2 | 0.3 | 0.0 | -6.7 |
| Percentage of families who keep only drinking and cooking water in covered containers | 55.6 | 6.4 | 22.2 | 0.4 | -60.0 | -93.2 |
| Percentage of families who keep only drinking, cooking, and bathing water in covered containers | 0.0 | N/A | 0.0 | N/A | N/A | N/A |
| Percentage of families who keep no water covered | 22.2 | 3.0 | 55.6 | 0.8 | 150.0 | -75.0 |

Although the hygiene education was lacking during the Nkol-Messe springbox project, the project management training was improved from the two earlier projects. The group had participated in sessions 1, 3, and 4 of the training sessions, and the president himself wrote, submitted, and presented the proposal. During the training of the group, my counterpart and I were feeling positive about the community participation expected during implementation. However, with the jealousy issues mentioned previously, these turned out to be false hopes. While the members and the community knew and understood their responsibilities, they simply refused to act. The president, however, did learn the importance of constant maintenance and protection of the spring after completion of the project.

When we paid our final visit to the Nkol-Messe springbox, we found that the water was flowing strong and clear, and tasted good. The site was well kept – even raked free of dead leaves. Seeing how the health of the community had improved and how neat the site was, we had to consider this project to be the most successful. This is ironic, considering the lack of cooperation within the community. Perhaps this is proof that a small water project either needs one individual willing and capable of taking responsibility, or else a well trained and trusted management committee.

### 7.4 Mvomekak Springbox

A complete evaluation was not possible in Mvomekak, because the project finished the very week that I left Cameroon. Evaluation was able to include, however, subjective observations to determine how well the community was prepared for the project.

Mvomekak was the one village that participated in all sessions for project management training. At least judging by participation during implementation of the project, this training seems to have paid off. Every day that I visited the construction site except the day when there was a large funeral in town, there were several people working, and the workers were all treated to palm wine after work. Although palm wine may seem like an improbable measurement of a community's capacity to organize, it is understandable when we see that the palm wine costs money, and that it was bought specifically for the purpose of motivating the manual labor force of the village.

### 7.5 Overall Evaluation of Springbox Projects

When evaluating the impact of the four springbox projects detailed in this report, it is evident that the projects were successful despite difficulties encountered in training the groups involved for project design and management and for community and personal hygiene. In the three

communities where a full evaluation including before and after health surveys was completed, the quality of life improved for most families. The average number of days that a person suffered from diarrhea per month was significantly less after the project in all cases, although with only a 60% confidence level in Nkol-Messe. With Bilik-Bikot and Nkol-Edinga, however, the statistical analysis showed significant decreases at 90% and 99.5% confidence levels, respectively. The results of the above evaluation, in terms of the percent decrease in the average number days a person suffers from diarrhea per month are summarized in Table 15.

**Table 15. Summary of springbox impact on community health.**

Health is judged by the number of days a person suffers from diarrhea per month. An independent t-test showed that the decrease in diarrhea after one year was significant with a 90% confidence level in Bilik-Bikot and with a 99.5% confidence level in Nkol-Edinga.

| | Percent decrease in the average number of days that a person suffers from diarrhea per month | |
|---|---|---|
| Village | After 3 months | After 1 year |
| Bilik-Bikot | 21 | 31 |
| Nkol-Edinga | N/A | 62 |
| Nkol-Messe | 88 | N/A |

The data describing the health of the community one year after construction of the project are probably more representative of the change in health due to the springbox project than the three-month data, as the one-year data were taken during the same seasonal conditions as the original survey. Unfortunately, the project in Nkol-Messe was completed too late to have a one-year health survey completed. The drastic change in the incidence of diarrhea after three months, however, does suggest that the data may show a significant decrease in diarrhea after one year.

When looking at the apparent success of the projects, especially in Nkol-Edinga, it is also important to note that there are many possibilities for creating inaccurate results in the evaluation. For example, in Nkol-Edinga, the survey techniques were not the same before and after the project. Before the project, five women conducted the survey. After the project, when they no longer had the motivation to conduct the survey, they refused, and I conducted the survey with an Eton woman who was an engineering intern with us at the time. Even though she

was Eton, we were both still outsiders in the community. This could have created some interview bias that may not have been present in the first interview. For example, perhaps in the beginning, when the women were interviewing, they were more trusted, so they got more truthful answers. When we conducted the interviews afterward, however, people may have biased their answers toward the healthier direction, being embarrassed to show that they were sick.

In Bilik-Bikot, however, the surveys were conducted with the same method before and after. Because methods were the same, even if there was bias, it was likely biased to the same extent and in the same direction both before and after. The potential for error in the health surveys due to this interview bias, in combination with the small sample sizes involved, means that the evaluation of the projects presented in this report may not be entirely accurate. Although the evaluation does suggest that the springbox projects had an impact on the communities' health, the measure of that impact cannot necessarily be taken as a definitive measure.

When evaluating the success of the springbox projects, it would have been ideal to have a control village. In order to determine whether a springbox, alone, could improve the health of a village, a control village could be selected where the community members participated in the same hygiene education as the springbox communities, but they did not build a springbox. This, however, poses problems for the development worker. When a development worker arrives in a village, it may be unreasonable to expect great participation in educative sessions and the health survey without the community reward of an actual physical project. Often, people are unwilling to give their time if they do not see immediate benefits, and this is reasonable, considering everything else they may have going on in their lives. If time allowed, perhaps a control village could participate in a physical project, after the evaluation is complete (Davis et al., 1993).

Despite the success seen in the health survey data, some unexpected challenges may have diminished the impact of the projects. For example, in Bilik-Bikot, if the community had participated in the project management seminars that were later developed for other groups, the management committee may have been better equipped to deal with issues such as water dues collection and upkeep of the area around the springbox. The same could be said for Nkol-Edinga, although they had at least participated in the session on roles and responsibilities.

Perhaps, had the management committee been better trained, the construction errors (leaks and mud blocking entrance to the reservoir) could have been taken care of more quickly and with full participation of the community. In Nkol-Messe, the project management committee followed much of the final series of management training sessions. The surprise that threw the project off, however, involved village politics and jealousy that could have only been avoided by having a different president. These issues made education during implementation of the project next to impossible, and so hygiene education was minimal.

The analyses also showed, for each project, the importance of household sanitation when conducting a water project, as summarized in Table 16. In Bilik-Bikot and Nkol-Edinga, the two villages where some households did not have any latrine, the families with latrines experienced a greater decrease in average number of days a person suffers from diarrhea per month than the families without latrines. In fact, in Bilik-Bikot, the families with no latrine at all saw an increase in the incidence of diarrhea after the water project. Another interesting discovery was that as long as a family had a latrine, whether sanitary or not, the family saw a greater improvement in health. When comparing families with sanitary latrines to families with unsanitary latrines, the difference in impact did not seem to say anything about having a sanitary latrine. In Bilik-Bikot, the families with unsanitary latrines actually saw a greater improvement than the families with sanitary latrines. In Nkol-Edinga the households with sanitary latrines saw a greater improvement, but in Nkol-Messe, there was no significant difference.

**Table 16. Summary of springbox impact on health as a relation to presence of latrines.**

Health is judged by the percent decrease in the average number of days a person suffers from diarrhea in a month. Unsanitary latrines are considered to be partially covered, not covered at all, or full.

| | Percent decrease in the average number of days that a person suffers from diarrhea in one month one year after completion (three months, for Nkol-Messe) | | | |
|---|---|---|---|---|
| Village | Households with latrines | Households with unsanitary latrines | Households with sanitary latrines | Households with no latrine |
| Bilik-Bikot | 39 | 59 | 26 | -129 |
| Nkol-Edinga | 67 | 61 | 81 | 41 |
| Nkol-Messe | 88 | 88 | 90 | N/A |

The data indicating how the health improvement varied with water storage methods are summarized in Table 17. After a year, in the case of Bilik-Bikot and Nkol-Edinga, families that kept all water in covered containers experienced a greater decrease in the incidence of diarrhea than families that covered only their drinking and cooking water. In Nkol-Messe, the results were the opposite, perhaps because the incidence was already low before the project for the two families that kept all water covered. The data from Nkol-Messe, however, did indicate that families covering at least drinking and cooking water had a greater improvement of their health than families that kept no water covered at all.

**Table 17. Summary of springbox impact on health as a relation to water storage methods.**

Health is judged by the percent decrease in the average number of days a person suffers from diarrhea in a month.

| | Percent decrease in the average number of days a person suffers from diarrhea in a year (three months in the case of Nkol-Messe) | | |
|---|---|---|---|
| Village | All water covered | Drinking & cooking water covered | No water covered |
| Bilik-Bikot | 36 | 21 | N/A |
| Nkol-Edinga | 83 | 8 | N/A |
| Nkol-Messe | 7 | 93 | 75 |

More research into how the combination of better sanitation and household water storage practices as part of a springbox construction project can improve the change in health of villages would be worthwhile. While the data from my surveys suggest that families with latrines and families who stored at least drinking and cooking water in covered containers experienced greater positive impact on their health, the sample sizes were small, and survey techniques may not have produced entirely accurate results.

The evaluation, overall, has plenty of room for improvement. When answering questions, people may not want to give true answers, or they may simply not be able to estimate accurately the number of days they suffer from diarrhea per month. It is suggested that the definition of diarrhea should simply be avoided by asking more specific questions, for example how many

times since yesterday has the interviewee passed stools (Cairncross et al, 1980). A future study to improve the accuracy of such data might also include actual lab tests of stool samples before and after the project, as well as taking more time to educate the sample population about the definition of diarrhea and asking them to actually record the cases of diarrhea in their families over a period of time, providing that a community could accept this extra work. Perhaps this could be another option for "homework" accompanying the project design and management sessions.

As mentioned earlier, some of the data may be confounded by other factors. For example, perhaps a family who covers drinking and cooking water does so because the family cares about household hygiene in general. In that case, covering the water may not be the only factor that makes this family more likely to experience a greater improvement in health with the addition of a springbox to the village. Because that family cares more about hygiene, maybe the mother is more careful about washing her hands before preparing a meal, or perhaps the children are trained better to wash their hands after using the latrine. The covered water containers may also suggest that the family is slightly better off financially than others who cannot afford pots with lids or jugs that screw shut. A family who is better off than others may be less likely to serve food on a communal plate without eating utensils. The same can be said about latrines. A family with a latrine may be either more conscientious in general about household hygiene or wealthy enough to afford things that improve hygiene. The best approach to minimize confounding factors would be to have an intervention sample and a control sample that does not have any improvements to water supply (Cairncross et al, 1980). Perhaps this would be ideal, but it is difficult to imagine a community being willing to conduct a health survey without the incentive of a water project.

The impact of project design and management training on the success of the projects was more difficult to judge. The group that had the most training, Mvomekak, did not complete the project in time to be well evaluated. During construction, however, the participation of the community members did show that the training must have shown them at least the importance of implicating the community. In Nkol-Messe, the village that had the second strongest project design and management training, the community experienced internal political and jealousy issues that acted

against the training. Despite the lack of community participation during implementation of the project, however, the springbox in Nkol-Messe appears to be the best cared for. This is probably because the president had paid close attention to the responsibilities of the members of the management committee and had taken it upon himself to ensure the success of the project. The two villages receiving the least project design and management training showed the least upkeep of the areas around the springs, and even showed how repairs became impossible without this training (in the case of Nkol-Edinga, where leaks were found and never repaired).

The only real gauge of the success of hygiene education during projects was the change in the presence of latrines, the improvement of latrines, and the change in household water storage methods. Because families did not know ahead of time the exact time and day of their survey interview, it is assumed that the state of their latrines and their water containers is representative of the day-to-day conditions. In Bilik-Bikot, although the total number of latrines in the village remained the same, two families improved their latrines, making them sanitary. Additionally, the percentage of families keeping all water in covered containers went from 11% to 33%. The two families who kept no water covered at all were covering at least their drinking and cooking water during the final survey. In Nkol-Edinga, the results were less positive. While the number of sanitary latrines increased (i.e. one family improved their existing latrine), the total number of latrines went down by one. By the time of the second survey, all families were keeping at least drinking and cooking water in covered containers, an improvement from having one family of the nine keeping no water covered. In Nkol-Messe, where hygiene education was most lacking, the number of families with latrines decreased by about 20%, with only one family improving from an unsanitary to sanitary latrine. The percentage of families keeping no water covered actually increased, with the number of families keeping all water covered remaining the same. The results from Nkol-Messe are proof that when hygiene education is lacking, behavior change during a project is minimal to negative.

