THE IMPACT OF RURAL WATER SUPPLY PROGRAMMES ON RECIPIENT COMMUNITIES : A case study of Kenya-Finland Western Water Supply Programme in Western Province

By

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Declaration

This thesis is my original work and has not been presented for a degree in any other university

Signed _____

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This thesis has been submitted for examination with my approval as University supervisor

Signed _____

Mr. Evans O. Mairura

(supervisor)

July, 1994

DEDICATION

This work is dedicated to my daughter

ALEXIS GRACE TEYIE

and to my husband

JOSHUA TEYIE

With love and affection

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This thesis has been made possible as a result of the joint efforts and support of many people.Although it may not be possible to mention them all, their assistance is appreciated.

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Abbreviations and Acronyms

DDC	District Development Committee
FINNIDA	Finnish International Development Agency
Km	Kilometre
KFWWSP	Kenya Finland Western Water Supply Programme
KM^2	Square kilometre
l/LU/d	litres per livestock unit per day
l/p/d	litres per person per day
L.U	Livestock unit
l/s	litres per second
m	metre
m^3/d	cubic metre per day
m^3/h	cubic metre per hour
mm	millimetre
NWCPC	National Water Conservation and Pipeline Corporation
Pers/km^2	Persons per square kilometre.
ppm	parts per million
RDF	Rural Development Fund
µ S/cm	micro-Siemens per centimetre

W.H.O	World Health organizations
U.N	United Nations
M.O.W.D	Ministry of Water Development

Abstract

The Kenya-Finland Western Water Supply Programme covers Western Province. It provides clean water for domestic and livestock consumption. When the programme was started in 1981, only 5% of the population in the programme area had access to clean water and by 1992 72% were within supply limit.

This thesis looks at the impact of this programme on the recipient community. The background of the study area especially the water resources have been studied. The programmes activities in the area have also been outlined.

The study also looked at the community's involvement in the programme's activities.

The impact of the programme is discussed in terms of presumed effects of improved supply.

The findings indicate that there are benefits accruing to the community, but not enough. The benefits could be maximised. In general, the programme has not resulted in much development in the area.

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CHAPTER ONE

1.0 INTRODUCTION

That the United Nations Organisation declared 1980-1990 the International Drinking Water Decade, and that the Kenya Government in its Development Plan GOK (1988-1993) aimed at providing drinking water in every home by the year 2000 underlines the indispensable aspect of water vis-a-vis sustenance of life.At the United Nations Centre on Human Settlement (Habitat)

Conference held in June 1976 in Vancouver Canada, one of the recommendations adopted was that, in the less developed countries two-thirds of the population do not have reasonable access to safe and ample water supply." In the case of Kenya, largely because of the topography and geology, water is not readily available from traditional sources which include rivers, streams and seasonal ponds in rural areas. Often times, water is fetched from distances of 5 to 8 kilometres away from the house. Even then, the quantity of water available might be very low. In some areas, there is a severe water quality problem due to pollution. As a consequence, the quantity of water used for domestic purposes is relatively low, the per capita daily

consumption averages about 15 litres.

Recognizing that the rural population urgently requires the provision of water and that it is a driving force for economic and social development, Kenya has given rural water supply a high priority in its national development plans.

Most of the urban population in the project area, estimated at about 29,250 in 1985, is either served from piped water supply schemes or has reasonable access to communal water points. The quality of supply is usually better in large towns than in smaller towns . The urban core population is usually supplied through metered individual connections with urban fringe groups having limited access to portable water. Usage is not excessive, ranging from 70 to 160 per capita per day.

The rural population estimated at almost 165,750 in 1985, generally had limited access to improved water supplies despite recent and ongoing rural water supply projects. The percentage of rural population with access to improved water supplies was estimated at between 4% and 25% with widely varying figures from province to province. The vast majority of the rural

population carries water over considerable distances from natural sources which are often polluted, insufficient or unreliable. A small proportion of the currently served rural population has individual connections and the balance draws water from communal water points, kiosks, protected springs or wells. Water usage ranges from 50 litres per capita per day for individual connections to about 10 litres per capita per day (or even less) for wells and protected springs.

Roughly 96% of the population of Western Province (on-going schemes Chesakaki and Busia-Mundika excluded) got their water from rivers, rivulets and springs in 1981. In most of the area those sources could offer reliable access to water during the wet periods of the year in terms of quantity.

However, in Western Province, the yearly dry period between December and February forces people to carry water several kilometres especially in the drier western part of the project area by the Ugandan border. The quality of untreated river water cannot meet the standards of acceptable drinking water. The number of existing water supplies in the project area in 1981

before the onset of KFWWSP was altogether 31 of which 13 were under the Ministry of Water Development, the other 18 being under county councils or institutions. The number of people served by these water supply systems in 1981 although often unsatisfactorily was approximately 39,000, 5% of the population in the project area. On-going schemes excluded, common characteristics of very many of these supplies are frequent operational difficulties caused by lack of diesel fuel or spare parts and yearly dry periods causing decrease of water and in most cases the absence of disinfection.Currently, there are 76 piped water schemes serving about 800,000 consumers.By 1990,there were 2346 point source supplies constructed by KFWWSP serving approximately 700,000 consumers. Therefore, it is estimated that altogether 1.5 million people (57%) of the population of Western Province are within the service area of improved supply.

In the project area, surface water quality was studied in detail during the preparation of the water supply Development Plan. Since then,there has been very little data available from the National Water Quality Control Stations.The general characteristics

are high colour and turbidity almost throughout the year, low dissolved mineral content and pH usually above 7.0 rising up to 8.0 in Lake Victoria.

The Water Quality and Pollution Control Division of the Ministry of Water Development has observed seasonal variations in pH, COD and BOD downstream of industrial effluent discharge points along the rivers. The main cause of pollution in the rivers is discharge of poorly treated effluent from sugar, pulping, coffee processing factories and agricultural inputs runoff. Generally, water from most rivers in western province requires full conventional treatment before it can be considered acceptable for human consumption. The physical quality of the water in shallow wells fluctuates from wet to dry season. The turbidity and colour increase in the rainy season mainly due to the intrusion of surface runoff through the cracked slabs and unsealed joints between the concrete rings. Apart from local pollution (pit latrines) the shallow ground water is normally bacteriologically good.

In most cases, the deep ground water quality meets the drinking water standards set by the Ministry of Water Development design manual and World Health

Organization guidelines.

From the foregoing, approximately 95% of the project areas population total in 1981 had unreliable water supply with the water quality below the required standards. In order to meet the United Nations Development Decade goals for extension of water supply to serve 25% of the rural population,massive investment is required.**U.N Directors Report(1971).** Nearly two-thirds of the additional rural population to be served live in the developing countries where per capita incomes are generally low. It is doubtful that the economies of these countries can sustain the investment necessary to meet the limited Nations Development Decade goals. Government and donor support has therefore been very necessary.**U.N Directors Report(1971)**

There has been assistance provided by multilateral and bi-lateral agencies to governments for rural water supply. Over the past two decades, it has been widespread and has taken many forms varying from short term technical advice to long-term projects. Among the agencies which have been associated with rural water supply are the European Development Fund (FED), Food

and Agriculture Organization (FAO), United Nations Development Programme (UNDP), World Health Organisation (WHO) and numerous bilateral agencies such as Centre For American Relief Everywhere(CARE),United States Agency for International Development (USAID), Finnish International Development Agency (FINNIDA) and Swedish International Development Agency(SIDA).

In Western Province, donor agencies commonly involved in rural water supply are FINNIDA and CARE. This thesis is divided in to in five chapters.The first chapter is an introduction to the research problem.The related literature is reviewed in this chapter. The second chapter looks at the background of the study area.A great deal of attention is paid to the water resources,particularly ground-water resources.This is because KFWWSP is based on the availability of abundant supplies of ground-water.The projects sustainability depends on it too.The third chapter brings out the main aspects of KFWWSP.The programme s activities,organisation,structure and related issues are discussed.The fourth chapter presents data collected,its analysis and findings.The last chapter consists of conclusions and recommendations.

1.1 STATEMENT OF THE PROBLEM

Rural water supply development is marked by a number of common difficulties; inadequate human and material resources, insufficient supporting investment and the need to accommodate numeric cultural differences among the population served. The major difficulty is the frequent inability of development organization to know whether the projects they do promote are accomplishing the purposes for which they were intended. This lack of knowledge has serious implications for the overall size of rural water supply programmes and for the ultimate use of resources within the programmes.

The success of any investment made in the cause of development should be gauged in the light of the objectives it sets out to achieve .In the case of rural water supply, the intended objectives as well as resulting effects are left as unspoken, implicit assumptions. The success of the programmes often is measured in terms of the number of people served with water per year or more frequently is the amount of expenditure commitment during the period in question. If water supply investments are made for development

purposes, then neither the expenditure commitment nor the size of population served should be used as measures of success or achievement.Success should be measured against the national development objectives that are related to rural water supply.

There are many claims made with regard to the results of rural water supply projects. In addition to providing water they sometimes are expected to improve health, encourage economic development and even foster national integration.

Due to the size, and lack of data collection, rural development activities in general are difficult to evaluate. The diverse nature of potential results of rural water supply projects make any evaluation even more difficult. The problem is accentuated by the fact that development organizations do not always have a clear idea of what they wish to achieve beyond the immediate provision of water supply. Intentions which are poorly defined at the planning stage are not likely to find practical expression at the evaluation stage. Thus the critical problem in rural water supply development today is a two-fold issue that can be reduced to two questions. What do we want to happen

and what actually happens? The first issue is concerned with the purpose of projects while the second evaluates the outcome.

Several factors have led to the need for greater understanding of the impact of what supply projects upon the areas in which they serve:

a) the advent of the Rural Development Fund (RDF) which allocates a fixed sum of money to each region for locally planned development projects.

b) enlarged programmes of rural water supply over the last years as a result of several aid programmes

c) the increasing importance of District Development Committee (DDCs) in setting out local development priorities.

An impact study carried out on a programme like the Kenya Finland Western supply Programme will enable an understanding of its outcome. This can then be compared with the programme's intended purposes. This is important because resources are scarce and should only be utilized where programmes meet the intended objectives and maximizes benefits to the community.

1.2 JUSTIFICATION OF THE STUDY

The Director General of the World Health Organization (WHO) stated that the provision of a safe and convenient water supply and basic sanitation services is of paramount importance to the health of people living in developing countries. Wijk Besma(1986). It is universally accepted that an adequate supply of water for drinking, personal hygiene and other domestic purposes, and adequate means of waste disposal are essential to public health and well-being.

Unfortunately, vast numbers of people in the developing world, most of them living in rural areas, do not have access to a safe and convenient source of water. Where they do, they would normally not have satisfactory sewage disposal facilities. The magnitude and nature of the problem cannot be over-emphasized.

Western Province is well endowed with both surface and underground water resources. The major problem here is one of water quality rather than quantity. The traditional water sources used by 95% of the rural population are often polluted. This is because often-times,livestock also use the same facilities. If water

is not polluted at the source it will most likely be polluted on transit due to the long distances from the water source to the houses. The containers are also a source of pollution if they are not clean.

The Kenya-Finland Western Water Supply Programme (KFWWSP) aims at alleviating the situation in Western Kenya. KFWWSP undertakes to provide easily available water in Western Kenya by use of protected springs, shallow wells and boreholes.

As already stated, it is becoming exceedingly important to find out the impact of water supply programmes on the area where they are situated. This is especially important in view of the massive resources channelled into the programme.

1.2 STUDY OBJECTIVES

This study has the broad objective to find out the impact of the KFWWSP on the project area.

The specific objectives are;

a) to assess the water resources of the study area

b) to find out the aims/goals of KFWWSP.

c) to find out the outcome of the programme.

d) to find out the level of community participation in the programme

e) to formulate programme selection criteria which will allocate investment to proposed water supply programmes of high impact potential.

1.3 STUDY HYPOTHESES

H_o:distance travelled to obtain water has not decreased significantly

H_1:distance travelled to obtain water has decreased significantly

H_o:quantity of water used has not increased significantly

H_1:quantity of water used has increased significantly

H_o:there is no significant reduction in occurrence of water related diseases

H_1:there is a significant reduction in the occurrence of water related diseases

1.4 STUDY ASSUMPTIONS

(a) distance travelled to the water point decreases

(b) improved supply has provided a stimulus for the development of secondary economic activities

(c)time and energy expended in obtaining water decreases

(d)quality of water improves

(e)quantity of water used increases

(f)improved supply is more reliable

(g)all people who do not live too far from the improved supply make use of it

(h)additional time made available through improved supply is put to productive use

(i)improved supply means better health

(j)input of improved water has acted as an incentive to overall development

1.5 LITERATURE REVIEW

Development has been defined variously from different value points. Development is not a value-free phenomenon since it has to do with the improvement of people s lives. Kabwegere(1981). To an urban dweller, development may mean more job opportunities, more buildings, better facilities. Development to a rural person might mean closer access to a safe water supply an irrigation scheme or primary health care. The Kenya Development Plan describes development as

> improvement of the of the well being of the people; a high and growing per capita income; a greater equality in the distribution of this income and the transfer of economic power to the

citizen Kenya(1988).

Hyder, (1970) describes development as

> increased differentiation of roles to better cope with change; growing equality in the allocation of society's scarce resources and in particular in the State's allocation of these; enhanced capacity (and performance) of social institutions, especially those associated with the state and finally increased choice and enlarged opportunities in the decision making process of society.

Development consists of attaining the good life, one that is congruent with our fundamental values and yet attainable and sustainable with our present and future resources Black,(1976) Economic development refers to improving the qualitative aspects of economic growth including changes in the quality of life Byrns,(1981). Development is thus generally accepted to improve the living conditions of people. Most people agree that the improvement of living conditions is related to non-material wants as well as to physical requirements. Development goals that call for the improvement of the quality of life reflect the agreement. As can be noted from the foregoing, there are many definitions of development. Although there is still no generally accepted definition of economic development, all definitions imply that it involves raising living

standards. It is for example a social process which results in a cumulative increase in levels of consumption.

Water supply has always been looked upon as a key factor in development especially in the rural areas. Many rural Kenyans consider modern water supply facilities extremely important for agricultural production and personal welfare . In most cases, present facilities are viewed as inadequate and the government has embarked on an ambitious investment programme with the aid of FINNIDA in the study area.

According to WHO (1969),

> in many developing countries the present rate of increase in urban community water supply is not even sufficient to make up for past neglect, let alone keep pace with the population increase. The present rate of progress in improving rural water supply is so low that it will take more than 10 years to reach a satisfactory level

Apart from International Development Bank (IDB) statistics, information on the amounts and the extent of assistance provided for rural water projects has often been in a form which could not be evaluated.

This is either because water supply has been mixed with other activities or because records have not been

returned or never collected from the field. Only rarely have evaluations been undertaken.

One would think that water is so essential to living that the goals served by its development would be straightforward and simple. If water was needed to drink, it should be captured and delivered. Besides serving our basic needs, water development is important in achieving social aspirations. The linked phenomena of burgeoning development and pollution, the moderating methods of preservation and aesthetics and the intuitive belief that there is some unique social mobilizing essence in the water development have led to public investment in water whose objectives and consequences are complex and little understood (Technical Report 1971)

Over the past two or three decades, systematic guidelines for evaluating water projects have been developed. These are largely related to predicting effects on economic growth and national income. While explicitly recognized as objectives, no measures for assessing well-being of people or preservation have been explicitly proposed.Belief in the importance of water resource development coupled with the

frustrations of assessing their social consequences led the Directors of Water Resources Research Centres of the 13 Western states in September 1969 to propose a research. This research was concerned with the types of character of water resource development which would or would not either enhance environmental quality or inhibit greater economic development. It was tentatively concluded that the way a consistent relationship could be established between water resources action and national goals was to precisely identify all(or at least most) of the principal characteristics and phrases which gave meaning to national goals.Water Resources Research Centre(1970)

Development and availability of water

Conventional wisdom holds that improved water supplies will abolish disease and increase agricultural production. The UN conference in Mar del Plate in 1977 set the goal of a safe rural water supply to be universally reached in 1990.U.N Report(1978)

If this goal is accepted and if they are not only to become wishes, it is quite clear that technical assistance and transfer of knowledge from

industrialised countries to developing countries will continue to play a central role.

The importance of the role of water in social development is not very well known. Evidently, water constitutes only one input among numerous others that are equally necessary for the process of development. On the other hand, water plays a key role in health development. According to the experience in industrialised countries, it also constitutes an important lubricant of modern society.

Present knowledge does not allow us to make any definite statement about the relationship between development defined in some precise manner and water availability in quantity and quality.

It may be possible to find out graphically how increasing availability of water may affect development. Such a graph can be expected to have the shape of a logistic like curve which means that a saturation value will be reached indicating that additional water cannot be used for this meaningful development. Widstrand(1980) Unfortunately we do not know enough about the details of this relationship. Burton and Lee(1974) tried to find a relationship

between GNP and water availability but were unable to find any unique relationship. Development is probably not uniquely identified thorough GNP.On the other hand, Vlachos and Hendriks(1977) point out that availability of water is a necessary factor for economic development but not a sufficient one. Only in some special cases will water be a decisive factor as for instance the development of an irrigation project, where, however, the presence of other factors are needed to reach an optimal result.

A country will experience an increase in overall economic activity as a result of a water supply programme where funds are obtained from sources outside the country, first, if these funds would not have flowed into the country except through the rural water supply programme.And second, if the country is not already fully employing all of its resources.At a minimum the increase in a country's economic activity or output will be equal to that proportion of the increase in direct programme expenditure financed by outside sources, plus the increase in indirect expenditure made by those newly employed in the programme and those directly or indirectly supplying

services, equipment and material to the programme.A good water supply system is both a consumption and an investment good.It is a consumption good in that people begin using it immediately upon its completion.It is an investment good in that it is part of the local infrastructure and direct general additional future economic activity by attracting and assisting local commerce and village industry; and improved health of local human resources in turn can increase production.

Warner (1979) carried out a comprehensive study in Tanzania. He conducted a survey in 26 villages in 10 different districts. In 10 of the villages,an improved supply was installed during the study so that observations could be made before and after. Another study of this kind was conducted in Ismani (Iringa District) by Henon. The baseline study attempted to measure water use before and after construction of the water pipeline. Therkitsden(1988) looked at the performance of foreign sponsored projects in Tanzania. The sponsors were mainly from Denmark (DANIDA) and Sweden (SIDA). He concluded that most programmes were control- oriented, that is firstly, the focus was on

medium and long-term plans on a set of future targets. Secondly, a detailed pre-implementation specification of the means to reach the goals. Thirdly, a substantial collection and analysis of information prior to implementation on the basis of which plans are specified. Fourthly,implicit and explicit specifications in the plans of the role of the intended beneficiaries either as passive receivers of intended services or as participants in pre-determined activities. And lastly, by-passing a recipient organisation at national, regional and district levels by the technical assistance teams especially during preparation of medium and long-term -plans but also to a certain degree during implementation.

White, et al (1983) carried out an impact study on water supply in Pare, Morogoro, and Iringa Districts of Tanzania. There was an initial survey then the main project after 5 years during which the water project had been completed. The result indicate that a water supply programme can have considerable impact on an area. WHO statistics indicated that it may have been possible to provide safe water for everyone during the 1980-90 period designated the International Drinking

Water Decade.

The WHO survey obtained information on the water supply situation in 91 developing countries at the end of 1970. The population of the countries surveyed was 1,700 million, of whom over 70% lived in rural areas. The WHO survey presented estimates of the investments needed to meet the United Nations Development Decade Goals by combining estimates of the number of additional people to be served (Table 1.0) and of per capita costs (Table 1.1.). The results are summarized in (Table 1.2), which shows that a total of $ 14,000 million may be required, $11,000 for urban areas $ 3,000 million for rural water programmes.

Table 1.0: Target population to be served by 1980

	Total Population to be served			Increase Over 1970			1980 population served as population of 1970		
Region	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Tot
Africa	54	47	99	32	63	95	2.6	3.0	5.6
Latin America & Carrib.	213	60	273	96	31	127	1.8	2.1	3.9
Eastern Mediterranean	102	54	56	37	37	86	1.9	3.2	2.2
Europe	42	12	54	3	3	27	2.3	1.3	3.6
South East Asia	240	218	458	163	163	326	2.9	4.0	6.9
Western Pacific	61	22	83	35	5	40	2.1	1.6	1.9
Total	710	413	1123	90	273	663	2.2	3.0	2.9

Source: World Bank Paper 1976 pg. 78

Table 1.1 Per capita cost of New supplies

Region	House Connection	Public Hydrant	Rural
Africa	$53	28	$20
Latin America & Carribbean	40	-	24
Eastern Mediterranean	30	11	13
Europe	120	25	20
Southeast Asia	16	9	8
Western Pacific	22	20	6
Weighted Average	35	$14	$12

Table 1.2 Estimated Investment; Water Supply Needed to Meet Development Decade Goals

Region	house connections	Public hydrants	Total	Rural	Total
Africa	$1,200	$300	$1,600	$600	$2, 00
Latin America & Caribbean	3,900	-	3,900	700	4,600
Eastern Mediterra-nean	700	300	1,000	500	1,500
Europe	1,500	300	1,800	10	1,900
South east Asia	1,400	600	2,000	1,20	3,200
Western Pacific	300	40	700	-	700
Total $	9,000	$,900	109 00	3,100	$14,000

Source: World Bank Paper, 1976, Pg 79

The WHO survey is a more extensive version of an earlier survey in 1962, when urban supplies in 77 countries were covered. This permits a comparison of past achievements in urban water with the UNDD targets. It was seen that, whereas the rate of growth of urban population served in 1962-70 was comparable with that needed to meet the UNDD goals, the

number of new urban consumers to be served in 1971-80 are about three times those served in 1962-70 (390 million compared with 134 million) Unfortunately, no comparable detailed study was made of the achievements in rural water supply. One informed estimate is that rural water supply coverage increased only from 10% of the rural population to 12% between 1961-71 WHO,(1972)

Only in Latin America do the average increase dramatically from 7% to 24% the same decade Pan America Health Organization((1972).

Commitment at all levels will help to ensure continual success of rural water efforts. Burton (1980) observes that in the past decade there has been a change in the prevailing ideas about rural water supply). The conventional view saw provision of improved supply to rural population in developing countries as low priority item in the plans of national government for development and in the array of international and bilateral programmes credited to be of assistance to national government. The rationale for this position rested largely on the grounds that investment in water supply for domestic purposes is not directly productive and does not therefore contribute

effectively in the development process. When the change came, it stemmed not from the technical and economic arguments about benefits and productivity but from a more basic rethinking about the purposes of development that had more to do with morals and politics than with economics. In the light of this new feeling, rural water supply rose to the status of high visibility.

1.60 SCOPE AND LIMITATION OF THE STUDY

Impact studies on water supply to examine the effect of new and improved domestic supplies in the rural areas are few. Ideally, therefore, they should be conducted over a number of years. A baseline study ought to establish the relevant facts before the construction of the improved supply, while further investigations after the consumption, should measure the impact. Preferably these changes should be traced over at least several years. In order to overcome this limitation imposed by time and financial constraints,secondary data is relied on describe the situation before the onset of the water programme. Questionnaires also help to shed light on the past

situation. The shortcomings of questionnaires as a means of obtaining data i.e. unreliability and inaccuracy have to be contended with.

The other problem in studying impacts of improved water supply is that they are so manifold and often present great problem to the researcher. Impacts need not necessarily be positive. Thus in this case, the researcher set out with a number of presumed effects and these were then tested.

The researcher will examine the most important effects, related to the social and economic benefits of improved rural supplies. The benefits considered are those which are most important in terms of national goals and aspirations and also those accruing to the community at large.

1.7 RESEARCH METHODOLOGY

1.7.1 Study area

This research was carried out in Western Province.The programme being studied covers a very extensive area.A detailed survey was carried out in the entire area. Questionnaires were administered in one sub-location,Ekero,South Wanga Location of Mumias Division.

1.7.2 Data collection

Information for this research was collected from a variety of sources.Generally two types of data was used;

(A) Primary data:

This were collected using questionnaires,interviews and observations.The interviews were personal interviews with key informants.

(a) District Development officer who provided information on the development of the area before the KFWWSP was started and the trend now.

(b)District Education Officer provided information on present enrolment in schools, teacher-student ratios and dropout rates.

(c) District Water Engineer gave information on ground water resources of the area and the water demand.

(d) District Works Officer provided information on infrastructural facilities.

(e) Public Health Officer who provided information on the health situation in the area and the existing facilities and common ailments .

(f)District Social Development Officer who provided a social profile.

g) KFWWSP staff who provided information on the water resources in the area, the programmes objectives and means of achieving the stated goals.

h) The water office and Population office provided vital statistics in the related areas.

Questionnaires were also administered in one sub-location Ekero of Central Wanga location of Mumias division. A sub-location was chosen to enable a indepth survey. A large area would not have been adequately covered due to time and financial constraints. The sub-location has an estimated population of 5,400 people i.e. about 900 households assuming on average household population of six.

60 questionnaires were administered in the sub-location. The method of sampling was systematic. Every 15 th household was interviewed.

The questionnaire provided information on the following benefits associated with improved water supply.

- Productivity benefits
- Economic benefits
- Self-reliance benefits
- Improved health benefits

-Negative impacts

This information was used to test the hypotheses which the researcher had set out with. These are presumed effects of the water projects.Simple observation was also used in the initial survey.

B. Secondary Data

This forms the theoretical framework of the study. Library research was the main source of information. This proved to be a very rich source yielding information on the global and national situation.

1.7.3 Data Analysis

The method used for analysis was mainly descriptive. In order to test the following hypotheses, the chi-square test and one way analysis of variance was used:

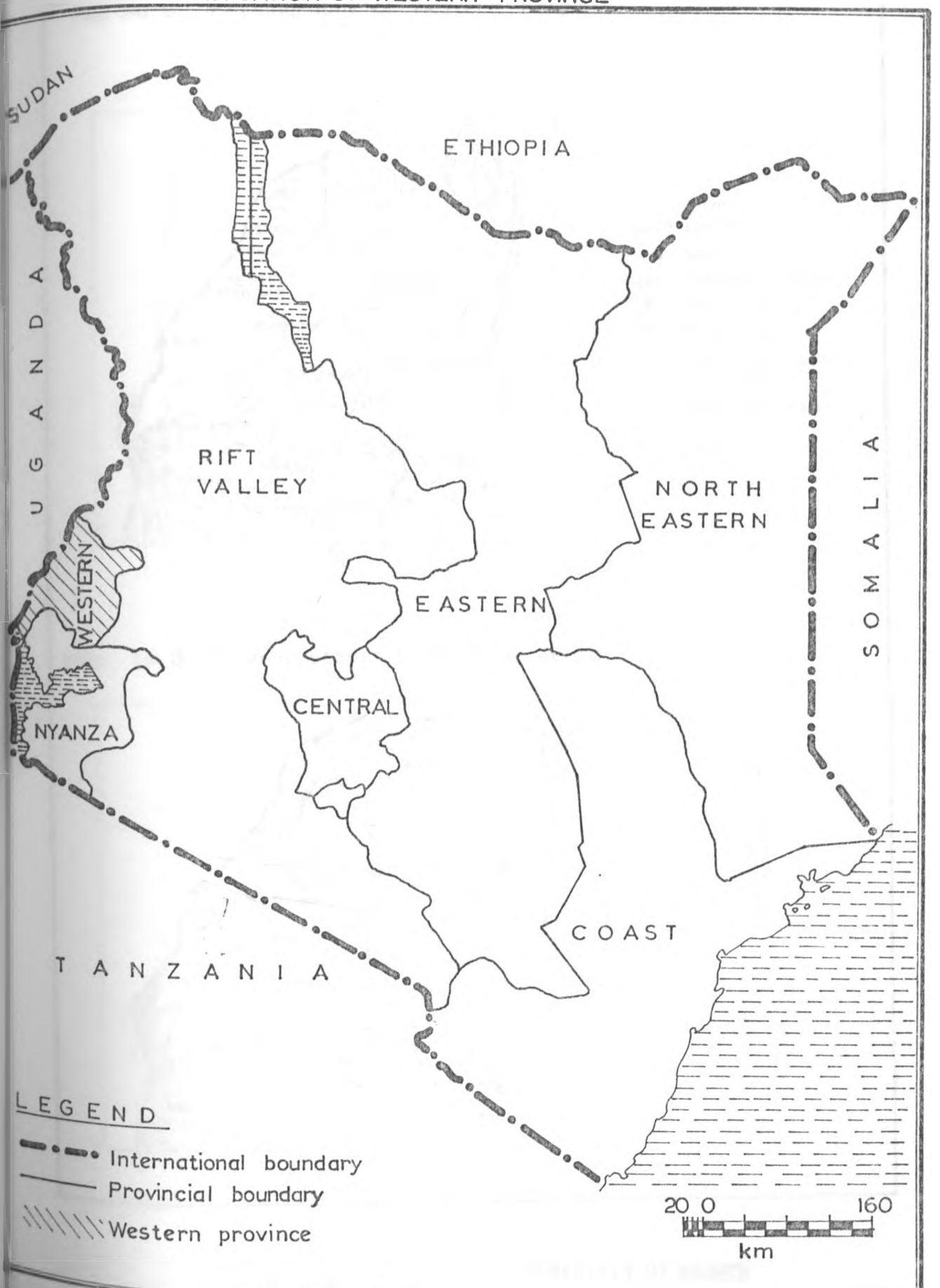
1.H_o:distance travelled to obtain has not decreased significantly.

Here,the distances travelled by consumers using water from KFWWSP projects was taken to be sample A and distances travelled by those using traditional sources were taken to be sample B.One way analysis of variance was used to find out whether variations in sample variances was significant or not.

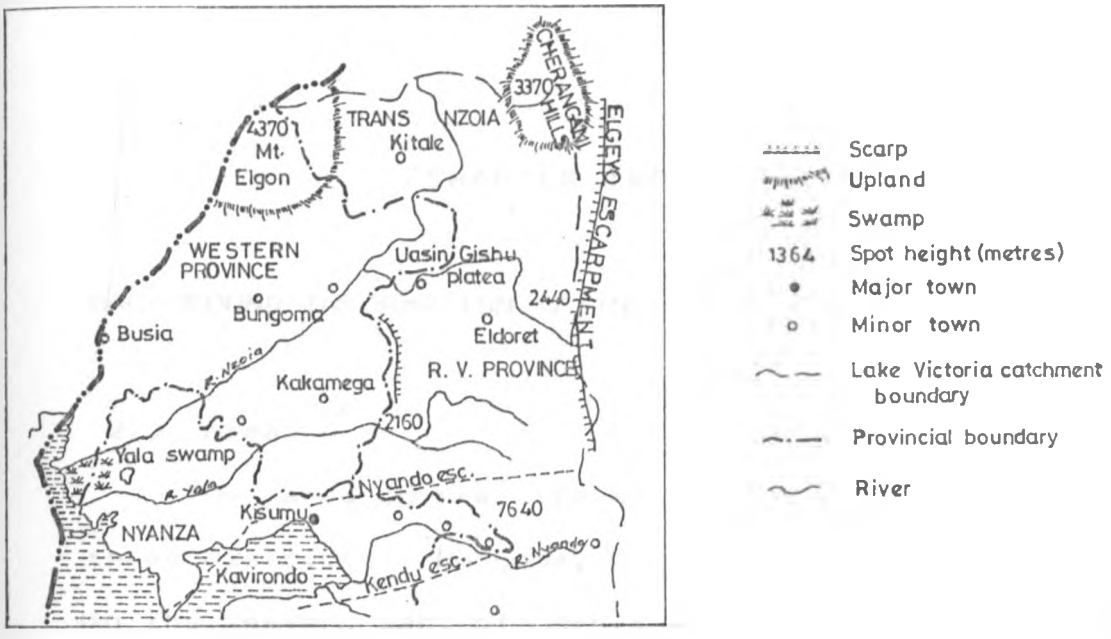
2.H_o:Quantity of water used has not increased significantly . Quantities consumed by people using KFWWSP projects and traditional sources formed two samples ,ANOVA was used.Regression analysis and Pearsons Co-relation was also carried out to find how much the amount of water consumed is influenced by distance travelled to collect it.

3.H_o:there is no significant reduction in occurrence of water related diseases. Chi-square test was used to test the "observed " percentage of water -related diseases in 1992 and the "expected " percentage cases before programme in 1981.

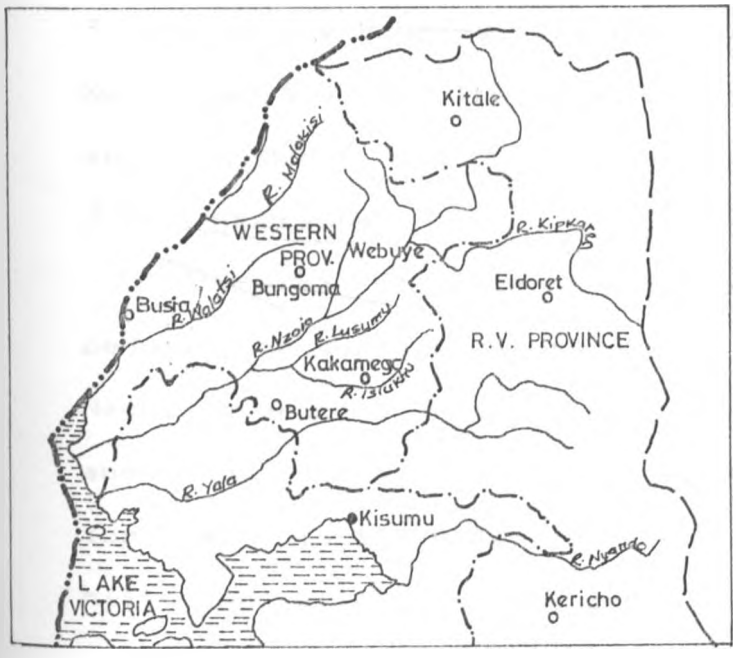
REPUBLIC OF KENYA
LOCATION OF WESTERN PROVINCE



Map No. 2 Physiography of Western Kenya



Map No. 3 River system of Western Kenya



CHAPTER TWO

BACKGROUND INFORMATION OF THE STUDY AREA

2.0 Area

The area covers the Western Province comprising three districts: Bungoma, Busia and Kakamega situated in the Western part of Kenya and extending in latitude from its southern border on the equator 0 upto 1 10' N (About 125 Km) and in longitude 33 55' - 35 10' (about 140 km) The total area of Western Province is 8410 Km^2 shared by Bungoma 3074 Km^2 , Busia 1774 Km^2 and Kakamega 3560 Km^2.The location of Western Province is shown in Map 1.