## 8 Conclusions and suggestions for further work

In the Lekie Department of the Center Province of Cameroon, springboxes have proven to be a simple, relatively inexpensive, and effective way to improve the quality of water in village

springs. Although many challenges arose due to working in a different country with people of a different culture and with different educational backgrounds, the springbox projects were able to change the quality of life for the communities involved.

In four villages, 1,306 residents were provided with clean water through the construction of springboxes. Research showed that springbox construction projects were linked to improvement in health. In two villages where a yearlong evaluation could be completed, health surveys showed that the average number of days a person suffers from diarrhea in both villages decreased significantly, with a 90% and 99.5% confidence level. Results also indicated that households with better sanitation and water storage habits experienced a greater improvement in health after springbox projects were finished. In households where there was no latrine, the incidence of diarrhea actually increased by 129% in one village and decreased by only 41% in the other. In the same villages, families with latrines, regardless of whether or not the latrines were in good condition, saw a 39% and 67% decrease in the average number of days a person suffers from diarrhea, respectively. Families who kept all water in covered containers also saw a greater improvement in health than families who kept only drinking and cooking water covered. After one year, the households covering all water experienced a 36% and 83% decrease in the average number of days a person suffered from diarrhea, whereas families in the same studies that kept only drinking and cooking water in covered containers saw only a 21% and 8% decrease, respectively.

Training in project design and management is an integral part of a community water project, as it increases ownership of the project, and enables communities to conduct continual maintenance as necessary, as well as conduct projects of their own in the future. Although by the time a complete training series was designed and completed in Mvomekak, it was too late to completely evaluate the impact of the education, the community seemed much more prepared to participate in the project construction, compared with the earlier projects.

Research into springbox project planning, management, and evaluation is far from complete. Much work needs to be done in the area of project management training, as it is often put aside as an unimportant aspect of a project. Although it is much easier for a development worker to

conduct every part of a project without the input and participation of a community, the community has much to gain from the experience, and the projects may turn out to be more successful in the end with greater community participation.

Evaluation of the projects was complicated by many factors, some of which were probably unavoidable. However, in the future, it would be interesting to see if a more complete evaluation could be done, with more consistent methods and perhaps over a longer period of time, to understand more fully the impact of springbox projects on a community's health. If a proper evaluation is to be conducted, the communities should first be well informed about the reasoning behind the survey, the interviewers should be chosen in order to minimize the possibility of interview bias, and the questioning should allow multiple chances for cross-checking.

Many water projects have been conducted in Cameroon, however many have failed. If the availability of improved water sources to rural communities in Cameroon is to improve, projects need to be conducted with more attention paid to the sustainability of the project. In order for a project to be sustainable, all components of a project plan must be thoroughly completed, including training in project design and management, community participation, hygiene education leading to behavior change, a system in place for maintenance of the project, and a full evaluation of the project. If a community is involved in all these steps, success is much more likely.

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**APPENDIX 1. Final Version of Health and Water Use Survey.**

The first version used asked essentially the same questions, except that it did not ask the amount of water used by every household and where they got their water. Questions were revised into the tables found in this survey.

L'information de Base: L'enquête sur la santé des familles bénéficiaires

| | | |
|---|---|---|
| Nom de famille: | Nombre d'adultes : | Number of adults : |
| Family Name | Nombre d'enfants : | Number of children : |

1. Quelles sont les maladies qui sont la plus commune dans ce ménage (Commencez avec la plus commune)?

What are the most common illnesses in this household (Start with the most common) ?

2. Combien cas de mal de ventre ou de diarrhée est-ce qu'il y a par semaine dans ce ménage?

How many cases of upset stomach or diarrhea are there per week in this household ?

3. Est-ce qu'il y a des gens qui ont la diarrhée maintenant dans ce ménage? Si oui, combien?

Is there anyone in the household right now who has diarrhea ? If so, how many ?

4. Qui est malade le plus souvent – les enfants ou les adultes?

Who is sick the most often – the children or the adults ?

5. Indiquez la quantité d'eau utilisée chaque jour pour les usages suivants. Indiquez avec une X la où on puise l'eau est si l'eau est garder dans les marmites couvertes ou non couvertes.

Indicate the quantity of water used every day for the following uses. Indicate with an X where water is drawn for each use and whether or not the water is kept in covered containers.

| | Quantité d'eau utilisée par jour (litres)<br>Quantity of water used per day (liters) | Puisé où | | | | | | Gardé où | |
|---|---|---|---|---|---|---|---|---|---|
| | | Source non aménagée<br>Unimproved spring | Source aménagée<br>Springbox | Puits équipé<br>Well with pump | Puits non équipé<br>Well without pump | Rivier<br>River | Pluie<br>Rain | Marmite Couverte<br>Covered container | Marmite Non couverte<br>Uncovered Container |
| À boire<br>Drinking | | | | | | | | | |
| À préparer<br>Cooking | | | | | | | | | |
| À se laver<br>Washing | | | | | | | | | |
| À laver les habits<br>Clothes washing | | | | | | | | | |
| À faire le ménage<br>Housework | | | | | | | | | |
| Autre<br>Other | | | | | | | | | |

6. Indiquez avec une X la condition des latrines que la famille utilise maintenant.

| | |
|---|---|
| Pas de latrine<br>No latrine | |
| Latrine couverte<br>Latrine covered | |
| Latrine ouverte<br>Latrine open | |
| Latrine ventilée<br>Latrine ventilated | |
| Latrine pleine<br>Latrine full | |
| Latrine avec dal à béton<br>Latrine with concrete slab | |

**APPENDIX 2: Example Springbox Project Proposal**

# Small Project Assistance Program

**Name of PCV:** Lauren Fry **COS Date:** April, 2004

**Primary Project:** H/W/S

**Secondary Project Title:** Construction of a Springbox

**Name of Community:** NKOL EDINGA (NKOL OSSAN)

**Total Project Cost:** 1,236,730 CFA

**Community Contribution:** 363,000 CFA

**Total SPA Contribution:** 873,730 CFA

## Project Description

**1. Specific Problem to be Addressed:**

The neighborhood of NKOL EDINGA in the village of NKOL OSSAN, was one of the first communities to come to my office seeking help. After meeting with the myself and M. EKOE Martin, Chief BOT at the Departmental Delegation of Agriculture, to determine the communities needs, the group decided that the problem that concerned them most was the lack of potable water. Currently, all water in the community is drawn from an unprotected spring. The spring water is murky, at best, and is a welcoming home to malaria-carrying mosquitoes. Water is drawn with dirty buckets, leaves and other debris collect in the open pool, and bathing is often done nearby the spring.

The group has gathered data from the local health center, and has found that diarrhea, amoebas, and other intestinal problems are the most prevalent causes for visits to the health center, along with malaria. These are all potentially caused by parasites or bacteria in the spring, and the

mosquitoes that breed in the standing water. These illnesses are most common among children and often lead to more serious problems such as dehydration.

**2. Proposed Solution:**

The group agreed that the best way to ameliorate these health problems was by construction of a springbox at the spring they presently draw water from. A springbox is a large, covered, concrete box that is built around a spring that captures spring water directly as it exits the source, and protects it by keeping debris, mosquitoes, buckets, and people out. Water in the ground is essentially free of bacteria and parasites, so by protecting water at its source, the quality of water can be improved greatly. In addition to the box where water is collected, a gravel filter box will be constructed to filter water directly as it leaves the source.

The community has also noted that potable water at the source, alone, will not be sufficient to keep their families free of water-borne illnesses. They have agreed to participate in animations to learn how to better transport water, store water in their homes, and change other hygiene-related behaviors. These animations will be focused on the women and children, because they are most often responsible for water-related chores.

**3. Project Objectives:**

1. Improve the health of beneficiaries through the construction of a springbox.
2. Transfer skills necessary for springbox construction, use, and maintenance.
3. Change hygiene behaviors to avoid the spread of water-born diseases.
4. Transfer of skills necessary for project design and management.

**4. Programming Criteria:**

*Responds to a felt need in the community:*

The community specifically sought our help in resolving the problem of potable water. The construction of the springbox will respond directly to this need.

*Is sustainable:* (Give estimates of ongoing costs and how they are to be met.)

The project is sustainable. Springboxes are a very simple technology that requires little maintenance, and maintenance will be able to be performed by the group. Material costs will be minimal – bleach to clean out the reservoir whenever the water begins to turn murky.

*Is appropriate:* (Solution you propose will address problem you identified.)

The springbox will provide potable water to the community, addressing the problem of malaria and intestinal diseases. The springbox will eliminate one breeding ground for mosquitoes, and it will capture clean water directly from the ground, protecting it from outside sources of pollution like buckets, soap, people, and natural debris. The proposed hygiene animation will give the community effective ways to improve their help through simple behavior changes.

**5. Expected Outcomes:**

*Number of beneficiaries:* -

Direct: 407 Indirect: 300
Men: 93 Women: 66 Boys: 146 Girls: 102

*New skills introduced:* (During the implementation of the project)

1. Project management and accounting skills will be transferred to the management committee.
2. Springbox construction and maintenance skills will be transferred to the members of the group and the technician.
3. Hygiene behavior changes will be encouraged through animations.

4. Evaluation skills and surveying skills will be transferred to the management committee. One member will be trained to conduct the health survey.

*Actual Changes (Impact):*

1. Decrease in water-borne diseases within the neighborhood of NKOL EDINGA.
2. Increase in the group's confidence in completing a project. They will have the experience and be encouraged to attempt more community projects in the future.
3. Change in hygiene behaviors: transportation and storage of water, hand-washing, bathing, dish washing, and food preparation.

**6. Background Information:**

*Community demographics:* (Total population: Men, Women)

NKOL EDINGA is a neighborhood in the village of NKOL OSSAN. The neighborhood consists of 239 males and 168 females. The community of NKOL OSSAN has a population of about 1000, 600 females and 400 males.

*History of community group involved:* Size, legal status, leadership, capacity to manage project, previous activities)

The community is a group of farmers, and their projects include 3 community farms: tomato, corn, and okra. They have also completed the construction of an Orthodox Chapel. They have already demonstrated their capacity to manage this project through the completion of these completed projects. The project timeline was created by the group, and there will be continuous training in project management and accounting. They have also demonstrated their motivation by beginning collecting materials and clearing the area around the srping.

7. **Project Financial Controls:** (who will be accountable for fiscal management and what measures will be taken to secure funds and materials throughout the project's implementation?)

I will be responsible for securing the funds for this project. I will purchase the materials, along with Chief BOT, EKOE Martin. The project management committee for each group will be responsible for guarding all materials at their house, where they will be checked out prior to use to keep track. The surveillance committee will be responsible for following the accounting to assure that all purchase are recorded.

Any money that is not spent will be returned to SPA after the completion of the project.

8. **Evaluation Plans:** (How will the project impact be measured?)

*Who will conduct the evaluation and submit a mid-term report?*

Evaluation will be conducted by Chief BOT, EKOE Martin and myself, along with one member from each group involved. Evaluation will consist of a health survey, completed by a trained member of the management committee, to determine the impact on the health of the families. The survey will be completed by interviewing the head of each beneficiary family about frequency of hygiene-related diseases and current sanitary conditions. The survey will be completed once before the completion of the project, once 3 weeks after construction, and once 3 months after completion. A mid-term report will also be completed, detailing the progress of the construction.

*What will be evaluated:* (Short term and long term – Indicators)

Short term:

1. Construction skills transferred, measured by evaluating the completed springbox structure.

2. Improvement in health, measured by completing the health survey 3 weeks after construction is complete.
3. Habit changes, measured by observations of family members.

Long term:

1. Skills transferred, (i.e. have they attempted any new projects with their project design and management skills, and are they successfully maintaining their springbox?)
2. Improvements in health, measured by completing the health survey 3 months after the construction is complete.
3. Habit changes, measured by observations of family members.