2.1 Topography

The area of Western Province is a gently sloping peneplained surface, south of Mt. Elgon and west of the Nandi Escarpment with a general elevation between 1200 and 1700 metres. The characteristic feature of the topography is the small scale undulating landscape with hills and valleys, rivers and rivulets.

The Nandi Escarpment forms a prominent physical feature at the eastern border of the area. The main escarpment rises from the general elevation of 1,700m up to 2,000 m within one kilometre. The highest points rise up to 2,100 m. In the north eastern corner of the area, where the River Nzoia cuts the escarpment, the elevation is 1,960m.

In the north-west the area rises to over 2,500m on the southern slopes of Mt. Elgon,which is a dominating feature controlling the drainage of the area. The slopes of Mt. Elgon rises abruptly from the plains as steep cliffs cut by deep river gorged with frequent waterfalls.

In the northern part of the area between Nambale and the Ugandan border the elevation is about 1,200m but the Amukura Hills rise above 1,3500m. The Amukura Hills (Akure Hills) are granitic masses forming residual hills standing out of the peneplain. Other high areas are the remnants representing the summit of some older peneplain such as Choboli Hills, Mwale Hills, Kwaviyai Hills, Bitonge Hills and Kakunga Hills.

In the south-west corner of the area lies L. Victoria on the elevation of 1130 m above sea level.

The characteristic of small scale featured topography is a challenge in siting different types of water supply.

The physiography of Western Kenya is shown in Map 2.

2.2 Drainage

The major river in the area is Nzoia River. The main tributaries of the Nzoia are the Kuywa, Chwele, Khalaba, Lusumu and Viratsi. Other important rivers are Isiukhu, Malaba, Malakisi, Yala and Sio rivers. The Isukhu River is a tributary of the Lusumu. Apart from L. Victoria there are no lakes in the area.The drainage

pattern is shown in Map 3.

2.3 Geology

The main rock of the area is granite which is intrusive to Kavirondian and Nyanzian system rocks. Other main geological structures consists of Nyanzian volcanics, Kavirondian sediments, tertiary volcanics, the basement system and Pleistocene and recent deposits.

2.4 Climate

The main climate of area is tropical. The annual

mean daily minimum temperature is 14-16° C. maximum not rising higher than 20-30°C. The rainfall characteristics are relatively favourable. The mean annual rainfall varies from about 1100 mm near L. Victoria to about 2000 mm around Kakamega. In the central parts of the area the mean annual rainfall is between 1600 and 2180mm

2.5 Population

The population living predominantly in rural areas was estimated in 1989 as shown below.

Table: 2.0 1989 Population of Western Province

	Occupied area Km	Population 1989	Density pers/Km
Bungoma	2,353	760,000	323
Busia	1,683	440,000	261
Kakamega	3,365	1,500,000	445
Western Province	7,401	2,700,000	365

Source:KFWWSP Water Supply Development Plan.

With an expected annual growth rate of 3.0-3.5% during 1989-1998 and 2.5% for year 1999-2005. The population will rise upto 3.4 million by 1998 and to

4.2 million by 2005. Whereas the average density is about 365 per/km there are some rural locations already with densities over 1000, such as Vihiga District.

The major ethnic groups within western Province are the Luhya, Teso, Kalenjin and Luo. The dominant group is the Luhya, which dominated 95% of Kakamega district. 70% of Busia District and 75% of Bungoma District.

2.6 Health situation

Due to the reasonably extensive network of hospitals, health centres and dispensaries, the health situation in western province is relatively good and does not differ much from the other parts of the country. The estimated infant mortality rate is 87 deaths for every 1,000 live births in Kenya, while in Western Province it is an average of 150 deaths for every 1,000 live births. The life expectancy is between 54 and 60 years (1979 census)

2.7 Administration

Administratively Western Province is divided into 5 districts, these further to divisions, locations and sub-locations. The emphasis in the administration is

now on the district (District Focus Policy)

2.8 Infrastructure and Services

In Western Province the infrastructure is relatively developed and fairly evenly distributed. In addition the trunk road to Uganda which passes through the area via Webuye, Bungoma and Busia, there are other important tarmac roads in the area, namely Kisumu-Busia, Kisumu-Webuye and Kakamega-Mumias. In total there are 4,000 km of classified roads in the province. The railway line which passes through Butere in Kakamega district and Malaba in Busia District provides supplementary service to the road network.

In addition to public bus services, smaller public service vehicles play a major role in the public transportation system. Most roads are well served by public transport, except those in Mount Elgon area.

Telephone service is relatively well distributed in most urban centres, divisional headquarters and locational chief's centres. The rest of the rural areas are inadequately covered compared to urban centres.

Electricity is available in most urban areas and rural electrification,especially for rural centres is

developing rapidly.

2.9 Economy

The economy of Western Province is still largely rural and more than 90% of the population earns its living from agriculture and livestock. The farms are privately owned and usually quite small, mostly 1-3 hectares. The main food crops are maize, millet, bananas and cassava and the cash crops consist of sugar cane,
cotton, tea, coffee, tobacco and rice. Animal husbandry is practised and dairy farming is increasing particularly in Bungoma District.

The biggest industries are the paper mill at Webuye and the sugar factories at Mumias and Nzoia. In addition there are numerous minor sugar factories, coffee roastaries and cotton ginneries. Smaller enterprises and commercial activities are concentrated in towns and trading centres.

2.10 WATER RESOURCES

2.10.1 General hydrology

2.10.1.1 Rainfall

The rainfall in Western Province is relatively high.

The mean annual rainfall varies from 1000mm/year in the south-western corner to about 2000mm/year in the Eastern part. The driest months are December (50-80mm) January(40-60mm), and February(40-60 mm) and May. Otherwise, the rains fall rather evenly all over the year in most parts of the area offering favourable conditions for different kinds of water supplies.

2.10.1.2 Evaporation

The evaporation information is based on observation at seven stations within the project area done by Hydrology Division of the Ministry of Water Development and by Meteorological Department of the Ministry of Transport and Communications. The mean annual pan evaporation within the western province is 1600-2100 mm. Variations between months and different parts of the area are small. Assuming the widely used ratio 0.7 between the actual evaporation from dammed storage and the pan evaporation from free water surface is about 1100-1500mm.(KFWWSP Project document)

2.10.2 Surface Water Resources

2.10.2.1 River system

The whole area of Western Province belongs to Lake Victoria Basin. The most prominent river in the area

is the Nzoia River. It originates from Cherangani Hills which form the northern part of the watershed dividing the Kerio valley from the Lake Basin. The main upper course tributary is the Moyben River. Many other rivers feed the Nzoia before the boundary of western province. The most notable are the Kwoittobus, the little Nzoia the Ewaso Rongaim, the Kibesi and the Kipkarren. Within the programme area the Nzoia River flows roughly in the south westerly direction. Here the main tributaries into the Nzoia are the Kuywa the Chwele and the Khalaba discharging into Nzoia from the North, and the Lusumu and Viratsi flowing into the Nzoia from the southern part of the Nzoia catchment. One of the main rivers in the area the Isiukhu river is a tributary of the Lusumu River. The Nzoia River empties into the L. Victoria in the south-western corner of the western Province.

Other important rivers in the area are the Malaba River, the Malakisi River, Yala River and the Sio River. The Malaba River originates from slopes of Mt. Elgon. The river forms a part of the border between Kenya and Uganda. About 15 kms to the north of the town of Busia the river turns to the west to the

Ugandan side of the border. The Malakisi River a tributary of the Malaba River, originates from Mt. Elgon and discharges itself into the Malaba River south of the Eldoret-Tororo Road.

2.10.2.2 Surface water Quality

As already mentioned, the general characteristics of surface water are high colour and turbidity almost throughout the year. Low dissolved mineral content and pH usually above 7.0 rising up to 8.0 in Lake Victoria.

The water quality and pollution control division of the Ministry of Water Development has observed seasonal variations in pH, Chemical Oxygen Demand(COD) and Biological Oxygen Demand(BOD) downstream of industrial affluent discharge points along the rivers. The main sources of pollution are:

a) use of fungicide, herbicides, phosphates and nitrogenous fertilizers in coffee, Sugar and wheat farming (Upper Nzoia)

b) Coffee factories: The affected rivers are the main tributaries of the river Nzoia e.g. Sosia,. Kuywe, Malakisi, Chwele and Khalaba.

(c) Sugar factories: The major factories are Mumias and Nzoia which discharge their effluent into Kuywa and

Nzoia rivers respectively.

(d) paper factory at Webuye discharges all its waste water into the Nzoia river. The pulp's daily water consumption is as high as 10,000m^3 and most of this end up as waste water in river Nzoia.

The pollution effect of the rivers draining into Lake Victoria has been reflected in lake water quality which has been manifested by proliferation of blue-green algae, raised pH, COD and organic load.Generally, water from most rivers in western province requires full conventional treatment before it can be considered acceptable for human consumption.

2.10.3 Spring potential

In Western Province the springs form an important source of water. Throughout the area with exception of south western Busia (Samia, Bunyala), perennial springs are common and springs yielding upto 500 m^3 per day are found.

Evaluation of spring potential is based on the discharge measurements made during the investigation phases of the KFWWP in 1981-83 and during the dry seasons of 1984-1986, The basic data includes more

than 500 spring discharge rates measured by a V - notch weir.

Kakamega District has by far the highest number of perennial springs . However, most of the springs are low yielding (5-20m^3/d) during the dry season, even though during April-May their yields could be several hundreds of cubic metres per day. Areas with relatively high yielding springs include North and West Wanga, parts of South Wanga, parts of North Butsotso and West Kabras Divisions, Shikalame, Central Marachi, East Marachi West Wanga and parts of North Butsotso and West Kabras Divisions have the highest minimum yields varying from between 20 and 35 m^3 per day (measured between January and March) . Throughout the rest of the District the spring potential is moderate(with the exception of the north-eastern part of the District) Individual high yielding springs can be found anywhere in District.Busia District has quite good spring potential in its central parts, mainly central Bukhayo Location.The potential is moderate in Marachi area and moderate to low in West Teso, South Teso and West Bukhayo. The northern parts of Busia District have low spring potential. The southern part

of the District Samia and Bukhayo has practically no potential springs.

Bungoma District is characterised by small, low yielding springs, which in most cases dry up during January-March. Moderate possibilities to utilize springs can be found in the southern parts of North Bukusu, South Bukusu and Bumala locations. The number of springs per square kilometer is also much smaller in Bungoma district than in Kakamega District or in Central Busia,. In north Nalondo the springs have high average minimum yield (from 28 to 35 m^3/day). On the slopes of Mt. Elgon there are numerous high yielding springs which are potential sources for gravity water supply schemes.

2.10.3.1 Spring water Quality

Because of its origin the quality of the spring water is basically the same as groundwater. Bacteriological contamination is common in unprotected springs caused by surface water entering the spring or by unhygienic water abstraction practices. In samples taken from protected springs during one year 65% showed no bacteriological growth, 25% showed between 1 and 10 faecal coliforms per 100 ml and 10% above 10

faecal coliform per 100 ml.The table below shows spring water quality.

Table 2.1:Spring water quality

Parametersin mg/litre	No ofwater points considered	average values
Manganese	549	0.7
Iron	582	2.2
Total hardness	365	100
pH	527	6.4
Conductivity	514	280
Sulphate	351	13
Chloride	357	11
Nitrate	477	3.3
Fluoride	266	0.3

Source:KFWWSP

Ground Water

2.10.4 Shallow Ground water

2.10.4.1 Shallow Ground water Potential

In this context, shallow ground water is water which lies near the surface (0-10m), that it can be reached by hand dug wells. Most often, shallow ground-water aquifers are in the over-burden or in highly weathered bedrock and sometimes it is perched water with no connection to deep ground water.

In most parts of the Western Province, shallow

groundwater level lies between 2.6 and 6.0m from the surface. In the northern part of Bungoma District and most parts of West Kabras, Central Kabras, East Isukha, Chevaywa and Bunyala locations shallow ground water levels are deeper. In these locations average digging depth usually exceeds eight meters. In Samia area the groundwater level usually lies so deep that hand dug wells are not possible to construct. On the other hand, ground water is found very near the ground surface especially in South and East Bunyala locations, where rivers sands and gravels are the main aquifer especially near the Nzoia River and in the swampy areas.

The seasonal fluctuations of ground water are considerable, often 2.3 metres, resulting in frequent need to deepen some of the already constructed wells.

2.10.4.2 Shallow Groundwater Quality.

Based on the water quality tests of about 900 shallow wells constructed by the KFWWS Programme the shallow groundwater has usually a very low concentration of dissolved solids with average conductivity of 110 μ s/cm, is very soft (average hardness value of 55 ppm) and has unique concentration

of dissolved carbon dioxide. The mean pH value is 6.1. The physical quality of the water in shallow wells fluctuates from wet to dry season. The turbidity and colour increase in the rainy season mainly due to the intrusion of surface runoff through the cracked slabs and unsealed joints between the concrete rings. In some areas the soil formation is so permeable that the surface runoff infiltrates into the well without enough retention affecting the turbidity and colour of the water. This is irrespective of the quality of the construction work and the protection from surface runoff. There is however, little evidence that the quality of the groundwater itself fluctuates considerably during the different seasons. In shallow wells, the quality is often poor due to the infiltration of surface water into the well. Of all samples taken from shallow wells during one year; 48% were free from bacterial contamination, 18% had faecal coliform count of less that 10 per 100 ml and 3 % above 10 per 100 ml.

Table 2.2 Shallow ground-water quality

Parameters in mg\litre	No. of water points considered	Average values
Manganese	173	0.1
Iron	174	0.3
Total hardness	174	55
pH	219	6.1
Conductivity	177	110
Sulphate	167	0.6
Chlorine	173	4.2
Nitrate	172	4.1
Fluoride	167	0.1

Source:KFWWSP records.

2.10.5 Deep Ground water.

2.10.5.1 Deep Ground water potential

In this context deep ground water means groundwater which lies so deep that it can only be utilized by boreholes. It is almost never perched water. In case of confined aquifer, the water rest level may be rather shallow after construction even if the first water struck level is deep.

The deep groundwater potential in most parts of Western Province is good or moderate. Using geophysical methods it is easy to find good sites for boreholes, the yield of which are high enough for handpumps or submersible pumps. The southern part of

Busia District and northern part of Busia and Bungoma District have low groundwater potential. Before drilling geophysical investigations are necessary in locating fractured zones in bedrock and the thickest parts of other aquifers.

2.10.5.2 Aquifer characteristics

This aspects are discussed from results availed by KFWWSP monitoring unit. First water struck level is the level at which water is first coming out during drilling. This parameter is in the range of 1m to 83 m below the ground surface. The average values for Kakamega, Bungoma and Busia districts are 245m, 34, and 35m respectively. The big difference in average values between Kakamega and other districts is mainly due to some specific areas in Bungoma and Busia Districts. In most parts of the Lwandanyi, south Samia and North Samia Locations the water struck levels are over 40m. No clear difference in struck levels in different rock types was found. The static deep groundwater level varies generally between 10m and 15m in most parts of the area. The area with the deepest struck levels i.e. south western Busia, has also the deepest static groundwater levels. In Butabona-Bulemia area, the

average groundwater level is more than 30 metres below the surface. On the other hand, large areas in Central Busia, Bukusu, Wanga and Kabras have an average groundwater level of less than 10 metres. In sediments and volcanics the static groundwater level is somewhat deeper than in granites varying from 11m to 13m.

The thickness of aquifers have been determined using samples collected during drilling. They vary between 1 m and 52 m, the average being about 8 metres. Because the drilling sites were chosen using geophysical methods, no clear areal difference in the aquifer thickness data can be found . The average thickness of weathered layers in the programme area is about 20m. In areas, where sedimentary rocks are predominant the weathered layer is remarkably thicker (about 27) .There are only small differences in the weathered layer thickness between granites and volcanics.