9. **Technical Assistance:** For construction projects: Please give name of builder/contractor and description of his experience.

GIC PRESDOR is a GIC of technicians that supplies technicians for development. They have been contacted and have provided one technician: BINGANA ATANGA Cyprien Pierre. He has been involved with one other springbox construction project in EMANA. With the previous project, we were there almost constantly to train him. Now, he is well trained so that the work may continue when we are not present. He has also been involved with the construction of classrooms, community health centers and conference rooms, and domestic houses.

10. **Comments:** (What perception do you have of this project?)

This project provides a simple, effective way to reduce water-borne diseases in the community. The need for potable water is clearly present in the community, and this is an appropriate solution. It is also a good project for this group to start with, as it is small and will give them encouragement and training to attempt larger projects in the future.

I believe that the community is motivated and will complete their contribution, as I have already seen much of the materials stocked and much of the work in digging around the source completed.

**APPENDIX 3: Example Hygiene Lesson Plan.**

This session, “The routes and barriers for the transmission of water-related illnesses,” serves to educate participants about how they can be infected by water-related diseases. By actively creating a physical diagram with ropes and human actors, the participants are able to visualize the oral-fecal routes and barriers. Barriers discussed include traditional latrines, VIP latrines, hand washing, properly cooking food, washing fruits and vegetables, boiling water, and covering food and water. During the discussion, it becomes evident that, even if a springbox project will improve the quality of water, improvement in health depends on many other behavioral and sanitation improvements.

## SESSION: Les routes et les barrières pour la transmission des maladies d’eau

**BUT:** Cette animation serve à sensibiliser les gens des routes de transmissions des maladies d’eau. Utilisez cette session pour commencer une discussion des options pour l’élimination de ces maladies.

**DURÉE:** 1 heure

**MATERIAUX:** Les affiches "Les Routes de Transmission des Maladies d’Eau et leurs barrières," et "La Latrine à Fosse Ventilée."
Une affiche vide pour la discussion des maladies d’eau
Les fiches "Les Routes de Transmission des Maladies d’Eau et leurs barrières," et "La Latrine à Fosse Ventilée."

**OBJECTIFS:** À la fin de la session, les membres de la communauté pourront:

- Décrire comment les maladies d’eau sont transmisses
- Citer les méthodes pour la prévention des maladies d’eau

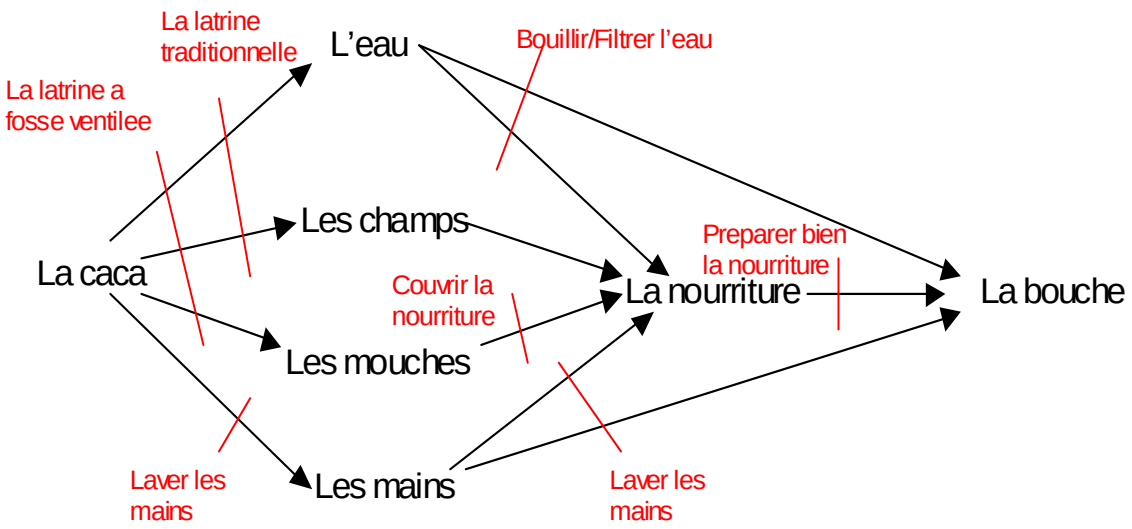
- Comprendre les processus générales dans les latrines ventilée qui font diminuée la population des mouches

**ACTIVITÉS:**

1. Introduction du facilitateur.

2. Commencez la session avec une discussion brève sur les maladies associées avec l'eau. Vous pouvez commencer par une question: "Les gens de votre village soufrent le plus souvent de quelles maladies?" Ils vont répondre avec beaucoup de maladies. Ecrivez toutes les maladies sur une affiche, et chaque fois qu'ils disent une maladie associée avec l'eau, marquez avec une *. Quand la liste est finie, ce sera évident que le plus part des maladies communes sont associées avec l'eau.

3. Expliquez que la plus part des maladies d'eau sont transmisses parce-que le fèces est entré dans la bouche. Essentiellement, on mange le caca. Demandez aux gens de donner des exemples des voies que le caca trouve pour entrer dans la bouche. À chaque participant qui dit un composant du diagramme des routes de transmission, donnez une carte correspondante. En donnent les cartes, arrangez les récipients dans la formation du diagramme. À ce moment, les cartes avec les dessins pour la fèces, l'eau, les champs, les mouches, les mains, la nourriture, et la bouche doivent être déjà distribués. Les autres cartes seront distribuées après.




**4.** Quand les participants sont en place, demandez aux participants comment les composants peuvent être connectés. On dit que les connections sont les routes. Quand un participant donne un exemple d'une route, donnez une corde entre les deux participants qui tiennent les dessins qui sont connectés par la route. Continuez jusqu'à ce que toutes les routes sont placées comme le diagramme.

**5.** Expliquez que les cordes sont comme les routes ou les pistes qui donne le voie a la fèces pour aller jusqu'à la bouche. Par exemple, la fèces peut arriver aux mains. Quand elle arrive aux mains, elle va trouver un carrefour. Elle peut conduire à la nourriture et après à la bouche, ou elle peut prendre l'autre route directement à la bouche.

**6.** Maintenant, demandez si les participants peuvent donner des exemples des barrières qu'on peut mettre sur les routes pour que le caca ne puisse plus voyager de son début jusqu'à la bouche. Chaque fois que quelqu'un donne une barrière, enlèvez la route qui est bloque par la barrière. Par exemple, si quelqu'un dit "couvrir la nourriture," enlevez la corde entre les mouches et la nourriture. Si quelqu'un dit "laver les mains," enlevez la corde entre la fèces et les mains, entre les mains et la nourriture, et entre les mains et la bouche. Chaque fois qu'on enlève une route, il faut bien expliquer pourquoi, surtout

quand on parle du barrière de la latrine à fosse ventilée. Utilisez l'affiche avec le dessin pour bien expliquer les principes.

7. L'activité précédente facilite une discussion de l'importance de l'intervention a beaucoup de niveaux. On peut voir facilement que même si on a de bonnes technologies comme les latrines à fosse ventilée, si on ne lave pas les mains, la fèces peut toujours arriver jusqu'à la bouche, et on deviendra toujours malade.

**DEVOIRS:** Si vous voulez donner les devoirs, vous pouvez demander que la communauté cherche à analyser leurs problèmes d'assainissement qui contribuent aux maladies d'eau. Par exemple, ils peuvent visiter tous les points d'eau pour voir s'ils sont bien protéger, et développer un plan pour l'amélioration (au court-terme et au longue-terme) de ces problèmes.

**APPENDIX 4 : Project Design and Management Seminars.**

These seminar session plans were used to train communities and project management committees to be effective managers of the project. Sessions could be useful for any type of small community development project. Session topics include :

1. The seven questions for good project planning
2. The characteristics of an effective project and an introduction to project planning
3. Meeting agendas for the project management committee
4. The roles and responsibilities of the management committee and the community
5. Financial and material management
6. Final project planning and application for funding, if necessary
7. The management committee proposes the final plan to the community and the community votes to accept the plan

Each session plan in French is followed by its accompanying handouts.

# SESSION 1: LES 7 QUESTIONS POUR UNE BONNE PLANIFICATION

**BUT:** Cette animation est la première session pour la planification et la gestion du projet. La session esplique le projet prioritaire pour la communauté et les ressources du village.

**DURÉE:** 1 heure

**MATERIAUX:** L'affiche "Les 7 Questions Pour une Bonne Planification"
Les fiches "Les Sessions pour la Planification et Gestion des Projets," "Les 7 Questions Pour une Bonne Planification," et "Les Ressources du village."

**OBJECTIFS:** À la fin de la session, les membres de la communauté sauront:

- L'ordre des sessions pour la planification et gestion du projet
- Citer les 7 questions pour une bonne planification
- Décider sur un projet prioritaire pour la communauté
- Cataloguer les ressources humaines et matérielles du village

**ACTIVITÉS:**

1. Introduction du facilitateur.

2. Introduction de l'ordre des sessions pour la planification et gestion du projet.
   a. Expliquez l'importance de l'éducation avec le projet materiel. Après avoir participé dans les sessions, la communauté sera capable de planifier leurs projets futurs.
   b. Donnez la fiche avec la liste des sessions au secrétaire. Expliquez q'ils ne peuvent pas monter un projet avec vous sans avoir terminé toutes les sessions.

3. Déterminez le projet prioritaire de la communauté. Si la communauté n'a pas de projet prioritaire, il faut les aider à analyser leurs besoins. Cela peu prendre une autre session.

4. Les 7 Questions pour une Bonne Planification

**a.** Quand le projet est déjà décidé, affichez les 7 Questions.

**b.** Commencez avec la question, QUOI? Laissez répondre la communauté aux questions sur le projet global. Par exemple, si c'est un projet d'aménagement d'une source, les réponses peuvent être:

- Quoi? L'aménagement de notre source
- Pourquoi? Pour avoir de l'eau potable et améliorer la santé du village
- Qui? Toute la communauté
- Quand? Aujourd'hui
- Où? A la source _____
- Comment? Ensemble
- Combien? Dépend du devis du technicien, mais, ça va nous coûter aussi la motivation pour les travailleurs, la main d'œuvre, le transport pour le surveillance, et les frais continuels de l'entretien.

**c.** Posez les mêmes 7 questions pour la première étape du projet.

- Quoi? Le stockage du gravier, sable, et les roches
- Pourquoi? Pour la contribution de la communauté.
- Qui? Toute la communauté
- Quand? La date et l'heure du travail
- Où? A la source _____
- Comment? Ensemble
- Combien? La motivation pour les travailleurs, la main d'œuvre, les outils de travaille