The yields during flushing of the boreholes indicate that parts of Bungoma District have a low groundwater potential. The average flush yield in that area is usually less than 2 m^3/h. Low potential areas are found also in South Samia and West Ugenya. Flush

yields higher than $5m^3/h$ in average have been met especially in West and South Wanga in Kakamega District as well as in Marachi-Bukhayo area in Busia District.

Specific capacity of a well is its yield per unit drawdown($1m^2$ /h) after a given time of continuous pumping has elapsed. Specific capacities are generally very low in western Province, an average about $0.5m^2/h$. In Bungoma District the average is even smaller ($0.15m^2/h$)(KFWWSP).

Transmissitivity is the rate of water flow through the vertical section of an aquifer, one meter wide and extending the full saturated height of an aquifer under a hydraulic gradient of 1. The transmissitivity indicates how much water can move through the formation. The transmissitivity values obtained for aquifers in the area are based mainly on single well pumping tests. In general the values of transmissitivity range from less than $10m^2/d$ to more than $10,000m^2/d$. If an aquifer has a T-value less than $10m^2/d$ it can only supply enough water for domestic wells. Aquifer with transmissivity over $100m^2/d$ represent adequate formations for industrial or municipal purposes.

High transmissivities are found in South Wanga, North Butsotso and South Butsotso, in Kakamega District. Low transmissitivities, less that $1m^2/d$ on the average, have been observed e.g. North Teso, Lwandanyi, Bumala and South Bukusu locations.

2.10.5.3 Deep Groundwater Quality

The assessment of the quality of deep groundwater is based on a total of 1420 samples which have been collected during test pumpings of the boreholes and during routine water quality monitoring in old boreholes since 1982 by KFWWSP monitoring unit. The samples were analyzed for the following parameters. Colour, pH, Turbidity, conductivity, Iron, Manganese, total alkalinity, total hardness, fluoride sulphate and chloride.

Generally, the deep groundwater has a low content of dissolved solids (average conductivity value of 310 μ s/cm) it is soft(average hardness value of 130 ppm), high in dissolved carbon dioxide and the average pH (6.5) lies in the acidic range. This makes the water aggressive to ferrous materials as has been indicated by severe corrosion of pump structures.

In Samia and Bunyala locations in Busia District,

there are areas of exceptionally high salinity in groundwater. Boreholes as well as shallow wells in Bunyala location have also hydrogen sulphide odour and therefore the water is not very acceptable to the consumers.

The most important parameters in aesthetic quality of the groundwater in the programme areas are colour and taste which have been associated with iron and manganese in groundwater. The maximum concentration of iron is found in Bunyala swamps where the level in the shallow wells rises to 10 ppm. Iron concentration in the rest of the project area is much lower and the maximum level encountered is slightly above 4ppm and occurs in scattered areas. The majority of the wells have iron concentration of less than 1.5 ppm and the average is 1.8 ppm. The highest manganese concentration encountered in the programme area is less than 1 ppm and the average value is 0.3 ppm.

Investigations have revealed that, though there is iron of natural origin in some borehole wells, a lot more has been contributed by corrosion of the pump structures and black steel casings in old boreholes. This has been confirmed by analyzing the correlation

values among various parameters. The other important contributing factor to high iron values in some boreholes and also shallow wells is turbidity. The iron contained in the sediments has often influenced the results as has been shown by filtering the samples. The turbidity factor is more profound in shallow wells than in borehole wells.

The distribution of manganese in boreholes and shallow wells has shown almost no correlation with iron and exceeded a concentration of 0.5 ppm therefore making natural origin quite doubtful. The source of such low concentrations of manganese could be galvanized iron rising pipes of the pumps.

The presence of nitrates and fluorides,which are substances harmful to humans do not appear in unacceptable concentrations in deep ground water in Western Province.The hygienic quality of deep ground water is normally perfect and better than in shallow wells and springs.Unlike shallow wells,the quality of water in boreholes does not show any remarkable seasonal variation in bacteriological quality.

There are some cases where shallow wells have been sited near pit latrines and contamination was noticed

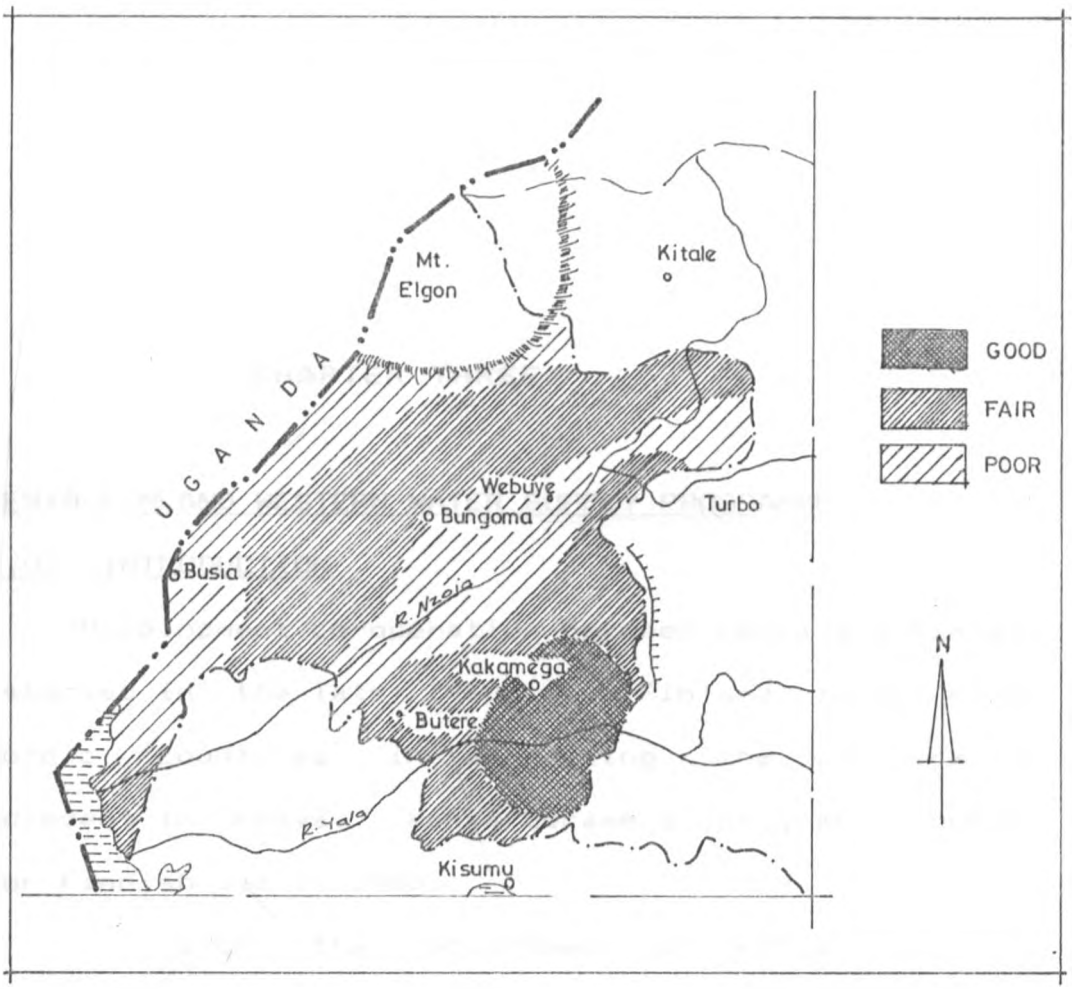
during the rainy seasons. Also cracked slabs ,poor spillwater allowing formation of pools near the wells resulted in contamination in some boreholes. On average 95% of borehole samples have not shown any contamination in one year.The remaining 5% have shown E. Coli contamination values of less than 10\100ml.

Table 2.3 Deep ground-water quality

Parameters in mg\litre	No. of water points considered	average value
Manganese	173	0.1
Iron	174	0.3
Total hardness	174	55
pH	219	6.1
Conductivity	177	110
Sulphate	167	0.6
Chlorine	173	4.2
Nitrate	172	4.1
Fluoride	167	0.1

Map.4 below shows ground water potential

Map No. 4 Groundwater potential



CHAPTER THREE

KENYA-FINLAND WESTERN WATER SUPPLY PROGRAMME

3.0 INTRODUCTION

Development co-operation between Kenya and Finland started in the late 1960s when Finland joined other Nordic countries in supporting the co-operative movement in Kenya. Kenya became a programme country for Finnish aid in 1980.

In 1980, the Government of Kenya and the Government of Finland agreed to start a rural water supply development project in Western Province of Kenya. The project was started in March 1981.

In March 1991, KEFINCO, a Finnish consulting firm was engaged to carry out a Water Supply Development Plan for selected project area with the long term objective of providing by the year 2005, the entire population of the area with a safe supply of water sufficient for domestic and livestock consumption.

3.1 National Targets

It is the aim of the Kenya Government to provide the whole population of the country with safe supply of drinking water by the year 2000. This is a major taskwhich cannotbe achieved withoutconsiderable effort.

According to the 1994-1996 Development Plan , of the total urban population, 66.5% are currently served with portable water, this figure is expected to rise to 74% by 1996. In rural areas, 44.5% of the total population are currently served. This is expected to increase to 50.0% in 1996. Overall, population served will increase from the current 55.5% to 62% by 1996. Therefore, in order the meet the target, population served is expected the increase by 38% in four years (assuming the 1996 target is met). In rural areas the increase is 50% in 4 years.

3.2 Project Objectives

The project aims at reaching the national target within the project area by the development of ground water resources which are abundantly available. These resources are being exploited to provide mainly point source supplies with dug wells , drilled wells and protected springs. It is also the policy of the project that the local population must be fully involved in the planning, construction and ultimately the operation and maintenance of these water supplies. In this way the project will be sustainable at a local level.

The prime underlying objective of the rural water supply programme and its sister programme (Kenya Finland Primary Health Care Programme) is to improve the health of the population. The health project includes health care education and assistance in the provision of sanitation facilities. The two projects are therefore inextricably linked to enable this objective to be met.

3.3 Institutional framework of the project

Project work started in 1981 and operated within a certain framework which was considered efficient at the time. This framework was based on a centrally organised project team with the headquarters at the provincial headquarters. As project activities increased,co-ordination of financial and management aspect has been difficult. The Government of Kenya also adopted a policy which seeks to shift most planning and management decisions from Ministry headquarters to the grassroot levels. This policy, the District Focus for Rural Development which became officially operational in 1983, has necessitated some structural adjustments in the implementation plan of

the project.

3.3.1 Project Steering Committee

The committee holds quarterly meetings at the project headquarters in Kakamega. The purpose of the committee is to "oversee guide and supervise the progress of the project to ensure the planned and successful completion". Different sectoral ministries at central provincial and district levels are participating in the quarterly meetings. Cooperation and co-ordination with the second FINNIDA-sponsored project in Western Province, the primary health care programme, is established through the steering committee.

3.3.2 Provincial Monitoring Unit

Within the framework of the District Focus Policy, the ministerial provincial outfits are charged with the responsibility of coordinating development activities in the districts. The Ministry of Water Development represented in this unit by its provincial water officer.

3.3.3 District Development Committee

The DDC is the foundation of the new decentralised

rural development strategy - the District Focus for Rural Development. The objective of this strategy is to shift most decisions on planning, manpower and implementation of rural development responsibilities from the headquarters of the different ministries to the district level. Coordination and planning of rural development projects sponsored by the Government's harambee efforts, local authorities and foreign donors fall within the district's responsibility.

The policy is based on the principle of a complimentary relationship between the ministries and districts where various sectors are represented in common support of rural development activities. The role of the DDC is to establish local development profiles, monitor the technical work of its executive committee and other sub-committees, and monitor the progress of all rural development activities including projects of foreign donors and local authorities.

3.3.4 Village Level Organisation

Below the division level, several locations form a division. Lower still several sub-locations form a location and the sub-locations are formed by several villages. At sub-location level, an assistant chief is

the administrator. Project proposals are normally channelled through him to the location and divisional level. The co-operation of this administrator is vital for the success of any project as it is his office that is responsible for the mobilization of any local resources.

There are 2 basic village level organisations that have been established. These are village health committees and women's organisations. The health committees have been formed as a nucleus of community health activities in line with the present government objectives of bringing primary health care to the people at grassroot level. Women s organisations have always existed in the project areas but more or less in unofficial capacity. Their role has been mainly to assist its members in times of distress. However, during the women s decade, this has changed and the groups are officially registered entities with clearly defined objectives. These groups are involved in various development projects from poultry keeping, to commerce. The provision of water apart from affording them more time to engage in development activities will enhance these very activities.

3.4 Manpower Development and Training

The Ministry of Water Development estimated its manpower requirements for 1990 according to the development targets of the water decade. The table below shows the development of the MoWD staff in different categories and numbers.

Table 3.0 MoWD staff.

Category	Existing 1981	Existing 1985	1990
Professional	150	165	1,020
Sub-professional	480	575	16,050
Skilled,semi-skilled, subordinate	11,500	12,000	30,000
Total	12,130	12,740	47,070

Source:MoWD Annual report.

The main manpower development institutions of the sector today are Summarised in the following table

Table 3.1 Man power development institutions

Institution	Category	Number p.a
1. MoWP Staff Training	Sub-professionals	185
2. University of Nairobi	Professionals	-
3. Higher National Diploma Course by Kenya Polytechnic	Sub-proffessional	20
4. MoWP Training Courses for operating	Operators	40-50
5. Institutes of Technology at Muranga Nakuru and Kakamega	Operators	400
6. Industrial Development Centre Nairobi (MoWD)	Craftsmen	40

With these facilities the number of the trained personnel increased by 3,500 only. The gap between need and availability would be more than 30,000. Self-help type low cost rural water supply solutions with strong community participation are able to succeed in the long run.

3.5 Coordination and Cooperation with Primary Health Care Programme in Western Province

The project provides logistical support for the

primary health care programme in Western Province also sponsored by FINNIDA. This support includes maintenance of vehicles and procurement services. The health care programme provides material and personnel assistance in the field of health education and sanitation to the water project.

3.6 Economic Aspects

The primary objective of the project is to provide the area with safe water for domestic and livestock consumption. The realisation of this objective is expected to release energies consumed in water collection for other socio-economic activities and improve the health of the population. Some of the 'other' economic activities have environmental implications. These activities and their implications are considered.

3.6.1 Livestock Water and Development

In the project, very little provision has been made for cattle watering troughs. It is assumed that water will be collected in containers and given to the cattle at a safe distance from the wells. In practice, at some of the wells, cattle are fed from a hole at the

end of the well apron drain. This situation can cause nitrate pollution problems at the wells and needs to be avoided. A cattle watering trough should be made an integral component of the wells.

The project area has a high potential for improved animal husbandry. This has been hampered in the past by the lack of clean water at reasonable distances all year round. Apart from water, tick borne diseases have also slowed down the rate of livestock development. The few cattle dips in the area collect water from long distances. With this programme, development of cattle dips in close proximity to the well is likely to occur. It should be ensured that such dips are constructed at distances that will not compromise the quality of well water.

3.7 Rural Sanitation

The area around Lake Victoria has a ground water table averaging about 1 m and as high as 0.2 m in the varying seasons (KEFWWSP report). The intensive use of both shallow wells and pit latrines could cause an enormous health hazard. The project in collaboration

with PHCP and MOH, should define a strategy for ensuring that this does not result.

3.7.1 Social environment of the well.

Washing of clothes at wells, although not encouraged in the training for water use, is a an activity whose ban is not enforceable within the project. It is part of the traditional social life around water source and its safe continuation should be ensured by the provision of properly drained water basins.

3.8 Sociological Aspects

3.8.1 Health Education

The project area is not water deficient. Indeed some parts of it form an object of serious flood protection and drainage measures undertaken by different government agencies. The need for a water project in this area is only justifiable in as far as it can improve the health and living standards of the users through the provision of safe water. So health education is considered an important component of this project.

The primary Health Care Programme operating in this area was set up mainly to fulfil this need.

- Health education material is required and health training directly related to water and its use is required.

3.8.2 Role of Women

Women have played a very important role in the development of rural programmes . Besides being home-makers, Kenyan women are often the sole providers of water to their families.

The rural women account between 75%-80% of all total women found in Kenya and it is their responsibility to fetch water, collect firewood, provide food for the families and participate in all kinds of rural development activities. It is important to note that many rural development programmes which have used women as strategies for setting up their programmes have drawn a useful conclusion. There are 2,000 women groups in the area.

From the sample collected it was evident that women were playing an important role in the committees.

Table 3.2 Water committees

District	Total Committees	Total Comm .	Women
Busia	25	349	163
Bungoma	52	722	313
Kakamega	10	133	57
Total	87	1204	533

Source:Field survey

3.9 Management and Staffing

The aim of the programme is to provide safe and clean water to the people in Western Province. The aim is also to provide the water as economically as possible.