**5.** Déterminez les ressources du village (argent, ressources humaines, et matérielle)

**a.** Donnez la fiche pour les ressources du village au secrétaire.

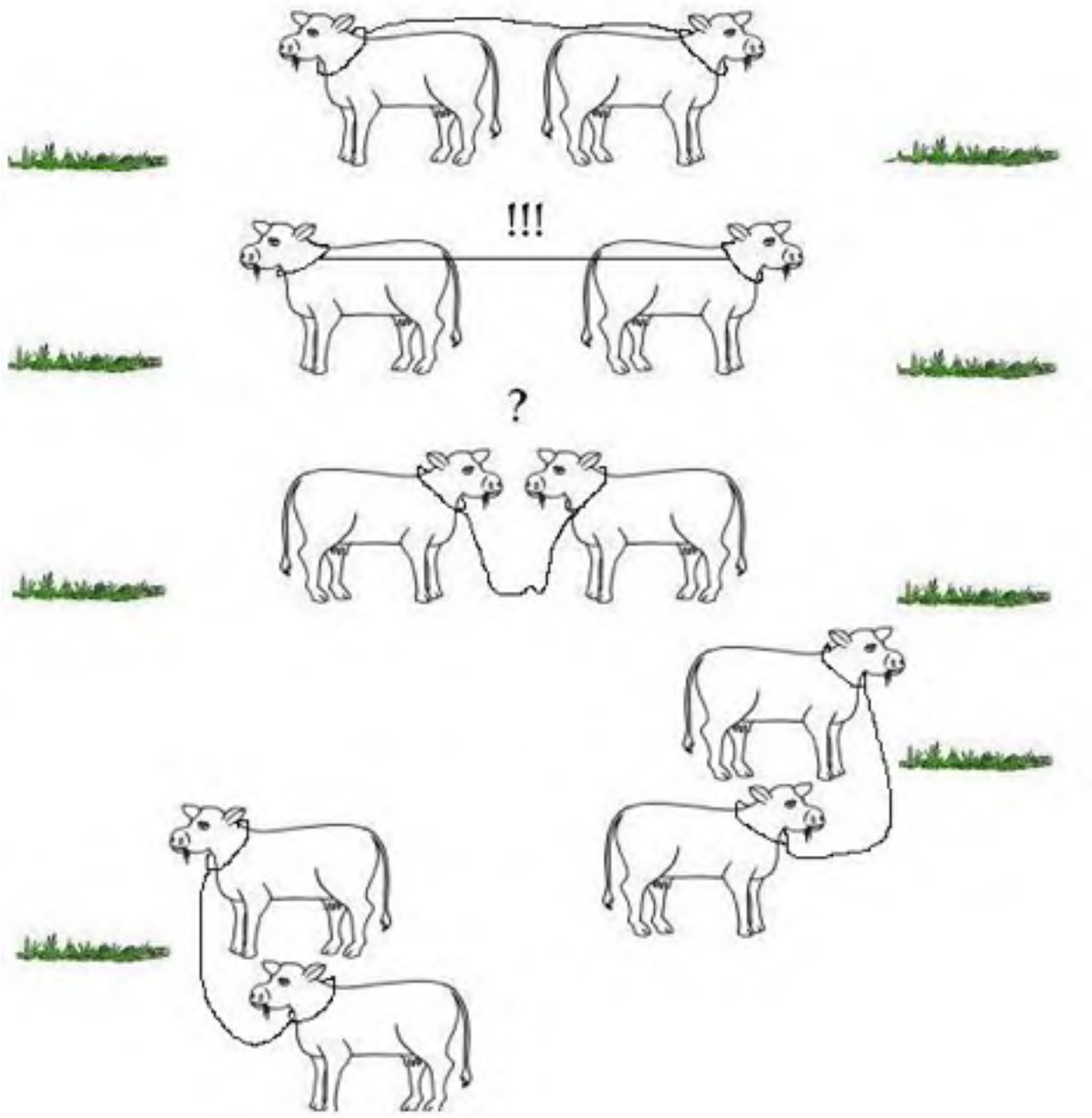
**b.** Demandez à la communauté leur contribution pour le projet.

**6.** Expliquez le rôle du Comité de Gestion dans le projet, et programmez une date pour le vote des membres. Décrivez très brièvement les attributions de chaque membre, pour qu'ils puissent bien élire les responsables. Demandez qu'ils écrivent les membres sur la fiche "Ressource du Village" Les membres sont:

- Président
- Secrétaire
- Trésorier

- Commissaire aux Comptes
- Collecteur
- Animateur

**7.** Expliquez le cas des bœuf comme example de la coopération.

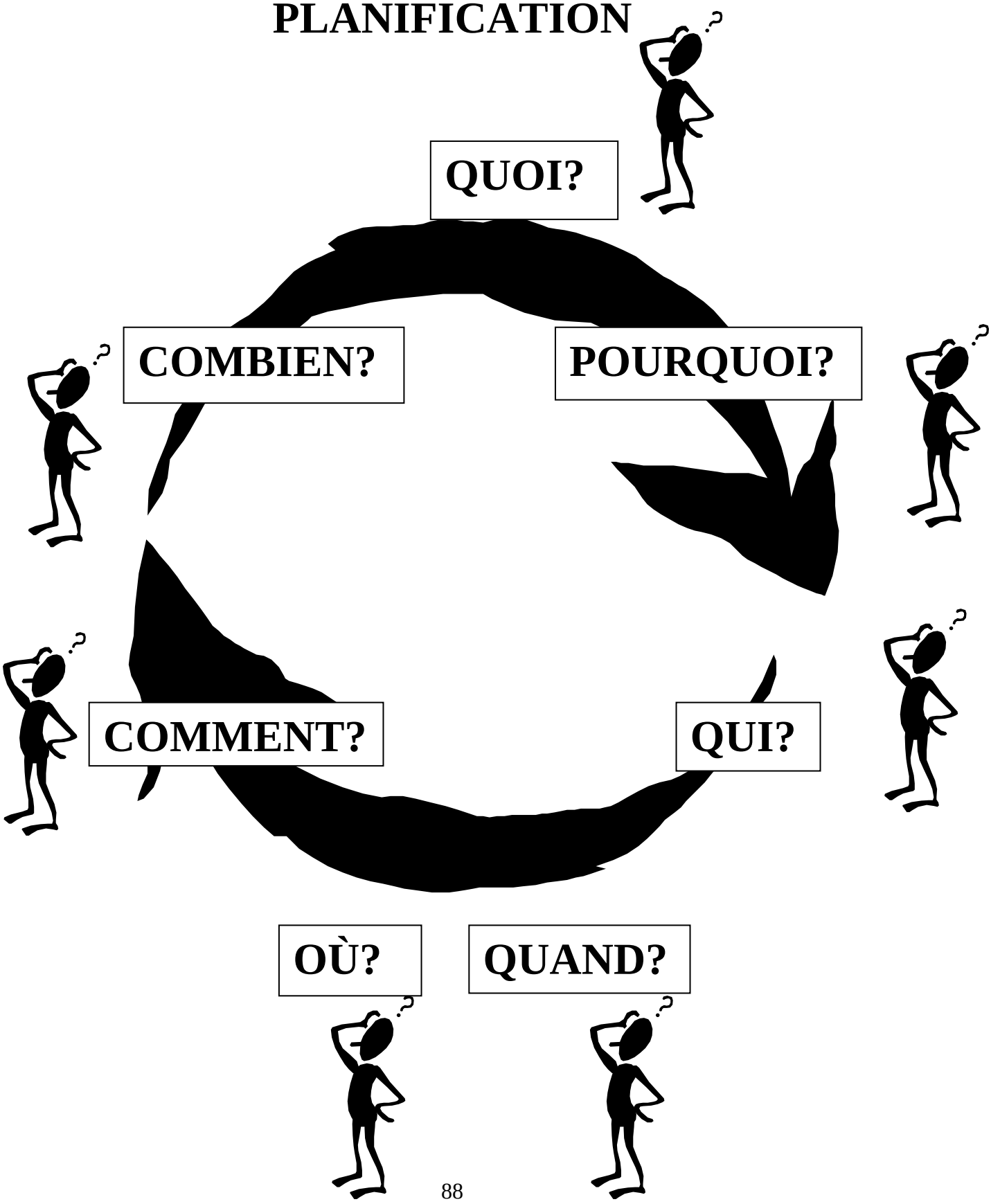


**DEVOIRS:** Avant la prochaine arrivée au village, la communauté doit remettre au facilitateur les documents suivants:

- Les réponses aux 7 questions pour le projet global
- Les ressources du village
- Les documents nécessaires pour l'analyse des besoins, par exemple: "L'Information de Base," une carte de la communauté

Quand les documents sont complets, on peut programmer la prochaine descente.

# LES 7 QUESTIONS POUR UNE BONNE PLANIFICATION



# LES RESSOURCES DU VILLAGE:

| **MATÉRIELS** (par exemple: le sable, le gravier, etc.) | **HUMAINES** (par exemple: les infirmiers, les charpentiers, les maçons, etc.) |
|---|---|
| 1. | 1. |
| 2. | 2. |
| 3. | 3. |
| 4. | 4. |
| 5. | 5. |
| 6. | 6. |

Le bureau de développement communautaire voudrait d'autre information, s'il y a quelques choses à mettre:

(par exemple: il y a une moto qui est disponible, si on paye le carburant, Chaque famille peut cotiser 1000 CFA par mois, etc.)

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# LE COMITÉ DE GESTION

**Président :**

**Secrétaire :**

**Trésorier :**

**Commissaire aux Comptes :**

**Collecteur(s) :**

**Animateur(s) :**

# LES SESSIONS POUR LA PLANIFICATION ET GESTION DES PROJETS

1. Les 7 Questions pour une Bonne Planification

2. Les Caractéristiques d'un Projet Efficace; Introduction à La Planification du Projet

3. Ordre des Réunions du Comité de Gestion

4. Les Rôles et les Responsabilités du Comité de Gestion et de la Communauté

5. La Gestion Financière et Matérielle

6. La Planification Finale du Projet et l'Ecriture de la Demande de Financement si c'est nécessaire

7. Le Comité de Gestion propose le plan final à la communauté et la communauté accepte le plan.

8. Réunions continuelles entre le Comité de Gestion et la Communauté

# SESSION 2: LES CARACTÉRISTIQUES D'UN PROJET EFFICACE ET L'INTRODUCTION À LA PLANIFICATION DU PROJET

**BUT:** On utilise cette session pour bien expliquer à la communauté les composants d'un projet, et pour commencer à comprendre l'utilization d'un Plan d'Action.

**DURÉE:** 1 heure

**MATERIAUX:** Les marqueurs,
Les affiches "Les Caractéristiques d'un Projet Efficace," "Planification du Projet," et une affiche vide pour le Plan d'Action.
Les fiches "Les Caractéristiques d'un Projet Efficace," "Planification du Projet," "Plan Préliminaire du Projet," "Les Statistiques Démographiques," et "Plan d'Action."

**OBJECTIFS:** À la fin de la session, les membres de la communauté sauront:

- Les caractéristiques pour un projet efficace
- Les composants d'un plan du projet
- La réduction d'un Plan d'Action

**ACTIVITÉS:**

**1.** Demandez à la communauté, "quelles sont les caractéristiques d'un projet efficace?" Après avoir reçu leurs réponses, affichez "Les Caractéristiques d'un Projet Efficace," et donnez la fiche correspondante au secrétaire. Utilisez cette affiche pour faciliter une discussion des composants d'un projet efficace.

**2.** Après la discussion des composants d'un projet efficace, affichez l'affiche "Planification du Projet." Utilisez cette affiche pour leur expliquer toutes les étapes dans la planification. La communauté peut commencer à écrire les composants du plan, mais ils vont écrire avec plus de détail dans les sessions futures. Il faut bien expliquer la différence entre le but du projet et les objectifs qu'on va réaliser pendant le projet. Par exemple, pour un projet de l'aménagement d'une source:

- Le but — Améliorer la santé du village, en diminuant les maladies d'eau
- Les objectifs — Avoir de l'eau potable, par l'aménagement d'une source.
  Améliorer les habitudes des gens, au moyen de l'éducation de l'hygiène.
  L'Education pour les latrines, le savon, et les "tippy-taps"

**1.** Plan d'Action Mensuel

**a.** Demandez aux gens les 7 questions pour une bonne planification pour un renforcement de ces idées.

**b.** Demandez à la communauté d'écrire un Plan d'Action mensuel avec les 7 questions sur l'affiche. Le secrétaire doit écrire sur la fiche "Plan d'Action" pour le garder dans son dossier.

**DEVOIRS:** Avant votre prochaine arrivée au village, la communauté doit remettre les documents suivants au facilitateur:

- "Plan Préliminaire"
- "Les Statistiques Démographiques"

Quand les documents sont reçus, on peut programmer la prochaine arrivée.

# PLANIFICATION DU PROJET

1. La Communauté choisit le Comité de Gestion.

2. Le Comité de Gestion prépare un PLAN qui comprend:

- Résumé du problème et des causes du problème
- Le but du projet
- Les bénéficiaires du projet
- Les objectifs qu'on veut réaliser pendant le projet
- Le Plan d'Action
- Un budget
- Une liste des membres du Comité de Gestion et un résumé de leurs responsabilités
- Un Plan d'Evaluation.