The project management is based on a production oriented organisation but training and community involvement are also given high priority. The production activities have been divided into piped scheme (design and construction) and source production (ground water section). Project co-ordination is the responsibility of a separate project co-ordination unit established by the MoWD.

3.9 .1 Project Staff

3.9.1.1 Design and construction section

In design and implementation the following

professionals are needed:

- construction professionals
- mechanical
- electrical

The staff here consists of 2 engineers and supervisors while the rest are hired, as follws

casual labourers

ground water section

geophysicists

drilling supervision

construction

3.9.1.2 Training and Community Development Section

According to government policy the people should be the main actors in development programmes. Since several different organisations are involved with development, it is essential that every effort be made to combine and co-ordinate the activities of different organisations both governmental and non-governmental. It is evident that community involvement and co-ordination with different parties are important factors for the long-term success of the project.

There are 3 categories of Training:

- health education

- design and construction of water supplies
- maintenance and operation of water supply.

Health education is essential to maximise the benefit of water supply. Training methods can vary from public meetings to training of school teachers. Operation and maintenance training is important for piped water supplies, springs and hand pumps.

The basic training in design and construction practices for water supplies can be done effectively only through the respective education systems. However, at project level, valuable vocational training can be given through separate seminars/courses or on the job training.

3.9.2 Project Management

The implementation team of the project is a consortium of consulting firms from Finland and it has full responsibility to design and implement the project activities according to the scope of work agreed upon in the agreement between the Government of Kenya and Finland and the consultants.

On the other hand, the programme is being implemented on behalf of MoWD. The role of MoWD in the project can therefore be seen as that of a client.

3.10 Project Activities

3.10.1 Protected Springs Programme

The protection of existing springs has the advantage of traditional usage and acceptability low capital cost and low maintenance requirements. The disadvantage is their often difficult access which may result in the community perceiving no real improvement to their water. A further problem is the need for careful protection from erosion (by construction of diversion channels) and pollution (by fencing). The project area has about 2,000 perennial springs and a similar additional number of seasonal springs.

3.10.2 Dug Wells Programme

The construction of hand dug wells has become established for large-diameter wells. Hand dug wells have a major advantage. They provide an opportunity for self-help which fosters the sense of community ownership that is essential for long-term care of the water supply. But dug-wells are more difficult to protect from pollution than a drilled well and they are susceptible to drying up due to falling water levels during dry periods.

3.10.3 Drilled Wells(Boreholes) Programme

Drilled wells equipped with hand pumps are provided where water levels are deep or well digging difficult. Well drilling requires expensive imported rigs and boreholes are costly to drill and cast. However if water supplies are to be brought close to the village, a drilled well is commonly the only possible source of water. Significant advantages of drilled wells are their resistance to drought and pollution.

3.11 Methods and Materials Used in Construction

In spring protection, a spring source is excavated and a reservoir of boulders created behind a concrete dam wall with an overflow discharge pipe. The reservoir is covered with gravel, sand, plastic sheeting and clay. The boulders are provided at the site by the community. Storage tanks may be installed which provide a more reliable and convenient supply from low discharge springs. Cattle troughs and washing basin may also be provided. In some areas, hydraulic ram pumps are installed with a flow of 11 m^3/day lifted 20 m to storage tank KFWWSP Review Report,(1986).

A typical protected spring takes 1-2 weeks to

construct by a team of 1 mason and 3 casuals and uses the following materials:

Table 3.3 Construction materials for a protected spring

Boulders for backfilling	3-7m
sand	4 tons
ballast	4 tons
cement	4 25 kg
reinforcing steel	25 kg
concrete blocks	40 Nos
PVC membrance	60 m2
steel pipe diameter 80-75mm	1m

Source: KFWWSP Report, 1981 .

In the investigation phase, most large diameter wells were dug with a tractor excavator. Each of these wells required 40.5 test-pits and few exceeded 4.5m in depth. Sites were thus selected on the basis of where the excavator could locate shallow water rather than where a well was wanted and needed. In the current phase all large diameter wells have been hand-dug. Before 1985, the project employed 90-100 digging groups . Since 1985 digging the well to water level has been the community's responsibility and the project contracts well completion (deepening, using, covering and construction) to private artisans. Well completion

is approved when there is at least a 2 meter deep water column or the yield is high enough to allow 3 m to be drawn.

A typical well constructed by project employees took 6 weeks to construct to a depth of 10 m by 1 mason and 3 casual labourers and used the following materials:

Table 3.4 Construction materials for a well

concrete (m dia 0.5m high)	20 nos
concrete blocks	40 nos
cement	300 kg
sand	3 tons
ballast	3 tons
reinforcing steel	20 kg
cover slab	1 no

Source: KFWWSP Review Report

Almost all dug wells have been lined with concrete rings, fabricated at the project headquarters. In drilled wells, drilling is carried out by the down the hole hammer method-and casing the upper unconsolidated part of the hole. Most boreholes have been cased and screened.

3.12 Maintenance of Point Sources

Maintenance of protected springs has largely comprised repair of drainage aprons and less often sealing of small leaks. Maintenance of dug wells themselves has primarily involved well deepening due to the drying of wells. Maintenance of drilled wells comprises repairs to well operon and cleaning of the borehole itself.

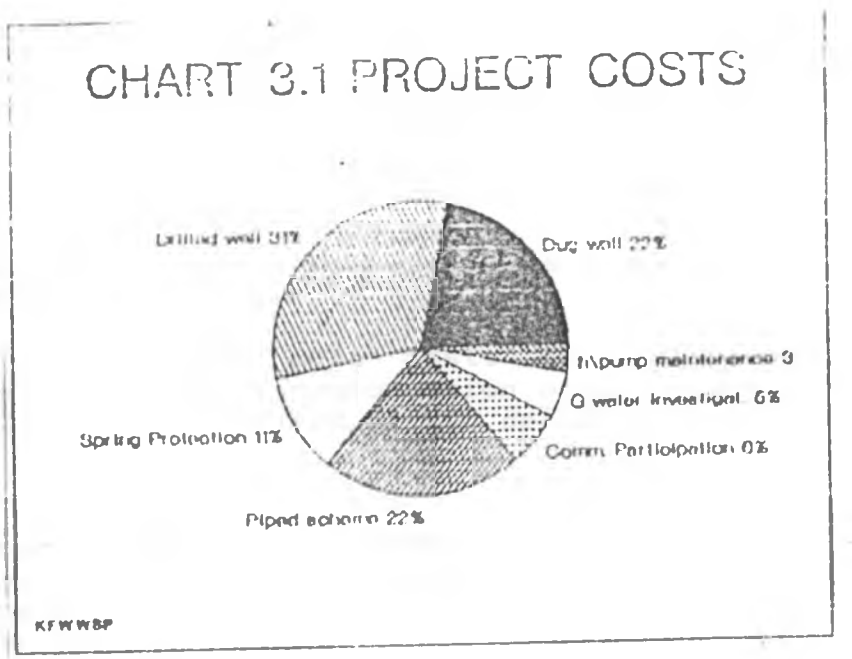
Maintenance is carried out by contractors currently. Initially the programme maintained all the wells, but this became impractical as the numbers of wells increased. Currently the community water committees handle minor maintenance work with the help of a pump attendant or repairmen. In case of major backdowns the programmes engineers can be contacted.

Handpumps are used to pump water from dug and drilled wells.

Initially NIRA pumps from Finland, Valanta (Netherlands) and Vergnet (France) were used. But the programme in collaboration with WECO and other organisations, now assembly the AFRIDEV handpumps are now used.

3.13 Cost Estimates

The breakdown of project costs as of 1985 between various production sectors was as follows:



Production costs of point source water supplies were identified as:

Table 3.5 Production costs

	direct costs	overhead	Total
dug wells	45,400	12,600	58,000
drilled wells	62,400	13,200	85,000
protected springs	24,400	17,400	41,800

Source: KFWWSP

The above unit costs give the following per capital costs for production of point source supplies using consumer basis of 200 persons per water point.

Table 3.6 Per capita costs

dug wells	290
drilled wells	430
protected springs	210

Source:KFWWSP

The above unit cases are based on a production method where the project directly use a large number of construction teams. A new production method currently adopted using small scale contractors enables 20% and 40% cost savings on dug wells and protected springs respectively. For piped schemes, Butula scheme is the most comprehensive scheme completed so far and provides a practical costing basis for future cost estimates.

The breakdown is as follows:

			%
(a)water (drilled well with		202,500	9
machines and electrical works)		69,500	
(b)transmission main 10m:108m)		406,200	18
(c)elevated reservoir (100m)		715,080	32
(d)distribution network (63 mm-110mm; 6250m including house connection of 25mm)	762,370		34
(e) operational buildings pump house, store and workshop, office and staff houses; altogether 265m).		58,250	3
	Total	2,213,900	100

The per capita cost in Butula schemes is about KES 650 (direct costs). In schemes where only part of the system has been rehabilitated, or augmented e.g Malava

and Shikusa, the per capita costs have been in the range of KShs.100 to 250.

The costs estimates	(million)
%	
(a) Handpump wells, springs)	63.7
Piped water supply schemes	16.0
Hydrogeological investigations	0.9
Community participation	13.0
	93.6
Base cost	
Engineering; studies and technical assistance	38.0
Contingencies	
(1) Physical contingencies	14.0
price contingencies	30.5
Sub total contingencies	44.5 25
Total project cases	176.1

3.14 Other activities

3.14.1 Workshop

The workshop is manned by a foreman (inspector/mechanical), 10 mechanics and 4 welders recruited from the open market. In addition there are 2 mechanics seconded from MoWD Kakamega working with the project.

3.14.2 Concrete Ring Casting Plant

This activity encompasses a series of activities related to the implementation of the project. The concrete sub-section makes pre-cast slabs for wells, well rings, blocks and slabs used in all forms of construction undertaken by the project. The carpentry sub-section prepares formwork for concreting, makes doors, windows etc and prepares soil sampling trays for borehole work. There are also plumbing, painting and electrical sub-sections providing similar support to construction activities in the field and at the offices.

The section is headed by a foreman who is in charge of the overall running of this outfit.

3.14.3 Water Laboratory

The functions of this laboratory have generally been quality monitoring.

Numbers Constructed by KFWWSP

Table 3.7 Water points constructed

Production	Bungoma	Busia	Kakamega	Total
Springs	148	213	470	831
Dug wells	110	237	379	726
Boreholes	151	301	337	789
Total	409	751	1,186	2,346

Source:KFWWSP

CHAPTER FOUR

DATA ANALYSIS AND RESEARCH FINDINGS

4.1 Existing situation

The existing water supplies in Western Province are piped water supplies and point source supplies.

There are altogether 76 piped water supply systems in Western Province at present. The water supplies covers an area with an estimated population of 830,000. During 1989-90 the schemes were visited and surveyed and their technical and operational conditions analyzed by a Finnish consulting firm. The results are discussed below.

Out of the 76 piped water supplies, 31 systems are directly operated and maintained by the Ministry of Water Development. Three water supplies are operated by the National Water Conservation and Pipeline Corporation since 1989. These schemes cover an area with 740,000 potential consumers. The rest of the schemes are either community based (self-help), industrial (sugar companies) institutional or Local Authority Water Projects serving around 90,000 consumers.

The table below shows the distribution of piped water scheme in the district. It can be noted that

Busia has the highest number of schemes but with the least number of consumers. Most of the piped water schemes make use of surface water as their source and serve about 720,000 consumers (MOWD. Annual Report) Spring sources are used by 30 systems serving around 95,000 consumers while 9 systems based on boreholes and serve around 18,000 consumers. All big water supplies using surface water include full conventional treatment.

Table 4.0 Population within supply limit

DIST	Kakamega		Bungoma		Busia		Total	
U/t	No	POP	NO	POP	NO	POP	NO	POP
MOWD	14	260000	6	235000	11	95000	31	590000
NWCP	2	126000	1	24000	0	-	3	150000
S-H	6	40000	4	8000	4	2000	14	5000
IND	1	8000	1	2000	0	-	2	100000
LA	0	-	0	-	10	8000	10	8000
INST.	3	8000	3	5000	6	7000	12	20000
MOH	0	-	0	-	4	2000	4	2000
TOTAL	26	442000	16	274000	37	14000	76	830000

Source:Kenya-Finland Western Water Supply Programme,Water Supply Development Plan(1990-2005).

According to the survey treated water from most water treated plants in Western Province do not always meet the minimum water quality standards as set out in the MOWD Design manual. This has been attributed to the following reasons.

- Lack of adequate skills in operation and maintenance procedures
- laxity in supervision
- lack of necessary working tools
- irregular supply of flocculants
- overloading of treatment works.
- lack of water quality control.

4.1.1 Point source water supplies

Point source water supplies include protected springs, dug wells and boreholes. Most of them have been constructed by KFWWSP. By 1990 there were 2346 water serving approximately 700,000 people.

4.1.1.1 Water supply coverage

It is estimated that altogether about 1.543 million people which means about 57% of the total population in Western Province are within the service area of some type of improved water supplies. This is

higher than the national averages of 44.5% in rural areas. This represents an increase of about 15% from the initial coverage at the onset of the programme.

Due to operational deficiencies not all people within the served areas of water supplies get regular and sufficient service

Table 4.1 Water supply coverage in Western Province

Water supply	No	Pop. within supply limits	Pop with reliable water supplies	%
Piped	76	830,000	450,000	54
Point source				
Dug wells	726	220,000	200,000	90
Boreholes	789	240,000	220,000	99
Protected springs	831	250,000	230,000	95
Total Population		2,540.000	1,100,000	72

Source: Kenya-Finland Western Water Supply Programme, Water Supply Development (1990-2005)

4.2 Utilization of KFWWSP Scheme

A water point utilization study was carried by KFWWSP. Each water point was visited by an enumerator who remained at the site from 6 a.m. to 6 p.m.. Each person who collects water from the water point is counted and record is made of the amount of water

collected; the number of visits made so far that day; the one way walking distance from home to water point; the number of the people in the family.

Below are the results of the survey

Table 4.2 Utilization of water points.

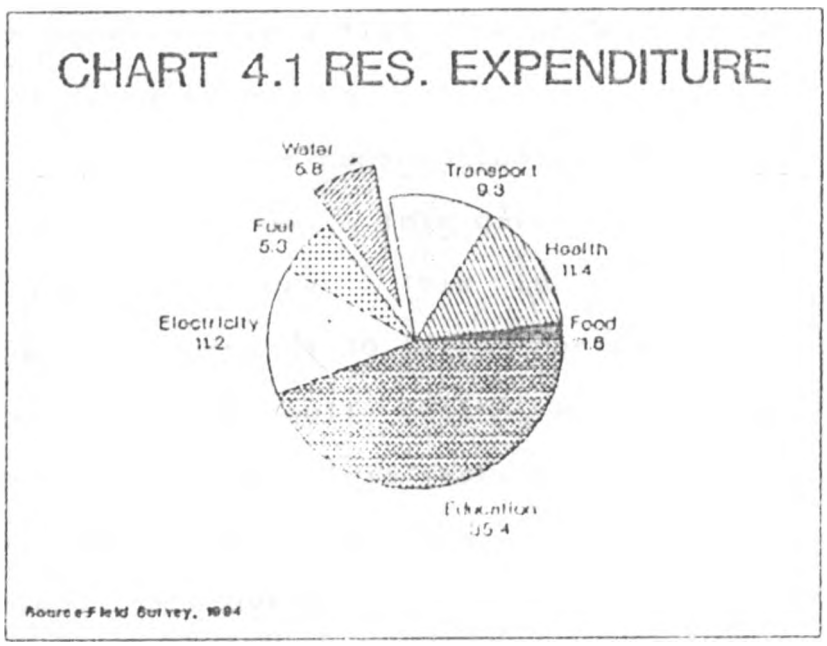
Sample Size	Springs	Dug wells	drilled Wells	Overall
	50	53	5	156
Consumers per waterpoint				
Min	13	68	88	
mean	222	164	487	
max	750	383	1900	
Consumption in litres /day/waterpoint				
Min	245	285	584	
mean	1185	880	4122	
max	2830	1680	14544	
Consumption in litres/day/consumer				
min	3.3	3.8	4.2	
mean	0.8.	5.4	8.5	
max	18.8	7.5	13.1	
One way walking distance/m				
Min	150	150	240	
mean	350	310	1090	
max	850	560	1780	

Source:KFWWSP records.

4.3 RESEARCH FINDINGS

Of the total number of questionnaires administered 49 were returned. 89.7% of the respondents were married and the mean age was 34.082. 10% of the respondents were 35 years old. There were 55.1% males and 42.9% females. For some reason there were more males which is surprising because most rural surveys encounter more women as most men go to work in towns. Mean number of people per household was 9. This compares well with the national average of 7. The highest number was 48. While this may seem incorrect, it is quite in order given the rampant practice of polygamy in the area. 91.8% of the respondents had heard about the programme. This shows how widespread its activities are. This can also be attributed to the programme s publicity campaigns through radio programmes(both in vernacular and Kiswahili) newsletters and public barazas. Of the total respondents 49.1% use water from a KFWWSP project and 51.0% use traditional sources.

The average income is 6,000 per month. This is rather high for a rural area. This is K£ 3600 p.a



From the above chart, water and fuel are low expenditure items. They are not expensive. This is because for fuel, most respondents use fuelwood, which they get from nearby bushes. They only buy charcoal or fuelwood when they cannot get it from their normal sources. For water, some people use traditional sources most of the year and only use for instance a borehole (which in most cases is further away) when

their normal sources are not sufficient. Since most water schemes have a flat rate of 50/= per month, water is still not expensive.

The mean water consumption per day was found to be 156 litres per day. This gives us about 17.3 litres per person per day. This is still lower than the design standards of 30 litres per person per day. The usage compares well with WHO standards of 20 litres/person/day. This represents a great improvement from 1985 when the water utilization survey was carried. The average consumption per person per day was 6.7 litres. This was much lower than what is needed. Of the people using water from KFWWSP, 95.9% perceived the water to be of good quality. The perception was based on smell, taste and whether it stains. Most common household chores like cooking washing, bathing were found to occur regularly.

As can be seem from the tables below, 67.3% live in semi-permanent houses and 63.3% use ordinary pit latrines. Only 26.5% use Ventilated Improved Pit (VIP)latrines.

Table 4.3 House type

House type	Val%	Cum%
Permanent	18.4	18.4
Semi-permanent	67. 3	85.3
Temporary	14.3	100.0

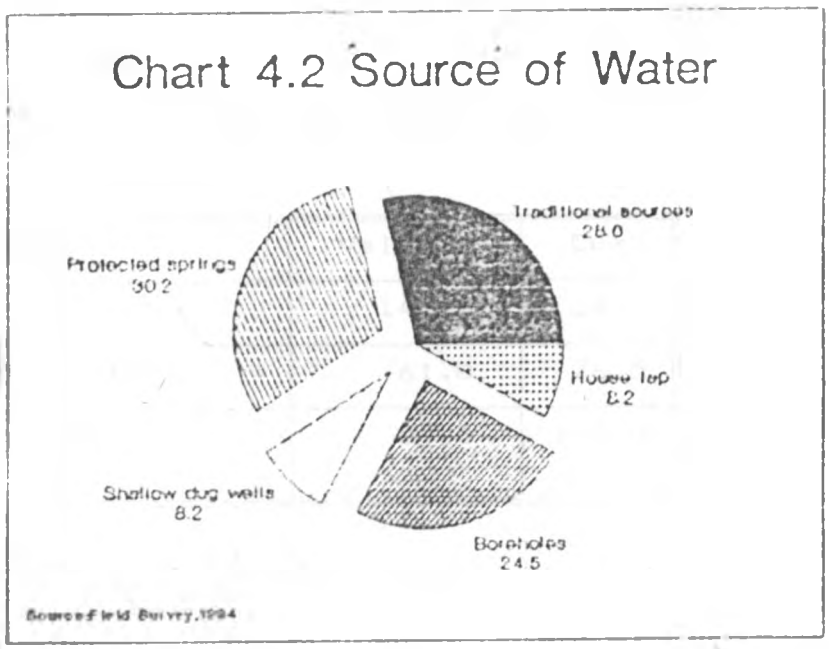
Table 4.4 Toilet types

Kind of toilet	Val%	Cum %
Water closet	10.2	10.2
VIP Latrine	26.5	36.7
Ordinary pit latrine	63.3	100.0

Source: Fieldwork, 1994

It must be noted as an achievement by KFWWSP since of all the respondents only 28.6% use water from traditional sources, 36.6% get water from protected springs. But only 8.2% get water from house tap. For many water is still to be collected from a distance.

The chart below gives a breakdown.



On employment opportunities offered only 20.4% of the respondents had someone within the household trained and subsequently employed by KFWWSP. 70% of these had only 1 member trained. This points to an attempt at equatability.

As can be seen, most people(61.8% of those interviewed) attend public health classes. These are organised by a sister programme Kenya-Finland Primary Health Care Programme and are meant to maximise the benefits of an improved water supply.

Table 4.5 Classes attended

Classes attended	Valid%	Cum%
Adult literacy	14.7%	14.7
Public health classes	61.8	76.5
Nutrition classes	23.5	100.0

Source: Fieldwork, 1994

55.3% of the respondents were self-employed, mostly sugar cane farming and in some cases business enterprises 40.4% were salaried employees. The average distance to the water sources was found to be 1.316km. Initially, people had to walk 1.578Km to a water source. These distances apply to people using KFWWSP water projects. The longest distance walked was about 5 km. The target of everyone being at least 1/2 km away from a water source has thus not been met.

The average time taken on a one-way trip to the water source is about 15 minutes (0.25 hrs).

The average number of trips made per day is 8. Therefore, the average consumer spends about 30 minutes (0.5hrs) on one trip. This amounts to 4 hrs per day fetching water.

In one month:

4 x 28 = 112 hrs

In one year 112 x 12 = 1344 hrs

.. The average consumer spends about an equivalent of 56 days of the year collecting water.

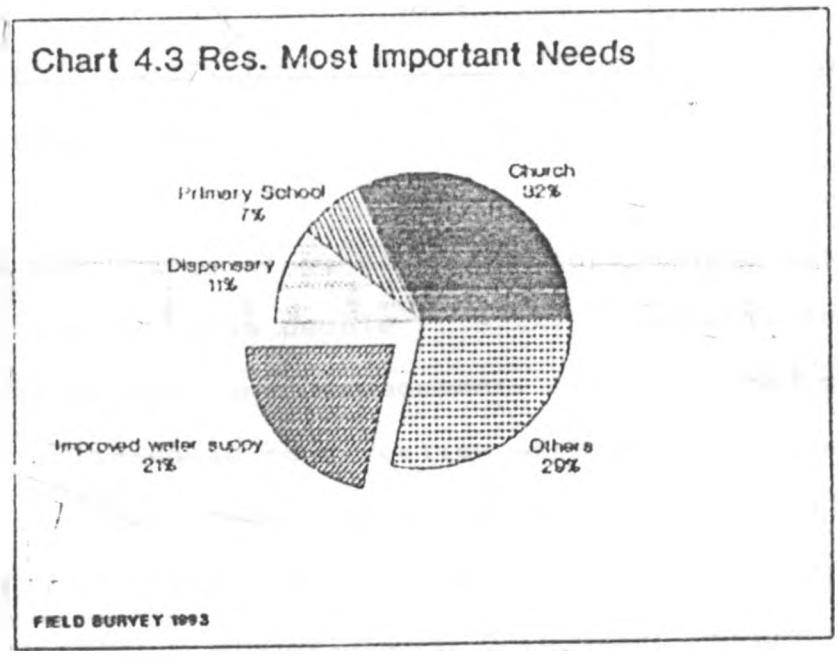
Initially before the KEFINCO project, the respondents had to spend an average of 35 minutes (0.58 hrs) on a one way trip. Taking the previous average of trips per day, about 9.28 hrs were spent collecting water.

This results to an equivalent of 3359.36 hrs per year . An equivalent of 139.97 days

The average number of cattle kept is 4 84.3% are indigenous only 16.7% are grade.

When asked what activity they would engage in if they had more time, 38.8% said they would start livestock farming 26.5% would spent the extra time on cultivation 12.2% on domestic activities, 18.4% would spend it on leisure.

83.3% had a reliable source of water and therefore did not rank water as a high priority need. When asked what they considered the most important needs, 32.1% said a church and 28.6% said a water source. The breakdown is given below.



77.6% of the respondents said there was no water problem

59.5% of the water projects were constructed using local materials.

The following table shows the level of participation

Table 4.6 Level of participation

	%	%
Participation in	Yes	No
Planning	13.5	56.5
Construction	36.2	63.8
Management	36.2	63.8

Source: Fieldwork 1994

The percentage of participants in planning was found to be 43.5%. Less people (36.2%) participated in the construction and management. But the ones who participated in construction were likely to participate in its/ management, thus the same percentage (36.2%). 37.5% of respondents engage in brickmaking due to availability of water. Most water projects (69.8%) are managed by the community through a water committee, KEFINCO manages 16.3% pending handing over to the community. Despite this 58.7% of the respondents do not pay for their water and average payment is 71/= per month which is almost negligible.

The following table shows mean distance to various facilities

Table 4.7 Distances to various facilities

Mean distance to Nearest	Mean distance
Dispensary	3.137
Nursery	0.928
Primary	1.380
Shopping centre	1.678

Source: Fieldwork, 1994

4.4 Analysis of data

4.4.1 Hypotheses Testing

At the onset of the study the researcher had laid down hypotheses and assumptions as to the expected effects of a water programme in rural areas.The following are the observations regarding the above.

1. Distance travelled to obtain water decreases.

Improved supplies reduces the distance travelled from 1.578 km to 1.316 km. This is a 19.9% reduction. From an economical point of view, distance travelled in the rainy season (which is the farming season) is the most important measure because the opportunity cost is greater then.From a sociological point of view a decrease in dry season is an important benefit.

H_o:There is no significant reduction in distances to water points.

C=0.95 Test statistic=ANOVA

Results of this indicates that H_o should be accepted because F-calculated is less than F-tabulated.

Regression analysis was carried out.Regression equation is.

$Y=247-46x$.

$r^2=0.80$ or 80% of variations in amount consumed can be explained by variations in distances travelled to water points.The relationship is inverse.

2. The quality of water improves

According to analysis in the KFWWSP laboratory based on 9,843 samples, 7,337 samples were tested for bacteriological quality out of which 4,693(63.9%) were

free from contamination. The water quality data on boreholes, hand-dug wells and springs was analyzed and average values on chemical quality parameters obtained. The results showed that springs yielded the best chemical quality water followed by hand dug wells and boreholes. Boreholes yielded the best bacteriological quality water, followed by hand dug wells and springs.

A summary of bacteriological analyses of water quality is presented below.

Table 4.8 Bacteriological analyses

F.C/100m	B/H		H.W		P.S		P.W	
	NO	%	NO	%	NO	%	NO	%
0	1904	88.4	1078	52.5	910	51.8	645	62.7
0-10	187	87	446	21.7	461	26.2	200	19.4
11-25	28	1.3	194	9.5	166	9.4	48	4.7
26-50	12	0.6	46	2.3	52	3.0	8	0.8
50++	23	1.0	288	14.0	168	9.6	128	12.4
TOTAL	2154	100	2052	100	674	100	493	100

Source:KFWWSP records.

The water quality now is at per with WHO standards. The analysts at KEFINCO analyzed the water from traditional sources and say the water was polluted and did not meet the recommended WHO standards. But it

should be considered that the same people carried out both tests and it was in their interest to justify the programme. And this they could by showing that existing sources are polluted.

3. Time and Energy expended decreases

Time and energy expended in obtaining water is at least partly a function of the distance travelled.

As already shown a time saving of 3015.36 hrs each year-about 5 hrs daily is made possible. However, in terms of the opportunity cost to productive activity, the value of this time saving is negligible. Water collection has an opportunity cost to domestic and minor agricultural tasks which is hard to value. In addition a reduction in the effort due to reduced distance, results in some social benefit because women quite justifiably, regard water carrying as an onerous chore.

4. The quantity of water used increases

The size of household, wealth, cost, season, distance, energy spent and type of source may affect the quantity as might also the quality in certain extreme conditions. This is the case in Samia, Busia district where ground water was salinated and hard

leading to reduced usage. The survey carried out at the project onset revealed a water consumption rate of 15 litres per capita per day. With improved supply, the mean water consumption figure was found to be 17.3 litres per person per day. However, the difference is not significant. There seems to be no significant difference in usage between households using either unimproved traditional sources or improved KFWWSP constructed sources. The question of quantities is important. Apart from the health aspect, the expected rate of consumption is directly relevant for the design of the supply. The actual increase in water consumption is less than that expected. This leads us to question the appropriateness of point source water supply as a means of increasing water consumption. The justification for the adopted mode of supply lies in appropriate low cost technology and low maintenance cost in terms of skills and finances. But it should be noted that consumption per head tends to vary tremendously between individual families so that there were large standard deviations and statistically meaningful conclusions are difficult to draw.

H_0:There is no significant difference in amount used

The sample variations are not significant . Test statistic :ANOVA

Results indicate acceptance of H_o.

5. Improved supplies are more reliable

The improved supply draws its water from underground sources, thus the availability becomes less dependent on variations in climate.

83.3% of the respondents considered the improved sources reliable. But it should be noted that the project area is not water deficient. The problem was more of quality than quantity. There are over 2,000 springs in the area which were used traditionally. The question of reliability is relative. But comparing the two sources, we find that none is any more reliable than the other.

The KFWWSP has tried to increase reliability of water by using geophysical methods to investigate proposed borehole sites. This reduces incidence of dry boreholes as the following table shows.

Table 4.9 Incidence of dry boreholes.

Year	Total Boreholes drilled	Dry Number	Boreholes % of total
1989	189	19	10.1
1990	122	15	12.8
1991	100	1	0.96
1992	79	3	3.8

Source: Kenya-Finland Western Water Supply Programme. Phase III (1989-1992)Report.

6. All people who do not live too far away from the improved supply make use of it.

Reasons for using a water point were found to be varied and complex. Some are based on rational criteria such as smell and taste. In Samia and Bunyala locations in Busia District, there are areas of exceptionally high salinity. In Bunyala location, water has hydrogen sulphide odour. This parameters in aesthetic water quality make improved supplies unacceptable to consumers. In the investigation phase, the community were not involved in site selection, such sociological factors like siting a water point next to a witchdoctor's home have meant that not all people living near the water source used it. However, some of these problems have been corrected. The water supply technology has been accepted at community level since

they now are convinced that the new supply is better.

7. The additional time made available through improved water supply maybe put to productive use.

There is a problem here, namely investigating how time saved is used. It is somewhat simplistic to contend that time spent on certain activities is productive while on certain others it is not productive. When asked what they do with the extra time (those using KFWWSP water) and what the ones who are not currently using KFWWSP water would do with the time, the following table shows that 12.2% would spent it on domestic activities.

Table 4.10 Activities engaged in

Activity	Valid %	Cum%
Cultivation	26.5	26.5
Cattle tendering	38.8	65.3
Paid employment	2.0	67.3
Domestic activities	12.2	79.6
Housebuilding	2.0	67.3
Leisure	18.4	100.0
	100.0	

Source:Field Survey,1994.

All these activities are productive when looked at from viewpoints rather than purely economic views.

8. Improved supply means better health.

A study was made of water related diseases and relationship between disease and water supply using existing health records. The major diseases commonly diagnosed in hospitals weree as shown on the following table.

Table 4.11 Commonly diagnosed diseases

Disease	%
Malaria	34.4%
Acute respiratory diseases	17.2%
Skin diseases	4.9%
Diarrhoea	9.2%
Intestinal worms	4.9%
Accidents	2.9%
Measles	2.6%

Source : Kenya - Finland Primary Health Care Programme Document Phase III

The main causes for seeking hospital treatment are malaria and acute respiratory diseases. Amongst the water related diseases the most prevalent infections are diarrhoeal diseases, skin diseases malaria and intestinal worms. Most water-related diseases peak in the wet seasons .

A comparison of records before and after the improved supply show that:

Chi-square test indicates no significant difference in occurrence of water related diseases before and after the programme.

There is no difference in the prevalence of water-related diseases in the two periods. There is no difference in epidemiology and seasonality of water related diseases. In fact, during the two periods, a

wet season peak in diarrhoea was exhibited.

This data is strongly suggestive of a situation in which village water supply has no measurable effect on health. This may be because there is no significant change in hygienic practices. This is also because the water point construction was not carried out concurrently with health education. The amount used especially; quantity used for washing clothes, bathing does not increase significantly so this benefit is limited. However time saving may lead to improved nutrition.

9.An improved water supply provides a stimulus for the development of secondary economic activities.

A large part of the rationale for implementing rural water supply programmes relies on the theory that the implementation will stimulate other activities.

One of the supposed benefits of an improved water point is that it encourages the growth of economic activities other than agricultural and fishing especially water using industries and commerce and acquisition of new skills.

This theory contains three arguments namely,

(a) Once a village has access to an improved water

supply this will lead to other development projects in which water plays a substantial part.

The study revealed that a number of activities were generated as a result of time and energy saved due to water in closer proximity. The tables below show the activities:

Table 4.12 Economic activities initiated

DISTRICT	BLK MAKING	VEG.GARDEN	TR. NURSERY	FISH POND
Kakamega	26	519	52	22
Busia	06	326	32	05
Bungoma	09	214	33	11
Total	41			

Source Fieldwork 1994

Table 4.13 Detailed performance and progress of women group activities

Women Group	Income generating activities	Year	Amount in Kshs
Mama Safi Women Group (Busia)	Filter-Sand Block-making	1991 1992 1993	128,810 362,720 26,720
Mumias Central Div. Committee	Block-making	1992	79,950
Mumias Muslim Women Group	Sale of spare parts	1992	40,625.50
Total			647,105.50

Source: Fieldwork, 1994

The above tables show that, the programme has had a considerable impact in the peoples economic activities. All these activities were made possible because of availability of reliable clean water supply at shorter distances. These activities have resulted in increased income and employment.