3. Le Comité de Gestion propose le PLAN à la communauté

11. La communauté accepte le PLAN

12. Le Comité de Gestion écrit la demande de financement, si c'est nécessaire.

# LES CARACTÉRISTIQUES POUR UN PROJET EFFICACE

- Implication de la COMMUNAUTÉ
- ANALYSE de la SITUATION
- BUTS réalistes
- OBJECTIFS concrets, réalistes, et mesurables
- ACTIVITÉS et RÔLES définies
- EMPLOI DU TEMPS et un BUDGET bien élaborés
- Un système de SUPERVISION efficace
- Méthodes pour tenir INFORMÉS une LA PLUS GRANDE PARTIE de la COMMUNAUTÉ
- EVALUATION DE CHAQUE PHASE
- Structure de PLANIFICATION et de GESTION du projet
- PERSONNES QUALIFIÉES qui jouent les rôles spécifiques
- FORMATION des membres dans l'ENTRETIEN du projet

# LE PLAN PRÉLIMINAIRE DU PROJET

**1. LE PROBLÈME ET LES CAUSES DU PROBLÈME** (Expliquez bien le problème et les causes avec détails.)

**2. LE BUT DU PROJET** (Ecrivez ici le but global du projet)

**3. LES OBJECTIFS** (Expliquez ici toutes les choses qui seront réalises pendant le projet - matérielles et éducatives)

**4. LES BÉNÉFICIAIRES DU PROJET** (éducation, ages, occupation, etc.)

**5. LE PLAN D'EVALUATION** (par exemple: enquête de santé, la qualité de vie, l'évaluation financière, etc.)

# LES STATISTIQUES DÉMOGRAPHIQUES

**Communauté: _____**

| | | Nombre d'Adultes | | Nombre d'Enfants | |
|---|---|---|---|---|---|
| **No.** | **Famille** | **Hommes** | **Femmes** | **Garçons** | **Filles** |
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# LE PLAN D'ACTION

| Quoi? | Pourquoi? | Qui? | Quand? | Où? | Comment? | Combien? |
|---|---|---|---|---|---|---|
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# SESSION 3: L'ORDRE DES RÉUNIONS DU COMITÉ DE GESTION

**BUT:** C'est une session courte pour faciliter les réunions du Comité de Gestion. La session peut avoir lieu le même jour que"Les Rôles et les Responsabilités du Comité de Gestion et de la Communauté."

**DURÉE:** 1/2 heure

**MATERIAUX:** Les marqueurs,
Les affiches "L'Ordre des Réunions du Comité de Gestion" et une affiche vide pour le Plan d'Action.
Les fiches " L'Ordre des Réunions du Comité de Gestion" et "Plan d'Action."

**OBJECTIFS:** À la fin de la session, les membres de la communauté sauront:

- Un Ordre du Jour exemplaire pour ses Réunions du Comité de Gestion
- Les rôles des membres du comité et de la communauté dans la réunion
- La Rédaction d'un Plan d'Action

**ACTIVITÉS:**

**1.** Suivez l'ordre du jour exemplaire sur l'affiche "L'Ordre Des Réunions du Comité de Gestion," chaque membre jouant son rôle.

**2.** Quand ils arrivent au point 9, écrivez le Plan d'Action Mensuel
   **a.** Posez aux gens les 7 questions pour une bonne planification.
   **b.** Demandez à la communauté d'écrire un Plan d'Action mensuel avec les 7 questions sur l'affiche. Le secrétaire doit écrire sur la fiche "Plan d'Action" pour le garder dans son dossier.

**3.** Demandez si le groupe veut changer l'ordre du jour. Si oui, écrivez les changements.

**DEVOIRS:** Pas de devoirs pour cette session.

ORDRE DES RÉUNIONS DU COMITÉ DE GESTION

| **QUOI ?** | **QUI ?** |
|---|---|
| 1. Convoquer les membres et annoncer l'ordre du jour | Président |
| 2. Feuille de présence | Secrétaire |
| 3. Résumer le compte rendu de la séance précédente | Secrétaire |
| 4. Rendre compte de la situation de la caisse | Trésorier |
| 5. Donner le rapport financier | Commissaire aux Comptes |
| 6. Rend compte de la collecte | Collecteur |
| 7. Rendre compte de la situation du projet | Président |
| 8. Commenter sur la situation du projet | Comité |
| 9. Plan d'Action | Comité |
| 10. Fixer les date(s) pour la prochaine journée de travail | Comité |
| 11. Fixer les date(s) pour la prochaine réunion | Comité |
| 12. Déclarer la réunion close | Président |

# SESSION 4: LES RÔLES ET LES RESPONSABILITÉS DU COMITÉ DE GESTION ET DE TOUTE LA COMMUNAUTÉ

**BUT:** On utilise cette session pour bien clarifier les rôles et les responsabilités du Comité de Gestion et de la communauté.

**DURÉE:** 1 heure

**MATERIAUX:** Les marqueurs,
Les affiches "Les Rôles et les Responsabilités du Comité de Gestion et de la Communauté" et une affiche vide pour le Plan d'Action.
Les fiches " Les Rôles et les Responsabilités du Comité de Gestion et de la Communauté," "Résumé des Rôles et les Responsabilités du Comité de Gestion et de la Communauté," et "Plan d'Action."

**OBJECTIFS:** À la fin de la session, les membres de la communauté sauront:

- Les rôles et les responsabilités de chaque membre du Comité de Gestion et de la communauté.
- La redaction d'un Plan d'Action

**ACTIVITÉS:**

**1.** Suivez l'ordre du jour qu'ils ont appris dans La Session 3. Quand vous arrivez au point 8, après leurs commentaires, continuez avec les activités suivantes.

**2.** Affichez l'affiche "Les Rôles et les Responsabilités du Comité de Gestion et de la Communauté." Avec la communauté, développez le reste de le tableau, pendant que le secrétaire remplit la fiche.

**3.** Donnez au secrétaire, la fiche, "Résumé des Rôles et les Responsabilités du Comité de Gestion et de la Communauté." Expliquez qu'il faut résumer tous les responsabilités et donner la fiche a tous les membres du comité.

**4.** Continuez au Point 9: Plan d'Action Mensuel

**a.** Demandez aux gens les 7 questions pour une bonne planification.

**b.** Posez à la communauté d'écrire un Plan d'Action mensuel avec les 7 questions sur l'affiche. Le secrétaire doit écrire sur la fiche "Plan d'Action" pour le garder dans son dossier.

**DEVOIRS:** Avant la prochaine arrivée au village, la communauté doit remettre les documents suivants au facilitateur:

- "Résumé des Rôles et les Responsabilités du Comité de Gestion et de la Communauté "

Quand les documents sont reçus, on peut programmer la prochaine arrivée.

# Les Rôles et les Responsabilités du Comité de Gestion et de la Communauté

| Quoi? | Pourqoui? | Qui? | Quand? | Où? | Comment? | Combien? |
|---|---|---|---|---|---|---|
| Donner des idées pour les projets | Développement de la communauté | | | | | |
| Planification des projets et montage des demandes si c'est nécessaire | Développer la communauté et avoir les fonds | | | | | |
| Supervision technique | Assurer la réussite du projet | | | | | |
| Garder le dossier du projet | Aider aux techniciens de faire l'entretien et pour planifier les projets futurs | | | | | |
| Tenir les réunions pour la gestion du projet | Avoir une bonne gestion du projet | | | | | |
| Annoncer les réunions | Avoir tout le comité présent aux réunions | | | | | |
| Garder les minutes de chaque réunion | Connaître l'histoire du projet | | | | | |
| Ramasser des cotisations | Avoir les fonds pour l'entretien du projet et pour les projets futurs | | | | | |
| Gestion des fonds | Avoir les fonds pour l'entretien du projet et pour les projets futurs. | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Organisation des journées de travail | Construction, nettoyage, et entretien | | | | | |
| Travail manuel | Construction, nettoyage, et entretien | | | | | |
| Provision de boissons et nourriture | La motivation | | | | | |
| Avertir le superviseur des problèmes | Avoir l'aide technique | | | | | |
| Suivre le compte du trésorier | Assurer la réussite du projet | | | | | |
| Acheter les matériaux et payer les techniciens | Construction et entretien du projet | | | | | |
| Garder les matériaux | Construction et entretien du projet | | | | | |
| Garder les reçus | Assurer la bonne gestion des fonds | | | | | |
| Continuer la promotion du projet | Sensibilisation des gens de leurs responsabilités | | | | | |
| Annoncer des problèmes de vandalisme | Assurer la durabilité du projet | | | | | |

RÉSUMÉ DES RESPONSABILITÉS DU COMITÉ DE GESTION

Utilisez l'information que vous avez écrite sur l'affiche « Les Rôles et les Responsabilités du Comité de Gestion et de la Communauté » pour résumer les rôles de chacun dans le comité et la communauté. Après chaque responsable, écrivez toutes ses responsabilités. Les responsables sont sous le titre « Qui ? » et les responsabilités sont sous le titre « Quoi ? ». Donnez cette fiche à tous les membres du comité pour qu'ils puissent bien apprendre leurs responsabilités.

## Président :

## Secrétaire :

## Trésorier :

**Collecteur :**

**Commissaire aux Comptes :**

**Animateur :**

**Communauté :**

# SESSION 5: LA GESTION FINANCIÈRE ET DES MATÉRIAUX

**BUT:** Le but de cette session est d'apprendre à gérer les fonds et les matériaux.

**DURATION:** 1 heure

**MATERIAUX:** Les marqueurs,
Les affiches "Gestion Financière des Matériaux" avec les tableaux non-remplis et une affiche vide pour le Plan d'Action.
Les fiches "Gestion Financière et des Matériaux" et "Plan d'Action."

**OBJECTIFS:** À la fin de la session, les membres de la communauté sauront:

- Gérer les fonds et les matériaux pour un projet
- Maîtriser toutes les transactions en argent du trésorier et du collecteur
- Ecrire un Plan d'Action

**ACTIVITÉS:**

**1.** Suivez l'ordre du jour qu'ils ont appris dans la Session 3. Quand vous arrivez au point 8, après qu'ils donnent leurs commentaires, continuez avec les activités suivantes.

**2.** Affichez l'affiche "Gestion Financière et des Matériaux," et donnez la fiche au secrétaire.

**3.** Prenez des exemples d'entrées dans le registre du collecteur. Remplissez le tableau sur l'affiche, avec tous les calculs. Par exemple:

| Date | Nom | Entrée | Total | Depot | Signature | |
|---|---|---|---|---|---|---|
| | | | | | Trésorier | Collecteur |
| 15/2/04 | Bela | 200 | | | | |
| 15/2/04 | Mvogo | 200 | | | | |
| 15/2/04 | | | **400** | **400** | *Trésorier* | *Secrétaire* |
| 22/2/04 | Tina | 200 | | | | |
| 22/2/04 | Onana | 200 | | | | |
| 22/2/04 | | | **400** | **400** | *Trésorier* | *Secrétaire* |

**4.** Prenez des exemples d'entrées et des sorties dans le registre du trésorier. Remplit le tableau sur l'affiche, avec tous les calculs. Par exemple:

| Date | Libelle | Entrée | Sortie | Solde | Signature | |
|---|---|---|---|---|---|---|
| | | | | | Trésorier | Président |
| 15/2/04 | collecte | 400 | --- | 400 | *Trésorier* | *Président* |
| 18/2/04 | Don "Self Help" | 600.000 | --- | 600.400 | *Trésorier* | *Président* |
| 20/2/04 | Achat des matériaux | --- | 450.000 | 150.400 | *Trésorier* | *Président* |
| 21/2/04 | Salaire maçon | --- | 50.000 | 100.400 | *Trésorier* | *Président* |
| 22/2/04 | Collecte | 400 | --- | 100.800 | *Trésorier* | *Président* |
| | | | | | | |

**5.** Prenez des exemples d'entrées et des sorties dans le registre des matériaux. Remplit le tableau sur l'affiche, avec tous les calculs. Par exemple:

| Date | Libelle | Entrée | Sortie | Stock | Signature | |
|---|---|---|---|---|---|---|
| | | | | | Trésorier | Président |
| 20/2/04 | Sacs ciment | 15 | --- | 15 | *Trésorier* | *Président* |
| | Kg Points | 1 | --- | 1 | *Trésorier* | *Président* |
| | Sacs sikalite | 10 | --- | 5 | *Trésorier* | *Président* |
| 21/2/04 | Sacs ciment | --- | 5 | 10 | *Trésorier* | *Président* |
| | Kg Points | --- | 0.2 | 0.8 | *Trésorier* | *Président* |
| | Sacs sikalite | --- | 3 | 2 | *Trésorier* | *Président* |

**6.** Continuez au Point 9: Plan d'Action Mensuel

- **a.** Posez aux gens les 7 questions pour une bonne.
- **b.** Demandez à la communauté d'écrire un Plan d'Action mensuel avec les 7 questions sur l'affiche. Le secrétaire doit écrire sur la fiche "Plan d'Action" pour legarder dans son dossier.

**DEVOIRS:** Avant la prochaine arrivée au village, le trésorier et le collecteur doivent arranger leurs cahiers, avec leurs propres registres. Maintenant, dans toutes les réunions suivantes, ils peuvent utiliser ces registres pour donner leurs rapports.

# GESTION FINANCIÈRE ET DES MATÉRIAUX

## EXEMPLE REGISTRE DU TRÉSORIER

| Date | Libelle | Entrée | Sortie | Solde | Signature | |
|---|---|---|---|---|---|---|
| | | | | | Trésorier | Président |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

## EXEMPLE REGISTRE DU COLLECTEUR

| Date | Nom | Entrée | Total | Depot | Signature | |
|---|---|---|---|---|---|---|
| | | | | | Trésorier | Collecteur |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

# OUTIL DE GESTION DES MATÉRIAUX

| Date | Libelle | Entrée | Sortie | Stock | Signature | |
|---|---|---|---|---|---|---|
| | | | | | Trésorier | Président |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

# SESSION 6: LA PLANIFICATION FINALE DU PROJET ET L'ECRITURE DE LA DEMANDE

**BUT:** Dans cette session, on ramasse toutes les informations des sessions précédentes pour écrire un plan final et pour écrire une demande de financement, si c'est nécessaire.

**DURATION:** 1 heure avec tout le monde, et 1-3 heures avec les membres du Comité de Gestion qui vont écrire la demande.

**MATERIAUX:** Les marqueurs,
Les affiches "Planification du Projet" avec les tableau non-rempli et une affiche vide pour le Plan d'Action.
Les fiches "Planification du Projet," "Plan Final du Projet," et "Plan d'Action."

**OBJECTIFS:** À la fin de la session, les membres de la communauté sauront:

- Écrire un plan pour un projet
- Écrire une demande de financement
- Ecrire un Plan d'Action

**ACTIVITÉS:**

**1.** Suivez l'ordre du jour qu'ils ont apprit dans Session 3. Quand vous arrivez au point 8, après qu'ils donnent leurs commentaires, continuez avec les activités suivantes.

**2.** Affichez l'affiche "Planification du Projet," et donnez la fiche au secrétaire.

**3.** Utilisez le "Plan Préliminaire du Projet" que le group a écrit dans Session 2 pour écrire un nouveau plan sur le "Plan Final." Il faut utiliser toute l'information que le group a apprise pendant les sessions précédentes.

**4.** Après le travail avec toute la communauté, fixez une réunion avec les membres du Comité de Gestion pour écrire la demande de financement.

**5.** Continuez au Point 9: Plan d'Action Mensuel

**a.** Posez aux gens les 7 questions pour une bonne planification.
**b.** Demandez à la communauté d'écrire un Plan d'Action mensuel avec les 7 questions sur l'affiche. Le secrétaire doit écrire sur la fiche "Plan d'Action" pour le garder dans son dossier.

**DEVOIRS:** Avant la prochaine arrivée au village, les membres du Comité de Gestion écriront une demande de financement avec le facilitateur. C'est avec cette demande que le comité présentera leur plan à la communauté.

# LE PLAN FINAL DU PROJET

**1. LE PROBLÈME ET LES CAUSES DU PROBLÈME** (Expliquez bien le problème et les causes avec détails.)

**2. LE BUT DU PROJET** (Ecrivez ici le but global du projet)

**3. LES OBJECTIFS** (Expliquez ici toutes les choses qui seront réalises pendant le projet - matérielles et éducatives)

**4. LES BÉNÉFICIAIRES DU PROJET** (éducation, ages, occupation, etc.)

**5. LE PLAN D'EVALUATION** (par exemple: l'enquête de santé, la qualité de vie, l'évaluation financière, etc.)

# PLANIFICATION DU PROJET

1. La Communauté choisit le Comité de Gestion.

2. Le Comité de Gestion prépare un PLAN qui comprend:

   - Résumé du problème et les causes du problème
   - Le but du projet
   - Les bénéficiaires du projet
   - Les objectifs qu'on veut réaliser pendant le projet
   - Le Plan d'Action
   - Un budget
   - Une liste des membres du Comité de Gestion et un résumé de leurs responsabilités
   - Un Plan d'Evaluation.

3. Le Comité de Gestion propose le PLAN à la communauté.

4. La communauté accepte le PLAN.

5. Le Comité de Gestion écrit la demande de financement, si c'est nécessaire.

# SESSION 7: LE COMITÉ DE GESTION PROPOSE LE PLAN FINAL À LA COMMUNAUTÉ ET LA COMMUNAUTÉ ACCEPTE LE PLAN

**BUT:** Le but de cette session est de finaliser le plan du projet avec l'accord de la communauté.

**DURATION:** 1 heure

**MATERIAUX:** Les marqueurs,
Les affiches "Planification du Projet" et une affiche vide pour le Plan d'Action.
Une copie du plan (cela peut être la demande) que le Comité de Gestion va proposer
Une copie du Plan d'Action Global que le group a écrite dans la session précédente
La fiche "Plan d'Action."

**OBJECTIFS:** À la fin de la session, les membres de la communauté sauront:

- Le but et les objectifs finals du projet
- Toutes les étapes du projet
- Tous leurs responsabilités et contributions
- Leur Plan d'Action global pour le projet

**ACTIVITÉS:**

**1.** Suivez l'ordre du jour qu'ils ont appris dans Session 3. Quand vous arrivez au point 8, après qu'ils donnent leurs commentaires, procédez avec les activités suivantes.

**2.** Affichez l'affiche "Planification du Projet."

**3.** Le président présente le plan, avec le Plan d'Action à la communauté.

**4.** La communauté vote sur le plan du projet. Si la communauté n'est pas d'accord avec le plan, il faut résoudre le problème avant de continuer.

**5.** Continuez au Point 9: Plan d'Action Mensuel

**a.** Posez aux gens les 7 questions pour une bonne planification.
**b.** Demandez à la communauté d'écrire un Plan d'Action mensuel avec les 7 questions sur l'affiche. Le secrétaire doit écrire sur la fiche "Plan d'Action" pour le garder dans son dossier.

**DEVOIRS:** Le projet peut être monté, des qu'on a tous les documents de la demande au bureau. Maintenant, le devoir c'est de continuer les réunions mensuelles (avec une invitation au facilitateur), la cotisation, et la contribution de la communauté.

# APPENDIX 5. Data Analysis from Yearlong Health Surveys

## Bilik-Bikot

Before Project:

| Family | # IN HOUSEHOLD | DAYS WITH SICK PERSON WITH DIARRHEA/MONTH | DIARRHEA DAYS/PERSON/ MONTH | NUMBER SICK IN HOUSEHOLD DURING SURVEY | LATRINE | LATRINE FULL | LATRINE COVERED | LATRINE PARTIALLY COVERED | SANITARY LATRINE | DIARRHEA DAYS/PERSON/ MONTH FOR HOUSEHOLDS WITH LATRINES | DIARRHEA DAYS/PERSON/ MONTH FOR HOUSEHOLDS WITH NO LATRINE | DIARRHEA DAYS/PERSON/ MONTH FOR HOUSEHOLDS WITH UNSANITARY LATRINES | DIARRHEA DAYS/PERSON/ MONTH FOR GOOD LATRINES | Variance Calculations for average diarrhea days/person/month |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 6 | 10 | 1.67 | 2 | 1 | 0 | 1 | 0 | 1 | 1.67 | | | 1.67 | 2.78 |
| 2 | 5 | 12 | 2.40 | 0 | 1 | 0 | 1 | | 1 | 2.40 | | | 2.40 | 5.76 |
| 3 | 10 | 7 | 0.70 | 0 | 0 | | | | | | 0.70 | | | 0.49 |
| 4 | 5 | 4 | 0.80 | 0 | 1 | 0 | 0 | 1 | | 0.80 | | 0.80 | | 0.64 |
| 5 | 4 | 10 | 2.50 | 0 | 1 | 1 | 0 | 1 | | 2.50 | | 2.50 | | 6.25 |
| 6 | 9 | 16 | 1.78 | 0 | 1 | 0 | 0 | 1 | | 1.78 | | 1.78 | | 3.16 |
| 7 | 5 | 10 | 2.00 | 0 | 1 | 1 | 0 | 1 | | 2.00 | | 2.00 | | 4.00 |
| 8 | 6 | 12 | 2.00 | 1 | 1 | 1 | 0 | 1 | | 2.00 | | 2.00 | | 4.00 |
| 9 | 8 | 10 | 1.25 | 1 | 1 | 0 | 0 | 1 | | 1.25 | | 1.25 | | 1.56 |
| | TOTAL | AVERAGE | AVERAGE | TOTAL | TOTAL | TOTAL | TOTAL | TOTAL | TOTAL | AVERAGE | AVERAGE | AVERAGE | AVERAGE | VARIANCE |
| | 58 | 10.11 | 1.68 | 4 | 8 | 3 | 2 | 6 | 2 | 1.80 | 0.70 | 1.72 | 2.03 | 3.58 |
| AVERAGE | 6.444444444 | | | | | | | | | | | | | |

3 months after completion:

| Family | # IN HOUSEHOLD | DAYS WITH SICK PERSON WITH DIARRHEA/MONTH | DIARRHEA DAYS/PERSON/ MONTH | NUMBER SICK IN HOUSEHOLD DURING SURVEY | LATRINE | LATRINE FULL | LATRINE COVERED | LATRINE PARTIALLY COVERED | SANITARY LATRINE | DIARRHEA DAYS/PERSON/ MONTH FOR HOUSEHOLDS WITH LATRINES | DIARRHEA DAYS/PERSON/ MONTH FOR HOUSEHOLDS WITH NO LATRINE | DIARRHEA DAYS/PERSON/ MONTH FOR HOUSEHOLDS WITH UNSANITARY LATRINES | DIARRHEA DAYS/PERSON/ MONTH FOR GOOD LATRINES | Variance Calculations for average diarrhea days/person/month |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 6 | 0 | 0.00 | 0 | 1 | 0 | 1 | 0 | 1 | 0.00 | | | 0.00 | 0.00 |
| 2 | 5 | 12 | 2.40 | 0 | 1 | 0 | 1 | 0 | 1 | 2.40 | | | 2.40 | 5.76 |
| 3 | 10 | 12 | 1.20 | 1 | 0 | 0 | 0 | 0 | | | 1.20 | | | 1.44 |
| 4 | 5 | 4 | 0.80 | 0 | 1 | 0 | 1 | 0 | 1 | 0.80 | | | 0.80 | 0.64 |
| 5 | 4 | 10 | 2.50 | 0 | 1 | 1 | 0 | 1 | | 2.50 | | 2.50 | | 6.25 |
| 6 | 9 | 0 | 0.00 | 0 | 1 | 0 | 0 | 1 | | 0.00 | | 0.00 | | 0.00 |
| 7 | 5 | 12 | 2.40 | 2 | 0 | 0 | 0 | 0 | | | 2.40 | | | 5.76 |
| 8 | 6 | 8 | 1.33 | 1 | 1 | 1 | 0 | 1 | | 1.33 | | 1.33 | | 1.78 |
| 9 | 8 | 10 | 1.25 | 1 | 1 | 0 | 0 | 1 | | 1.25 | | 1.25 | | 1.56 |
| | TOTAL | AVERAGE | AVERAGE | TOTAL | TOTAL | TOTAL | TOTAL | TOTAL | TOTAL | AVERAGE | AVERAGE | AVERAGE | AVERAGE | Variance |
| | 58 | 7.56 | 1.32 | 5 | 7 | 2 | 3 | 4 | 3 | 1.18 | 1.80 | 1.27 | 1.07 | 2.90 |