(b) Villagers will gain from the experience of a successful water project the idea that they can help themselves and thus sustain an enthusiasm for future development initiatives.

The study found that in practice enthusiasm has increased especially since most communities manage

their water through water committees. This has increased their self-confidence. The enthusiastic village response is maintained by an efficient administrative response to water point demands by quick implementation. This has meant that the demand-driven approach to project implementation is not constrained by delays.

(iii) The establishment of an alternative source of authority in the villages through a village water committee provided a base from which the village can go on to instigate further development project.This is quite widespread because with exception of women groups, the economic activities were initiated by water committees already in existence in a bid to diversify activities. For women groups, the water point management was an additional activity.

10. **The input of improved water acts as an incentive to overall rural development.** The result of this study suggests that water alone is not enough to stimulate rural development. This is because the project area is not in any way more developed than areas without the project but with similar potential. The programme has not resulted in better living conditions, new

agricultural practices and education. It appears, therefore, that water must be provided as part of a "package deal" including improvement in health, nutrition and education.

4.5 SUMMARY OF BENEFITS AND NON-BENEFITS

4.5.1 SELF RELIANCE AND BENEFITS

These are benefits accruing to the community due to the programme being situated within it. Self reliance benefits are construed to include community involvement in project activities which helps in capacity building and nurturing of community self-confidence, employment and manpower development. This gives the community economic freedom which is necessary for self-reliance.

4.5.2 Community Involvement

The concept of community involvement refers to the actual participation of the beneficiaries in all the applicable stages of a development project right from identification, planning, design and implementation.

The communities played vital roles in decision making and the planning and design processes of the water development activities.

A total of 24 socio-economic surveys and 9

feasibility studies were carried out jointly by the planning and design department of KFWWSP.

Siting of water facilities is one of the most sensitive areas of the decision making process where the communities needs and interests are important. The objective for community involvement is to instil a sense of ownership and responsibility among the local people. Most water facilities sited without the consent of the communities were not properly maintained after their construction. During siting meetings organised in liaison with local leaders, communities within a location discussed and agreed on how to share the water facilities allocated to that location. After the distribution had been finalised according to sub-locations and villages, the consumers pinpointed the actual place where the water point was to be located. Communities provided labour for hand auger test drilling for hand dug wells during site investigation. Generally, siting of water points was not easy because it involved power sharing. Out of the targeted 4,500 siting meetings and 1,700 sites to be selected by communities, only 1,226 meetings (i.e. 27%) and 864 site selections i.e. (51%) were accomplished Phase

III(includes sites in Siaya District).

One of the factors that determined communities decision on the acceptance of the construction of water facilities was measured through the beneficiaries willingness to provide free land for water development. With the awareness of the benefits that accrue from construction of safe and clean water, most communities were positive in the provision of land for water point projects. The area where the facilities were to be constructed had to be land eased. The land easement process is quite lengthy. It requires the land owners to sign a letter of no objection and then, fill in land easement forms which are taken to Divisional Land Authority for endorsement. The District Registrar does the final authorization. During Phase III a total of 1,436 sites 45% of the 3,200 planned sites were land eased including sites in Siaya District.

The community was involved in these activities in the second and third phases. During the investigation and first phases there was no attempt to involve the community. The project workers picked sites at random and dug boreholes without due regard to the communities cultural beliefs and taboos. This resulted in a lot of

unused boreholes, because firstly, the community did not feel the need for a water source as the traditional ones were adequate. Secondly some water points were put up in sacred areas, and grave yards.

Land easement means that the owner of the land cannot convert the water point to private use because in effect he waives his rights over the piece of land. This ensures that the water point remains for the community to use.

During the third and second phases the past mistakes are being corrected by community involvement.

The tables below shows community involved in siting of water points and registration of land easements (1989-1992).

Table 4.14 Community involvement in siting of water points

	No. of site meetings	Siting meetings attendance	Sites investigated	Sites selected by communities
District		Women Total		
Kakamega	471	7,544 23,847	156	365
Busia	364	4,882 17,315	136	187
Bungoma	264	5,252 12,668	90	221
Total	1,099	17,678 53,830	382	773

Source:KFWWSP and Field Survey.1994

Table 4.15 Registered land easements

District	Number of Land Easement Registered
Kakamega	481
Busia	383
Bungoma	280
Total	1,144

Source: KFWWSP records

The local people were mobilised to participate in construction. The labour and materials provided differed according to each type of water point

In the protected springs, the cost of construction (1993 prices) was KSh.40,000.

The percentage contributed by the community is 25% of the cost i.e. KSh.10,000. In phase 3. 57% of the sites had stones collected. The items contributed by the community are costed as follows (protected spring).

Table 4.16 Community contribution

Item	Unit	Rate	Quantity	Total Amount
Rubble stones or hardcore	ton	500	5	2,500
Sand	ton	250	3	750
Fencing of catchment area	m	1,250		1,250
Miscellaneous				500
Total contribution in terms of materials and labour 2,006	8	500		

Source: Fieldwork

So the community contribute about KSh.5,000 worth of materials and the rest is paid in cash.

The cost (average) of hand dug wells is KSh.120,000, the community contribute 25% i.e. 30,000 Sh.10,000 can be labour contribution the remainder in cash 68% of hand dug wells were dug to water level by the recipient community.

For boreholes (drilled wells) communities

contribution is clearing access routes to sites. 34% of the sites had routes cleared by the community. In spring protection, 57% of the springs constructed had stones, collected communally.

Table 4.17 Summary of community participation in construction of water points schemes 1989-1992).

Activity	District	Quantity done
Routes cleared	Kakamega	108 sites
	Busia	109 sites
	Bungoma	94 sites
Sited Stones collected	Kakamega	86 sites
	Busia	112 sites
	Bungoma	88 sites
Pits dug to water level	Kakamega	79 sites
	Busia	80 sites
	Bungoma	83 sites

Source:Field Survey(1994)

The community also participate in maintenance and operation of water points. The community selected individuals to be trained as pump attendants. Pump repairmen, local contractors and spring attendants. Committees selected 3956 pump attendants and 2450 spring attendants. These attendants did necessary repair and consumers met the operation and maintenance

costs.

The community participates in management of the water source through elected water committees. 3193 committees have been formed and 2613 activated. Most water committee are registered under the MOCSS as self-help groups - 2,731 are registered. Effective management was achieved through decentralisation, back up support in terms of transport facilities and monitoring staff. For better management water committees collected funds for water facilities and 1,010 accounts were opened.

Communities were prepared for taking over and managing their facilities. Intensive monitoring and evaluation of water committees was done before taking over the management of the project. The tables below summarises the great strides made in community development as a whole.

There were locational leaders seminars, well committee seminars film shows and spring/pump attendants training all aimed at capacity building within the community. This ensured that the institutional framework within the community would be able to sustain the water point activities.

Table 4.18 Well Committees formed (1989-1992)

District	Reg. MOCSS	A/C Opened	Meetings held	Funds Collected	Attendance Women	Total
Kakamega	1,123	403	5,752	702,796	7,544	23,847
Busia	719	307	2,968	352,923	4,882	17,315
Bungoma	447	144	2,691	256,374	5,252	12,668
Total	2,289	854	11,411	1,311,983	17,659	57,850

Source: KFWWSP records and fieldwork, 1994.

Table 4.19 Maintenance of water points

District	P.A. Selected	S.A selected	Pump repair selected	Amount involved on repair	Amount Collected (paid)
Kakamega	1,220	612	17	178,284.80	127,911.60
Bungoma	950	602	14	74,305.00	39,234.90
Busia	980	640	15	115,742.00	73,159.60
Total	3,150	1,854	46	368,334.80	240,305.70

Source: KFWWSP records.

Table 4.20 Handing over of water points (1989-92)

District	Total of water points	Water points handed over
Kakamega	1,415	994
Bungoma	500	360
Busia	830	578
Total	2,745	1,932

Source:KFWWSP records and field survey

Table 4.21 Seminar Attendance

Seminar	Attendance
Locational leaders	2,411
Well committee	4,642
Pump/Spring Attendants	1,043

Field Survey.1994

There were about 700 trainees on attachment to KFWWSP between Jan 1989 - Dec. 1992.

All these tables indicate that the community has benefitted from the programme because they have been educated and some have got gainful employment. Women groups and local contractors have benefited because they can now be self reliant.

4.6 ECONOMIC AND PRODUCTIVITY BENEFITS

These benefits are those accruing to the community due to the programme and result in improved economic wellbeing and increased productivity.

This economic benefits identified were mainly due to the employment opportunities generated. A total of 1043 members were gainfully employed directly as a result of the programme as pumps spring attendants. About 60 local contractors have also got employment because they are hired by the communities in construction. 154 water supply operators were trained and employed to run piped schemes. 536 women from different income generating groups were trained and are now actively participating in the groups activity. In total about 1793 employment opportunities were generated implying better standards of living for these families including improved nutrition.

The income generating activities initiated due to the availability of water like block making,tree nursery and vegetable gardens have implied increased productivity and diversification to non-farm activities. The vegetable gardens will improve nutrition and bring in more cash incomes.

However, improved water supply has still not resulted in appreciable increase in either dairy or beef production.

Most of the respondents keep indigenous cattle and the average herd size is four. The largest is 14. This shows that cattle keeping is still not productive. A few zero-grazing units have been constructed. There is a tendency to assume that provision of better water for livestock is valuable, because it will improve the conditions of existing animals and allow large numbers to be kept. This is not always true. First, although more frequent watering improves the quality of animals, improvement in other aspects of animal husbandry, especially disease control are equally important. Secondly, even if improved water produces more and better livestock this will have little economic value unless it is accompanied by higher sale of animals or animal products. In Western Province, there is little evidence to indicate any improvement in livestock and its sales.

The time saving resulting from nearer water sources have significantly released labour. But there is inadequate evidence to suggest that this labour is

put to productive use. The area cultivated has not increased significantly. Agricultural practice has also not improved. There is no significant increase in the demand for and use of farm inputs to increase productivity. Thus there has been no significant increase in economic productivity. Water collection is done by women who time saved to accomplish domestic chores. This is non-marketed output that is difficult to quantify and does not reflect increased economic productivity.

4.7 HEALTH BENEFITS

Faecal contamination of domestic and drinking water may introduce a variety of intestinal pathogens: bacterial, viral and parasitic. Their presence is related to diseases and carriers in the community. Water used for drinking and bathing if it contains excessive numbers of pathogens may produce a variety of infections of the skin and of the mucous membranes of the eye, ear, nose and throat.

The transmission of diseases and their relation to water and sanitation can be grouped into (Feacham et al)

(a) Water Borne Diseases

These are spread by drinking or washing hands, food or utensils in contaminated water which acts as a passive vehicle for the infecting agent.

(b) Water-Washed Diseases

These are spread by poor personal hygiene and insufficient water for washing. Lack of proper facilities for human waste disposal is another contributing factor.

(c) Water-Based Diseases

These are transmitted by a vector which spends a part of its life cycle in water in an aquatic animal. Contact water thus infected conveys the disease causing parasite through skin or mouth.

(d) Diseases with Water Related Vectors

Diseases are contracted through infection carrying insects (mosquitoes, flies, cockroaches) that breed in water and bite near it.

(e) Faecal Disposal Diseases

These are caused by organisms that breed in excrement when sanitation is defective and

contracted by eating uncooked fish and other food.

The following table shows diseases spread and attributed to inadequate water supply and sanitation.

Table 4.22 Categories of diseases

Group	Disease
Water-borne diseases	Amoebiasis Diarrhoea Typhoid Poliomyelitis
Water-washed diseases	Round worm (ascariasis) Whipworm (trichiasis) Leprosy
Water-based Diseases with water-related vectors	Schistosomiasis Malaria Sleeping sickness (trypanosomiasis) Liver blindness (onchocerciasis)
Faecal disposal diseases	Hookworm (anchylostomiasis)

Source: Kenya Finland Primary Health Care Programme. Project Document, 1985.

The tables below shows percentage distribution of major diseases in western province in 1985 and 1981

Table 4.23 % of diseases.

Diseases	1981	1985
Malaria	34.4%	39.0%
Acute respiratory diseases	17.2%	14.0%
Diarrhoeal diseases	9.2%	9.0%
Intestinal Worms	4.9%	5.0%
Skins diseases	4.9%	5.0%
Accidents	2.9%	negligible
Measles	2.6%	negligible
Rheumatism	negligible	5.0
Pyrexia	"	1.0
Others	"	23%

Source:Kenya-Finland Primary Health Care Programme Report,1986.

Diseases due to inadequate water supply accounted for 58.4% of all cases attended to in hospitals before the onset of the project this reduced to 53.0% in 1985 when the project was in Phase II. There is a reduction in water related diseases. The chi-square test indicates that the reduction is not significant. While it is not possible to isolate the effect of water on the reduction, it might be accepted that improved water supply played an important role.

Improved water supply at shorter distances should imply that more washing is done and exposure to

diseases is reduced. This leads to improved hygiene and lower morbidity and improved overall health. However the research reveals that quantity used does not increase significantly between the people using improved supply and those using traditional sources. This is because distances to water points are not significantly reduced. The hygienic practices are more or less the same leading to intangible improvement in either hygiene or nutrition. Thus the occurrence of diseases is almost similar. The reason for this could be that the fact that water has to be carried over a distance. Contamination can thus occur either in transit or in the container used for carrying water if it is not well cleaned. And since hygienic habits are still basically the same, it is a fallacy to assume that availability of water on it's own right results in improved health. Provision of water has to be accompanied by health education aimed at improving hygienic practices and faecal disposal habits. The combination of the two can result in a significant improvement in health. The existing women groups can be used for health education while involving the community fully.

The programme currently runs a health education programme in conjunction with Kenya-Finland Primary Health Care Programme. The activities are geared towards creating awareness amongst communities for the benefits of clean water supplies. Community education meetings were carried out during public barazas and well committee meetings. Seminars and study tours were organised and total of 1,000,000 consumers were reached. Promotion of use of water jars and ferro-cement tanks as alternatives against commonly used jerricans for water collection as the latter are difficult to its clean effectively. The water point is also kept clean.

4.8 NEGATIVE IMPACTS

4.8.1 MODE OF WATER SUPPLY

There appears to be a dichotomy in the mode of supply used in project area. The programme justified the mode by noting that it is low cost and easy to operate and maintain. But the community would prefer house connections. They perceive only little improvements in the water supply since they still have to walk to collect it. Community is thus prone to

pollution of water. There appears to be a fundamental question regarding communal water point source-supply as a viable technological option. This is a constraint to reaping full benefits of improved supply and its effect on health. A basic rethinking is required about communal water point supply if benefits of improved health are to be realised.

The reason advanced by KFWWSP that communities are sparsely distributed thus making individual connections uneconomical does not hold with the current population densities in Western Kenya. It may be said that the argument was used more to justify the programmes existence-than the communities felt need. Actually most residents felt that there was no water problem before the onset of the project.

When estimating the water demand in the rural and urban areas, the following unit water demands have been used:

Urban centres	75 L/p/d
Market centres	60 l/p/d
Rural population	20 l/p/d
Livestock	50 litres /l/u/d

conversion factor

1 Grade cow = 1.L.U.

3 indigenous cow, 3 donkeys = 1.L.U.

3 pigs = 1.L.U.

15 goats = 11.L.U.

The estimated water demand m /d is represented below:

Table 4.24 Water demand

District	1989	1993	1998	2005
Bungoma	40,300	44,700	50,900	61,300
Domestic	32,300	36,300	42,100	51,800
Non-domestic	8,000	8,400	8,800	9,500
Busia	28,400	31,700	36,400	44,100
Domestic	25,100	28,200	32,800	40,200
Non-domestic	3,300	3,500	3,600	3,900
Kakamega	91,300	101,900	116,900	142,000
Domestic	81,400	91,600	106,100	130,400
Non-domestic	9,900	10,300	10,800	111,600
Western Pro.	160,000	178,300	204,200	247,400
Domestic	138,800	156,100	181,000	222,400
Non-domestic	21,200	22,200	23,200	25,000

Source: Kenya-Finland Western Water Supply Development Plan 1992-2005

The above water demand indicated that there exists adequate demand to support individual connections.Using the Butula Scheme as a costing basis ,the per capita cost of piped supply is KES.650(direct costs).The

per capita GDP of Western Province is KES.1100 and per capita income is KES 6000(per month).This indicates the community can support piped supply.