1 year after completion

| Family | # IN HOUSEHOLD | DAYS WITH SICK PERSON WITH DIARRHEA/MONTH | DIARRHEA DAYS/PERSON/ MONTH | NUMBER SICK IN HOUSEHOLD DURING SURVEY | LATRINE | LATRINE FULL | LATRINE COVERED | LATRINE PARTIALLY COVERED | SANITARY LATRINE | DIARRHEA DAYS/PERSON/ MONTH FOR HOUSEHOLDS WITH LATRINES | DIARRHEA DAYS/PERSON/ MONTH FOR HOUSEHOLDS WITH NO LATRINE | DIARRHEA DAYS/PERSON/ MONTH FOR HOUSEHOLDS WITH UNSANITARY LATRINES | DIARRHEA DAYS/PERSON/ MONTH FOR GOOD LATRINES | Variance Calculations for average diarrhea days/person/month |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 6 | 6 | 1.00 | 0 | 1 | 0 | 1 | 0 | 1 | 1.00 | | | 1.00 | 1.00 |
| 2 | 5 | 12 | 2.40 | 0 | 1 | 0 | 1 | 0 | 1 | 2.40 | | | 2.40 | 5.76 |
| 3 | 10 | 16 | 1.60 | 2 | 0 | 0 | 0 | 0 | | | 1.60 | | | 2.56 |
| 4 | 5 | 12 | 2.40 | 0 | 1 | 0 | 1 | 0 | 1 | 2.40 | | | 2.40 | 5.76 |
| 5 | 4 | 8 | 2.00 | 0 | 1 | 1 | 0 | 1 | | 2.00 | | 2.00 | | 4.00 |
| 6 | 9 | 6 | 0.67 | 0 | 1 | 0 | 0 | 1 | | 0.67 | | 0.67 | | 0.44 |
| 7 | 5 | 1 | 0.20 | 0 | 1 | 0 | 1 | 0 | 1 | 0.20 | | | 0.20 | 0.04 |
| 8 | 6 | 1 | 0.17 | 0 | 1 | 1 | 0 | 1 | | 0.17 | | 0.17 | | 0.03 |
| 9 | 8 | 0 | 0.00 | 0 | 1 | 0 | 0 | 1 | | 0.00 | | 0.00 | | 0.00 |
| | TOTAL | AVERAGE | AVERAGE | TOTAL | TOTAL | TOTAL | TOTAL | TOTAL | TOTAL | AVERAGE | AVERAGE | AVERAGE | AVERAGE | |
| | 58 | 6.89 | 1.16 | 2 | 8 | 2 | 4 | 4 | 4 | 1.10 | 1.60 | 0.71 | 1.50 | 2.45 |

Before construction:

| Family | ALL WATER STORED IN COVERED POTS | DRINKING WATER AND COOKING WATER STORED IN COVERED POTS | DRINKING, COOKING, AND BATHING WATER STORED IN COVERED POTS | DIARRHEA DAYS/PERSON/MONTH FOR HOUSEHOLDS WITH ALL WATER COVERED | DIARRHEA DAYS/PERSON/MONTH FOR HOUSEHOLDS WITH DRINKING AND COOKING WATER COVERED | DIARRHEA DAYS/PERSON/MONTH FOR HOUSEHOLDS WITH DRINKING, COOKING, AND BATHING WATER COVERED | DIARRHEA DAYS/PERSON/MONTH FOR HOUSEHOLDS WITH NO WATER COVERED |
|---|---|---|---|---|---|---|---|
| 1 | 1 | 0 | 0 | 1.666666667 | | 0 | |
| 2 | 0 | 1 | 0 | | 2.4 | 0 | |
| 3 | 0 | 1 | 0 | | 0.7 | 0 | |
| 4 | 0 | 1 | 0 | | 0.8 | 0 | |
| 5 | 0 | 0 | 0 | | | 0 | 2.5 |
| 6 | 0 | 1 | 0 | | 1.777777778 | 0 | |
| 7 | 0 | 0 | 1 | | | 2 | |
| 8 | 0 | 1 | 0 | | 2 | 0 | |
| 9 | 0 | 0 | 0 | | | 0 | 1.25 |
| | TOTAL | TOTAL | TOTAL | AVERAGE | AVERAGE | AVERAGE | AVERAGE |
| | 1 | 5 | 1 | 1.666666667 | 1.535555556 | 2 | 1.875 |

3 months after construction:

| Family | ALL WATER STORED IN COVERED POTS | DRINKING WATER AND COOKING WATER STORED IN COVERED POTS | DRINKING, COOKING, AND BATHING WATER STORED IN COVERED POTS | DIARRHEA DAYS/PERSON/MONTH FOR HOUSEHOLDS WITH ALL WATER COVERED | DIARRHEA DAYS/PERSON/MONTH FOR HOUSEHOLDS WITH DRINKING AND COOKING WATER COVERED | DIARRHEA DAYS/PERSON/MONTH FOR HOUSEHOLDS WITH DRINKING, COOKING, AND BATHING WATER COVERED | DIARRHEA DAYS/PERSON/MONTH FOR HOUSEHOLDS WITH NO WATER COVERED |
|---|---|---|---|---|---|---|---|
| 1 | 1 | 0 | 0 | 0 | | | |
| 2 | 0 | 1 | 0 | | 2.4 | | |
| 3 | 1 | 0 | 0 | 1.2 | | | |
| 4 | 1 | 0 | 0 | 0.8 | | | |
| 5 | 0 | 1 | 0 | | 2.5 | | |
| 6 | 0 | 0 | 0 | | | | 0 |
| 7 | 0 | 1 | 0 | | 2.4 | | |
| 8 | 0 | 0 | 0 | | | | 1.333333333 |
| 9 | 0 | 1 | 0 | | 1.25 | | |
| | TOTAL | TOTAL | TOTAL | AVERAGE | AVERAGE | AVERAGE | AVERAGE |
| | 3 | 4 | 0 | 0.666666667 | 2.1375 | #DIV/0! | 0.666666667 |

1 year after construction:

| Family | ALL WATER STORED IN COVERED POTS | DRINKING WATER AND COOKING WATER STORED IN COVERED POTS | DRINKING, COOKING, AND BATHING WATER STORED IN COVERED POTS | DIARRHEA DAYS/PERSON/MONTH FOR HOUSEHOLDS WITH ALL WATER COVERED | DIARRHEA DAYS/PERSON/MONTH FOR HOUSEHOLDS WITH DRINKING AND COOKING WATER COVERED | DIARRHEA DAYS/PERSON/MONTH FOR HOUSEHOLDS WITH DRINKING, COOKING, AND BATHING WATER COVERED | DIARRHEA DAYS/PERSON/MONTH FOR HOUSEHOLDS WITH NO WATER COVERED |
|---|---|---|---|---|---|---|---|
| 1 | 1 | 0 | 0 | 1 | | | |
| 2 | 0 | 1 | 0 | | 2.4 | | |
| 3 | 0 | 1 | 0 | | 1.6 | | |
| 4 | 0 | 1 | 0 | | 2.4 | | |
| 5 | 1 | 0 | 0 | 2 | | | |
| 6 | 0 | 1 | 0 | | 0.666666667 | | |
| 7 | 1 | 0 | 0 | 0.2 | | | |
| 8 | 0 | 1 | 0 | | 0.166666667 | | |
| 9 | 0 | 1 | 0 | | 0 | | |
| | TOTAL | TOTAL | TOTAL | AVERAGE | AVERAGE | AVERAGE | AVERAGE |
| | 3 | 6 | 0 | 1.066666667 | 1.205555556 | #DIV/0! | #DIV/0! |

Results to Report:

Overall Health Change Data:

| | | | | Percent Decrease | | Confidence Interval Calculations: | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Before Project | 3 months after completion | 1 year after completion | 3 months after completion | 1 year after completion | S^2pool | Sya-yb | 90% confindence interval,tv=16,alpha/2=.025*Sya-yb | ya-yb |
| with diarrhea during time of survey | 6.90 | 8.62 | 3.45 | -25.00 | 50.00 | 0.68 | 0.32 | 0.43 | 0.52 |
| with someone sick with diarrhea in the household per month | 10.11 | 7.56 | 6.89 | 25.27 | 31.87 | | | | |
| with diarrhea/person/month | 1.68 | 1.32 | 1.16 | 21.27 | 30.88 | | | | |

Behavior Change Data:

| | Before Project | | 3 months after completion | | 1 year after completion | | Percent change: 3 months after completion | | Percent change: 1 year after completion | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Percentage | Average number of days with diarrhea/person/month | Percentage | Average number of days with diarrhea/person/month | Percentage | Average number of days with diarrhea/person/month | Percentage | Average number of days with diarrhea/person/month | Percentage | Average number of days with diarrhea/person/month |
| Households with latrines | 88.89 | 1.80 | 77.78 | 1.18 | 88.89 | 1.10 | -12.50 | -34.23 | 0.00 | -38.63 |
| Households with sanitary latrines | 22.22 | 2.03 | 33.33 | 1.07 | 44.44 | 1.50 | 50.00 | -47.54 | 100.00 | -26.23 |
| Households with unsanitary latrines | 66.67 | 1.72 | 44.44 | 1.27 | 44.44 | 0.71 | -33.33 | -26.17 | -33.33 | -58.85 |
| Households without latrines | 11.11 | 0.70 | 22.22 | 1.80 | 11.11 | 1.60 | 100.00 | 157.14 | 0.00 | 128.57 |
| Percentage of families who keep all water in covered containers | 11.11 | 1.67 | 33.33 | 0.67 | 33.33 | 1.07 | 200.00 | -60.00 | 200.00 | -36.00 |
| Percentage of families who keep only drinking and cooking water in covered containers | 55.56 | 1.54 | 44.44 | 2.14 | 66.67 | 1.21 | -20.00 | 39.20 | 20.00 | -21.49 |
| Percentage of families who keep only drinking, cooking, and bathing water in covered containers | 11.11 | 2.00 | 0.00 | n/a | 0.00 | n/a | -100.00 | n/a | -100.00 | n/a |
| Percentage of families who keep no water covered | 22.22 | 1.88 | 22.22 | 0.67 | 0.00 | n/a | 0.00 | -64.44 | -100.00 | n/a |

## Nkol-Edinga

Before Project:

| Family | # IN HOUSEHOLD | DAYS WITH SICK PERSON WITH DIARRHEA/MONTH | DIARRHEA DAYS/PERSON/ MONTH | NUMBER SICK IN HOUSEHOLD DURING SURVEY | LATRINE | LATRINE FULL | LATRINE COVERED | LATRINE PARTIALLY COVERED | SANITARY LATRINES | DIARRHEA DAYS/PERSON/MONTH FOR HOUSEHOLDS WITH LATRINES | DIARRHEA DAYS/PERSON/MONTH FOR HOUSEHOLDS WITH NO LATRINE | DIARRHEA DAYS/PERSON/MIONTH FOR HOUSEHOLDS WITH UNSANITARY LATRINE | DIARRHEA DAYS/PERSON/MONTH FOR GOOD LATRINES | Variance Calculations for average diarrhea days/person/month |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 18 | 12 | 0.67 | 2 | 1 | 0 | 0 | 1 | | 0.67 | | 0.67 | | 0.44 |
| 2 | 26 | 30 | 1.15 | 1 | 1 | 0 | 1 | 0 | 1 | 1.15 | | | 1.15 | 1.33 |
| 3 | 15 | 16 | 1.07 | 3 | 1 | 0 | 0 | 1 | | 1.07 | | 1.07 | | 1.14 |
| 4 | 8 | 8 | 1.00 | 0 | 0 | 0 | 0 | 0 | | | 1.00 | | | 1.00 |
| 5 | 6 | 12 | 2.00 | 0 | 1 | 0 | 0 | 1 | | 2.00 | | 2.00 | | 4.00 |
| 6 | 7 | 16 | 2.29 | 1 | 1 | 0 | 0 | 1 | | 2.29 | | 2.29 | | 5.22 |
| 7 | 22 | 16 | 0.73 | 0 | 1 | 0 | 0 | 1 | | 0.73 | | 0.73 | | 0.53 |
| 8 | 35 | 20 | 0.57 | 0 | 1 | 1 | 0 | 1 | | 0.57 | | 0.57 | | 0.33 |
| 9 | 19 | 16 | 0.84 | 0 | 1 | 0 | 0 | 1 | | 0.84 | | 0.84 | | 0.71 |
| | TOTAL | AVERAGE | AVERAGE | TOTAL | TOTAL | TOTAL | TOTAL | TOTAL | TOTAL | AVERAGE | AVERAGE | AVERAGE | AVERAGE | |
| | 156 | 16.22 | 1.15 | 7 | 8 | 1 | 1 | 7 | 1 | 1.16 | 1.00 | 1.17 | 1.15 | 1.84 |
| AVERAGE | 17.33333333 | | | | | | | | | | | | | |