4.8.2 COST SHARING

The KFWWSP, since 1989 has introduced an aspect of cost sharing. As already outlined, the community contribute 25% of the construction cost of the project. The contribution could be in terms of labour, cash and materials. The programme has adopted a demand-driven approach. This implies that they no longer construct water points anywhere unless the community itself comes forward and requests for a water point. In addition, the community should also have the requisite contribution and should be prepared to operate and maintain the water point through an organised water committee. While this is commendable in building up a sense of ownership and responsibility, it excludes the poor communities. As Robert Chambers points out, the poor of the poorest are excluded from part-taking the benefits of this programme. Yet they are the ones who need it more. Their children are among the 2 million who die each year from water borne diseases. The mothers still have to travel considerable distances to

fetch water. The programme has not reduced these peoples burdens. It appears that the programme will now never reduce the burden because these people cannot raise the required amount. Looking at it from this point of view, the programme has not achieved its prime objective of improving healths through improved supplies.

4.8.3 Environmental Impact

Inadequate sanitation is a major cause of the degradation of the quality of groundwater and surface water. Inadequate investments in collection and disposal mean that large quantities of waste enter ground water and surface water. Ground water contamination is less visible but often more serious because it can take decades for polluted aquifers to cleanse themselves and because large numbers of people drink untreated ground water. In Western Province, most people use pit latrines which may lead to local pollution especially where shallow wells are utilised.

When groundwater is drawn off at a rate faster than the rate of natural recharge, the water table falls. In China's Northern Provinces, where ten large cities rely on ground water for their basic water

supply, water tables have been dropping by as much as one meter a year. In the southern Indian state of Tamil Nadu, a decade of heavy pumping has brought about a drop of more than 25 meters in the water table. World Development Report(1992)

The costs are often substantial and go beyond the additional costs of pumping from greater depths. Coastal aquifers can become saline, and land subsidence can compact underground acquifers, and permanently reduce their capacity to recharge themselves. In for example, Bangkok excessive pumping has led to subsistence, cracked pavements, broken water and sewerage pipes.

All these are long term effects. In Western Kenya the water is currently exploited only for domestic use. Studies on ground water potential indicate abundant supply and it may last a long time before effects of exploitation are felt. But the effects should be taken into account. Currently there is no noticeable environmental damage.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

This chapter draws conclusions based on the data previously analyzed.On the basis of this conclusions, recommendations are tendered.

5.1 Conclusions

5.1.1 Community Needs

The community identified various important needs. 32.1% identified a church, 10.7% wanted a primary school. 28.6% considered a water source a priority need. When asked whether they considered water to be a problem, 77.6% said No. This indicates that the community does not consider water to be a major constraint in their activities. Actually what the community wanted was house connections not point sources. The community was actually not involved is selection of the type of supply. What happens is they are told to select a site for a protected spring. The question of what would the community prefer does not arise. As far as technology options are concerned, the community is considered ignorant. The KFWWSP on the

other hand carried out sample tests on the water quality and concluded that traditional sources were polluted thus requiring better sources. There appears not be a meeting of minds as far as the mode of supply is concerned. Thus whereas the programme is laudable the community was given no choice as to whether or not they required a water project using the given options.

5.1.2 Goals

The programme has got goals broadly directed at improving health through improved water supply. Beyond providing water, there is no other clearly articulated goals. But it must be noted that the programme has initiated economic activities and primary health care education. This improves nutrition and hygienic practices whilst broadening the economic base.

The community basically aims at achieving the good things in life. This they do in various ways, self-help groups being the main method of achieving their goals. It can be concluded that the programme has yet to formulate well articulated long-term goals that go beyond the provision of clear water for domestic and livestock consumption.

5.1.3 Resource Availability

As already outlined the natural resources available are abundant. There exists ample surface water in form of rivers, rivulets, surface springs and dams. Geophysical investigations indicate existence of large reservoirs of ground water. In terms of materials, the ones currently used are low-cost, reliable and easy to operate and maintain. The materials are locally available and the systems use little external power. The spare parts are available in certain strategically placed hardware shops. The local capacity in the area of management efficiency in terms of delivery of required material, financial and human resources to the target exist at adequate levels. Financial resources are still a constraint. This is because most communities consist of small scale subsistence farmers. The farm holdings are small, between 2-5 acres and production for the market is limited. Remittance of income from surrounding urban areas is also not substantial. Thus available income for development activities is limited.

In terms of human resources, the development of technical management skills have proceeded quite well.

The community have gained new skills. This was achieved in seminars, film shows on health education and hygiene, pump and spring attendant training.

There still exists a need for local capacity building to increase effectiveness in mobilising resources without external institutions.

5.1.4 Means proposed to achieve stated goals

The means to achieve the goals of improved supply are now considered.

1. Piped Water Supply

This is a common form of improved water supply, it normally consists of the following: intake, treatment works, pumping unit, reservoir and distribution network. The source of a piped water supply can be lake, river, dam, spring, well or borehole. When the source is surface water, some kind of treatment is usually required in order to meet the water quality standards.

The advantages of piped water schemes are:

- high level of service can be provided by bringing water to or near to the consumers
- water quality can be controlled
- water can be supplied to an area where no

local water resources are available

The disadvantages of piped schemes are:

- piped schemes require substantial initial investments costs
- piped schemes require skilled manpower for construction, operation and maintenance
- piped schemes are costly to maintain.

2. Hand pump wells

- These tap ground water from shallow or medium depth aquifers and from deep aquifers. The advantages of hand pump wells are:
- water is relatively safe without treatment
- community participation is easy to organise
- Operation and maintenance require less skills

The disadvantages are:

- lower service level compared to piped schemes
- hygiene of the wells, especially shallow wells, is not satisfactory as a result of surface water intrusion through leaking slab and superstructure.
- The well capacity is limited and can only serve 200-300 people

3. Protected springs

- Springs may be tapped with drains placed in gravel pack and discharging into a storage chamber. Proper protection of the catchment area is very important.

The advantages are:

- little treatment
- inexpensive
- no operating cases

The disadvantages:

- law service level
- hygiene not satisfactory
- difficult access

5.1.5 Alternatives Considered

Rock and roof catchments were considered as alternative means of supplying water in Western Province. This method can also be used successfully in special areas.

The rock and roof catchments are simple systems to collect rain water. Siting should take into account access of the users and geological structures. According to a KEFINCO report, the best sites are found

on the lower reaches of bare rock inselbergs. Storage may be provided by dams or open reservoirs.

Roof catchments are suitable for individual households, schools and institutions with impermeable roof cover. The required catchment area depends on water demand and on the amount and variability of rainfall. Gutters and storage tanks are required.

5.1.6 Activities and Achievements

Point Source Supplies

These are springs, shallow hand dug wells and drilled borehole wells. These sources provide water for the majority of Western Province.

Piped Schemes

Many schemes have been rehabilitated and augmented.

Health Education

The programme has been engaged in health education using film shows, seminars, barazas. 195 community based workers have been employed to educate the people on hygienic practices, use of V.I.P. toilets, and better nutrition practices. The programme has been able to reach 1,000,000 of the project population in this way.

Manpower Development and Training

The programme has organised one week seminars to train locational leaders and water committees in management of the water supplies. The number of participants in the seminar was 2,411 96% of targeted 2,500 for phase III.

5,006 executive members of 1,544 water point committees were trained, 45% of water points have a trained water committee.

2.191 pump attendants from 1,189 wells were trained in 3 week seminars. 44% of hand pump wells constituted by the programme have at least one trained pump attendant.

60 local contractors were trained in management and technical skills. This implies that there are persons able to meet demand for further water supply development arising from communities in the area. 39 pump repairmen are used by water committees in repairing major breakdowns of hand pumps which are beyond the skills of pump attendants. These repairmen were trained on the job by the operation and maintenance staff of the programme.

During training seminars arranged for water

committees, the community members were invited for a film show, where the film "Prescription for health" was shown and discussed. A total of 23,500 persons were reached this way.

Economic Activities

The programme through village level organisation has enabled the water committees to diversify their activities. The activities initiated as already shown are block making. Vegetable gardens, sand harvesting and fish ponds. It can be concluded that the programme is involved in many activities. These have resulted in increased income and self-confidence of the community. Community involvement in programme implementation has resulted in the instilling of a sense of responsibility and ownership for the community.

5.1.7 Achievements

The programme has achieved the following since its inception. The programme has brought 72% of the entire population of Western Province within supply limits. This represents a substantial increase from the initial situation at the programme's onset.

As already outlined it has also achieved a lot in

the fields of health education and training of manpower.

The programme has also managed to include a high level of community participation in its programme activities. It can be concluded that effects of the programme are quite substantial.

The distance to improved sources has reduced significantly. There has been a significant reduction in incidence of water related diseases. Although the percentage of this decrease that can be attributed to improved supply cannot be accurately calculated, it should be appreciated that the amount must be substantial. The quantity consumed has increased and the quality has improved. The programme has resulted in overall development of the area.

5.2 Recommendations

5.2.1 Design Criteria

Currently, the design criteria being used is not consistent with the Ministry of Works Design manual. It is recommended that the criteria prescribed by the Ministry of Works be used in order to eliminate probable problems. This is likely to arise when the donor agency pulls out without having prepared

operation and maintenance manuals. The Ministry's manual can thus be used.

The KFWWSP is preparing operation manuals for some water points. It is recommended that this be encouraged and standardised manuals be available for all water points to avoid operational difficulties.

5.2.2 Construction

The current construction method using local contractors and community involvement through cost-sharing is working very well and should be encouraged. It is recommended that the food for work programme be discouraged. The community should volunteer because they need the water and not because they will get free food or food vouchers. This diverts attention from development programmes to other issues. It will therefore be impossible to initiate any development programmes in future unless food is provided. The community has in essence to be paid to retain interest in development initiative. This creates a dependency syndrome.

5.2.3 Management

The initiation of water committee to manage water points is very successful. This is commended and it is

recommended that it should be encouraged. However, it is recommended that existing groups be used as water committees. This is because these groups already have established lines of authority and group cohesiveness is higher. These groups are for instances women groups.

5.2.4 Health Education

This is a very important aspect, because it enables the full benefits of improved water supplies to be reaped. It is recommended that this be continued through the currently existing 2,000 women groups. Health education includes hygienic practices and better nutrition. This education will be more effective through women since it is them who prepare the food. It is also recommended that the programme collaborates with the Ministry of Health to provide requisite staff and teaching implements in conjunction with the Kenya-Finland Primary Health Care Programme.

5.2.5 Economic Activities

The initiation of economic activities is important because it broadens the economic base. This strengthens the recipient community s ability to

participate in other development programmes. It is recommended that these activities be encouraged and be diversified further. This is important because according to the current development plan, off-farm income is emerging as an important source of livelihood.

5.2.6 Community Participation

This is the most important aspect of the entire programme. Community participation should be encouraged because this promotes programme suitability. It also assists in local capacity building and development of leadership qualities at a local level. It is recommended that this should be promoted.

5.2.7 Planning Criteria

From the programme's activities outlined in chapter 3, it can be concluded that this programme can be used as a prototype for other similar programmes in similar climatic conditions. The planning criteria used in this programme could thus be adopted in selecting programmes of high potential and impact in other similar areas.

Priority should be given to programmes using low-cost technology. The systems should be reliable and

easy to maintain. The systems should preferably utilise locally manufactured materials and equipment.

The emphasis should be in provision of at least minimum level of service to everybody with priority for unserved populations.

In urban areas consumers should pay full cost of this water supplies whereas in rural areas the operation and maintenance cost should be covered.

Programmes that trains the local artisans to meet its manpower requirement should be preferred. Lastly beneficiaries involvement should be stressed with selection of programmes with higher level of community participation. In addition, social and cultural aspects should be considered and programmes incorporating the local institutional framework into programmes activities should be given priority.

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APPENDIX

RESEARCH QUESTIONNAIRE

NAME OF INTERVIEWER

DATE

QUESTIONNAIRE NUMBER

BACKGROUND INFORMATION

1. Name of respondent .....
2. Marital Status of respondent.....
3. Age of respondent.....
4. Sex of respondent.....

5. Number of people in the homestead.....

6. Have you heard of the KFWWSP(Kefinco Programme)?

   YES ( )

   NO ( )

7. Do you use water from a KFWWSP project

YES ( )

NO ( )

8. How much money do you spend on the following per month

Health Services	Ksh:
Transportation	Ksh:
Water	Ksh:
Fuel	KSH:
Electricity	Ksh:
Food	Ksh:

HEALTH BENEFITS

9.How much water do you use per day?.....Jericans.

10. What is the quality of water

GOOD ( )

BAD ( )

11.Does the water have a smell

12. Does it stain laundry (clothes)

YES ( )

NO ( )

13. How often do the following activities occur in your homestead

(i). Drinking

(a) activity occurs daily ( )

(b) activity occurs irregularly ( )

(c) activity does not occur ( )

ii. Cooking

(a) activity occurs daily ( )

(b) activity occurs irregularly ( )

(c) activity does not occur ( )

iii. Bathing babies

(a) activity occurs daily ( )

(b) activity occurs irregularly ( )
(c) activity des not occur ( )

iv. Bathing Children and Adults
(a) Activity occurs daily ( )
(b) activity occurs irregularly ( )
(c) activity does not occur

v. House Building
(a) activity occurs daily ( )
(b) activity occurs irregularly ( )
(c) activity does not occur ( )

vi Animal use
(a) activity occurs daily ( )
(b) activity occurs irregularly ( )
(c) activity does not occur ( )

14. What type of house do you live in?
Permanent ( )
Semi permanent ( )
Temporary ( )

15. What kind of toilet do you use
(a) water closet ( )
b) ventilated improved pit latrine ( )
c) ordinary pit latrine ( )
d) others specify

16 Where do get your water from?
(a) traditional source ( )
(b) protected stream ( )
(c) shallow dug well ( )
(d) Borehole ( )
(e) House tap ( )

EDUCATIONAL BENEFITS

17. Has Kefinco Water Programme trained someone in this homestead.
YES ( )
NO ( )

18. If YES to the above, how many?.....

19. Do you attend any of these classes? Tick where appropriate.

(a) adult literacy classes ( )
(b) public health classes ( )
(c) nutrition classes ( )

PRODUCTIVITY BENEFITS

20. What is your occupation?

21. Is the occupation
(a) salaried employment ( )
(b) self employed ( )
(c) any other specify

22. What is the distance to the water source?.....kms

23. If you are currently using water from a KEFINCO project, how far was the initial water source.....kms

24. How long does it take walking (one-way) to the water source?

---

25. How many trips does an adult make to the water source daily

---

26. What activity do you spend most of your time on? Tick where appropriate.

(a) cultivation ( )
(b) cattle tending ( )
(c) paid employment ( )
(d) house building ( )
(e) domestic activities ( )
(f) none of the above ( )

27. Which of the following activities do you engage in?

(a) brick making ( )
(b) pombe brewing ( )
(c) sugar cane growing ( )

28. Is any one employed by KEFINCO homestead
YES ( )
NO ( )
29. If YES to the above, how many are employed? ------
---

30. How many herds of cattle do you own
---

31. What kind of cattle do you keep
(i) grade
(ii)indigenous

32. Which of the following would you engage in if you had more time?
(a) cultivation ( )
(b) cattle tending ( )
(c) paid employment ( )
(d) domestic activities ( )
(e) house-building ( )
(f) more of the above ( )

SELF RELIANCE BENEFITS

33. How reliable is the water source?
(a) reliable ( )
(b) unreliable ( )

34. Do you participate in any development project
(a) Yes ( )
(b) No ( )

35. If YES to the above, is it
(a) self-help participation ( )
(b) paid employment participation

36. What materials were used in the construction of the water source
(a) local materials ( )
(b) imported materials ( )

37. Do you own the house you live in?
(a) Yes ( )
(b) No ( )

38. What do you consider to be your most important need at the moment as a community?

(a) church
(b) school primary
(c) secondary school
(d) dispensary
(e) a water source
(f) any other specify

39. State the needs in order of priority

1.
2.
3.
4.
5.

40 Is there a water problem here?

Yes( )
No ( )

41. Did you participate in

(a) planning of the water project

Yes( )
No( )

(b) Construction of water project

Yes ( )
No ( )

c) Management of water project

Yes ( )
No ( )

42. Who manages the water project

(a) community through a water committee ( )
(b) KEFINCO ( )
(c) Others ( )

43. Do you pay for the water

Yes ( )
No ( )

44. If Yes how much ----------

MODERNIZATION BENEFITS

45. What way of life do you prefer
(a) modern ( )
(b) old ( )

46. What type of education do you prefer
(a) modern ( )
(b) old ( )

47. Are you a member of a national organization
YES ( )
NO ( )

48. If Yes, name the organization ----------

49. How many meals does this household take per day?
---

50. What level of education has the most educated person in this household attained?----------

51. How far is the nearest dispensary? ----------

52. How far is the nearest shopping centre?

---

53. How far is the nearest primary school?
---

54. How far is the nearest nursery?
---

55. How often do you go to Kakamega town?

56. Where do you get the means of transportation when travelling to Kakamega town.

57. How far is it from your home? ---------- km

Thank you for your cooperation