1 year after completion:

| Family | # IN HOUSEHOLD | DAYS WITH SICK PERSON WITH DIARRHEA/MONTH | DIARRHEA DAYS/PERSON/ MONTH | NUMBER SICK IN HOUSEHOLD DURING SURVEY | LATRINE | LATRINE FULL | LATRINE COVERED | LATRINE PARTIALLY COVERED | SANITARY LATRINE | DIARRHEA DAYS/PERSON/MONTH FOR HOUSEHOLDS WITH LATRINES | DIARRHEA DAYS/PERSON/MONTH FOR HOUSEHOLDS WITH NO LATRINE | DIARRHEA DAYS/PERSON/MIONTH FOR HOUSEHOLDS WITH UNSANITARY LATRINE | DIARRHEA DAYS/PERSON/MONTH FOR GOOD LATRINES | Variance Calculations for average diarrhea days/person/month |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 13 | 1 | 0.08 | 0 | 1 | 0 | 0 | 1 | | 0.08 | | 0.08 | | 0.01 |
| 2 | 7 | 3 | 0.43 | 0 | 1 | 0 | 1 | 0 | 1 | 0.43 | | | 0.43 | 0.18 |
| 3 | 13 | 4 | 0.31 | 0 | 1 | 0 | 0 | 1 | | 0.31 | | 0.31 | | 0.09 |
| 4 | 4 | 0 | 0.00 | 0 | 1 | 0 | 1 | 0 | 1 | 0.00 | | | 0.00 | 0.00 |
| 5 | 20 | 30 | 1.50 | 2 | 1 | 0 | 0 | 1 | | 1.50 | | 1.50 | | 2.25 |
| 6 | 7 | 7 | 1.00 | 0 | 0 | 0 | 0 | 0 | | | 1.00 | | | 1.00 |
| 7 | 8 | 3 | 0.38 | 1 | 1 | 0 | 0 | 1 | | 0.38 | | 0.38 | | 0.14 |
| 8 | 16 | 3 | 0.19 | 0 | 0 | 0 | 0 | 0 | | | 0.19 | | | 0.04 |
| 9 | 10 | 0 | 0.00 | 0 | 1 | 0 | 0 | 1 | | 0.00 | | 0.00 | | 0.00 |
| | TOTAL | AVERAGE | AVERAGE | TOTAL | TOTAL | TOTAL | TOTAL | TOTAL | TOTAL | AVERAGE | AVERAGE | AVERAGE | AVERAGE | |
| | 98 | 5.67 | 0.43 | 3 | 7 | 0 | 2 | 5 | 2 | 0.38 | 0.59 | 0.45 | 0.21 | 0.46 |

Before Construction:

| Family | ALL WATER STORED IN COVERED POTS | DRINKING WATER AND COOKING WATER STORED IN COVERED POTS | DRINKING, COOKING, AND BATHING WATER STORED IN COVERED POTS | DIARRHEA DAYS/PERSON/MONTH FOR HOUSEHOLDS WITH ALL WATER COVERED | DIARRHEA DAYS/PERSON/MONTH FOR HOUSEHOLDS WITH DRINKING AND COOKING WATER COVERED | DIARRHEA DAYS/PERSON/MONTH FOR HOUSEHOLDS WITH DRINKING, COOKING, AND BATHING WATER COVERED | DIARRHEA DAYS/PERSON/MONTH FOR HOUSEHOLDS WITH NO WATER COVERED |
|---|---|---|---|---|---|---|---|
| 1 | 1 | 0 | 0 | 0.666666667 | | 0 | |
| 2 | 1 | 0 | 0 | 1.153846154 | | 0 | |
| 3 | 1 | 0 | 0 | 1.066666667 | | 0 | |
| 4 | 1 | 0 | 0 | 1 | | 0 | |
| 5 | 0 | 1 | 0 | | 2 | 0 | |
| 6 | 1 | 0 | 0 | 2.285714286 | | 0 | |
| 7 | 0 | 1 | 0 | | 0.727272727 | 0 | |
| 8 | 0 | 0 | 1 | | | 0.571428571 | |
| 9 | 1 | 0 | 0 | 0.842105263 | | 0 | |
| | TOTAL | TOTAL | TOTAL | AVERAGE | AVERAGE | AVERAGE | AVERAGE |
| | 6 | 2 | 1 | 1.169166506 | 1.363636364 | 0.571428571 | #DIV/0! |

After Construction

| Family | ALL WATER STORED IN COVERED POTS | DRINKING WATER AND COOKING WATER STORED IN COVERED POTS | DRINKING, COOKING, AND BATHING WATER STORED IN COVERED POTS | DIARRHEA DAYS/PERSON/MONTH FOR HOUSEHOLDS WITH ALL WATER COVERED | DIARRHEA DAYS/PERSON/MONTH FOR HOUSEHOLDS WITH DRINKING AND COOKING WATER COVERED | DIARRHEA DAYS/PERSON/MONTH FOR HOUSEHOLDS WITH DRINKING, COOKING, AND BATHING WATER COVERED | DIARRHEA DAYS/PERSON/MONTH FOR HOUSEHOLDS WITH NO WATER COVERED |
|---|---|---|---|---|---|---|---|
| 1 | 1 | 0 | 0 | 0.076923077 | | | |
| 2 | 1 | 0 | 0 | 0.428571429 | | | |
| 3 | 1 | 0 | 0 | 0.307692308 | | | |
| 4 | 1 | 0 | 0 | 0 | | | |
| 5 | 0 | 1 | 0 | | 1.5 | | |
| 6 | 0 | 1 | 0 | | 1 | | |
| 7 | 1 | 0 | 0 | 0.375 | | | |
| 8 | 1 | 0 | 0 | 0.1875 | | | |
| 9 | 1 | 0 | 0 | 0 | | | |
| | TOTAL | TOTAL | TOTAL | AVERAGE | AVERAGE | AVERAGE | AVERAGE |
| | 7 | 2 | 0 | 0.196526688 | 1.25 | #DIV/0! | #DIV/0! |

Results to Report:

Overall Health Change Data:

| | Before Project | 1 year after completion | Percent Decrease: 1 year after completion | Confidence Interval Calculations: S^2pool | Sya-yb | 99.5% confidence interval,tv=16,alpha/2=.025*Sya-yb | ya-yb |
|---|---|---|---|---|---|---|---|
| Percentage of population with diarrhea during time of survey | 4.5 | 3.1 | 31.8 | 0.3 | 0.1 | 0.4 | 0.7 |
| Average number of days with someone sick with diarrhea in the household per month | 16.2 | 5.7 | 65.1 | | | | |
| Average number of days with diarrhea/person/month | 1.1 | 0.4 | 62.4 | | | | |

Behavior Change Data:

| | Before Project | | 1 year after completion | | Percent change: 1 year after completion | |
|---|---|---|---|---|---|---|
| | Percentage | Average number of days with diarrhea/person/month | Percentage | Average number of days with diarrhea/person/month | Percentage | Average number of days with diarrhea/person/month |
| Households with latrines | 88.9 | 1.2 | 77.8 | 0.4 | -12.5 | -67.0 |
| Households with sanitary latrines | 11.1 | 1.2 | 22.2 | 0.2 | 100.0 | -81.4 |
| Households with unsanitary latrines | 77.8 | 1.2 | 55.6 | 0.5 | -28.6 | -61.2 |
| Households without latrines | 11.1 | 1.0 | 22.2 | 0.6 | 100.0 | -40.6 |
| Percentage of families who keep all water in covered containers | 66.7 | 1.2 | 77.8 | 0.2 | 16.7 | -83.2 |
| Percentage of families who keep only drinking and cooking water in covered containers | 22.2 | 1.4 | 22.2 | 1.3 | 0.0 | -8.3 |
| Percentage of families who keep only drinking, cooking, and bathing water in covered containers | 11.1 | 0.6 | 0.0 | n/a | -100.0 | n/a |
| Percentage of families who keep no water covered | 0.0 | #DIV/0! | 0.0 | n/a | #DIV/0! | n/a |

## APPENDIX 6. Pictures of Springbox Construction

**Figure 7. Unimproved Spring at Bilik-Bikot.**

Before the springbox is constructed, the brush should be cleared, especially around the spring pool, and the rocks should be cleared away to allow the water to drain fully. A channel should also be dug, leading downhill from the spring to allow drainage. After the spring is drained, the output can be measured.

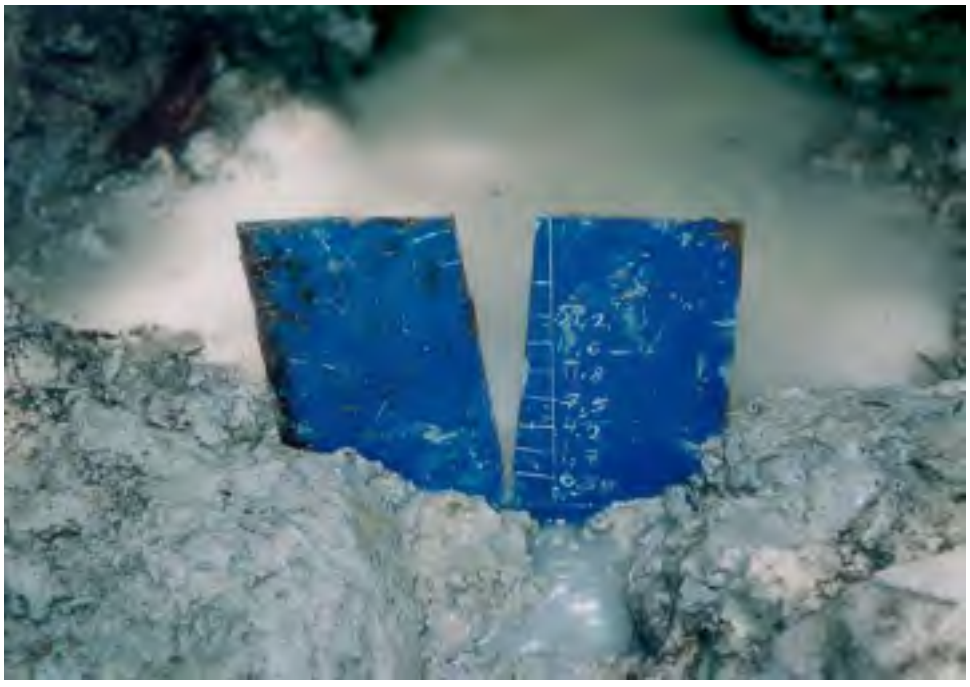

**Figure 8. Measuring the Output of a Spring with a Weir.**

To measure the output, a small dam should be made with mud and rocks, and the weir can be placed in the dam.

**Figure 9. Construction of the Primary Filtration and Capture Area, Filter, and Reservoir.**

The spring pool and primary filtration and capture area is located at the front of the picture. The three men are standing on the walls of the filter, with the gravel layer entrance showing in front. The mason in the background is constructing the walls of the reservoir.

**Figure 10. The Completed Springbox at Bilik-Bikot.**

The reservoir is just to the right of the man standing. Behind the reservoir, where the two male volunteers are sitting, is the filter. Behind them is the primary filtration and capture area. The other four people are sitting on retaining walls. The collection pipe is visible at the center of the reservoir, and the overflow pipe is at the upper right corner of the reservoir, bending down to prevent children from breaking it.

**Figure 11. Reservoir with Collection, Overflow, and Drainage Pipe.**

The overflow pipe is coming out of the top, and bends down to avoid children breaking it. The collection pipe has a stopper over it, made of two PVC pipe segments and a 90-degree elbow. The upper segment is closed. The stopper is simply removed to collect water. The galvanized drainage pipe is just visible below the collection pipe.

**Figure 12. The Collection Pipe.**

Water is collected by removing the stopper.