SAND DAMS OF KITUI: SOCIAL AND ECONOMIC IMPACT STUDY

ZERO DRAFT

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Abstract

Kenya is among a group of countries faced with inadequate renewable resources, a problem acute in arid and semi-arid parts and compounded by weak development institutional arrangements. Only 45% of Kenyans have access to clean water. Studies show that communities living in arid and semi arid lands have limitations in accessing sources of water.

The story of sand dams in Kitui is another example of positive reaction to drought caused misery and distress. Since 1992, women and men in Kitui have taken action for survival. This community has proved less conservative and more adaptive to change. Men are accepting a less dominant role. The community has realized its potentials. There is nothing to hold them back and nothing seems to be too difficult to them.

The success of the sand dam project in Kitui is based on community participation, which is strongly rooted in greater understanding of the differences and overlaps between male and female roles and responsibilities. The fact that almost all women involved are housewives suggests that their new roles are accepted and supported by the male members of their respective households and the community at large.

This study attempts to explore the Social and Economic impact of the sand dams

1.0 INTRODUCTION

1.1 Background

Kenya is among a group of countries faced with inadequate renewable resources, a problem acute in arid and semi-arid parts and compounded by weak development institutional arrangements. Only 45% of Kenyans have access to clean water. Generally, households living in the medium and high potential parts of the country are considered to have access to safe water if they can get 20 litres of clean drinking water daily from sources within a kilometre away (Kimuyu 1998). Studies show that communities living in arid and semi arid lands have limitations in accessing sources of water. They use open water sources, more prone to contamination, during the dry season. Closeness to a source of water and opportunities for multiple applications of the source are important considerations in choosing technologies for providing water sources.

Most governments in the developing countries are shifting their roles from 'providers' to facilitators'. This has been necessitated by contracting resources, sustainability and the failure of 'top down' (*one size fits all*) approach to development. This shift is placing more emphasis on water resources management at the lowest appropriate level. It calls for the empowerment of the users and interaction between the users, non-governmental organizations, private sector and the local government.

Major weaknesses and gaps preventing communities from benefiting from their water supply systems have been reported (IRC 1995). These include insufficient capacity building; partial coverage of user populations; lack of effective and equitable financing systems; absence of suitable management tools; environmental degradation of water sheds; and absence of proper gender balance in planning for, contributions to and control over the established water service.

Much can be achieved by building on experience with locally developed management patterns for traditional water sources. Water collection and use are often regulated by explicit agreements (IRC 1995). Women, who have for long played a crucial role in the traditional society, make many of these agreements. Management of water resources, and also proven to be capable of taking responsibility for complex technologies, as well as managing basic care of water points. Women and men can play decisive and indispensable roles in ensuring the success of water improvement programmes, when neither party is overburdened or excluded and then when work; authority and training are divided in a well-balanced way.

2.0 SASOL AND THE SAND DAMS

SASOL stands for Sahelian Solutions Foundation. It is a non-governmental organization founded in 1990. Its motivation was to address water scarcity in Kitui district. Initially, SASOL intended to facilitate the development of water through construction of shallow

wells; water tanks and rock catchments to harness rainwater; sand dams and other sources. The main objective was to shorten the distances families had to move in search of water, limiting it to a maximum of two kilometres. Of all these methods, construction of sand dams brought about a unique dimension in the whole water development process in the area. To date over 200 (2001) sand dams have been constructed in central and western parts of Kitui district.

Sand dams are not new in the district. The earliest were constructed during the colonial period in 1920's and 50's and most of them are still in existence. At that time, they were referred to as sub-surface dams because the water is stored below the surface. However, the term 'sub-surface dam' is used in some countries to refer to a barrier below the surface. It could also be used to refer to an impervious underground barrier in a low-lying area that prevents the lateral flow of ground water and maintaining or raising the water table. In contrast, a sand dam is made as a concrete or masonry barrier on an ephemeral river. Although the upper side of the wall may be hidden by sand, the lower side is usually exposed, in part due to excavation by water when the river is flowing.

3.0 THE STUDY AREA: KITUI DISTRICT IN PERSPECTIVE

Kitui district in Kenya's Eastern Province is semi-arid and lack of water is a perennial story. This district extends for roughly 200km from north to south and 120km from east to west. It covers an area of approximately 20,555.74km^2 including 6369.1km^2 occupied by the uninhabited Tsavo National Park. The climate is hot and dry for most of the year and is characterized as an arid and semi arid area with very unreliable rainfall. The high rate of evaporation, combined with unreliable rains (1000mm), limit intensive and meaningful land use and other related development activities. Kitui population stands at 574,215 people with a density of 213 persons/km$^{2.}$ (Republic of Kenya, 1997). Sixty per cent of the households in Kitui are female headed and this has impact on the household human capital endowment. This is because of various reasons including men working outside the district, single parenthood and widowhood.

Moving southward from Kitui town, the land falls gradually and rainfall decreases. The land is characterized by scattered homesteads and irregular patches of cropland interspersed with areas under grass or bush. Indigenous trees such as *Acacia tortilis* and *Terminalia brownei* are common, and together with the occasional baobab, typify the hot, dry conditions that prevail. *Senna siamea* trees with bright yellow flowers are noticeable around many homesteads, and sisal together with the shrub *Lantana camara* is common along field boundaries (SASOL 1999).

3.1 Water resources

Water is a common denominator and a major development input; and thus remains the most essential commodity in the District. The search for water is a significant preoccupation of the people of Kitui District as there are only a few water sources such as

rivers and springs to serve them. The major sources of water are perennial rivers. The population residing along the rivers does benefit from subsurface water in the sandy riverbeds. Distance to source frequency of water fetching trips and number of persons per trip varies between the wet and dry seasons. Sources of water are usually rare during the dry seasons. In some places, women walk as far 25-30kms, a round trip of around five hours returning with water of questionable quality. However much of the available water is relatively of good quality partially due to minimal use of agricultural chemicals and little industrial discharge. According to Kimuyu (1998), the size of the household, economic status and proportions of females in the household positively influence the domestic demand for water in the household (Kimuyu 1998).

3.2 Agricultural Activities

Dry land farming is practiced. Agricultural activities are mainly subsistence in nature and are highly constrained by weather conditions. However it's important to note that the poor and rich households draw 77% and 22% respectively of their incomes from agriculture. Irrigation potential along rivers has been only minimally exploited. With more use of these rivers, a lot of cultivation would be done to increase food production in the District.

3.3 Livestock production activities

Due to the arid climate of the District, livestock production is a major economic activity. The majority of the rural households keep cattle either for meat, milk, pulling carts and/or ploughing. Source

3.4 Food availability

The District normally experiences food deficit due to recurrent drought episodes. The little harvest gotten is supplemented by relief food from donor agencies. To avail food to the majority of the population there is need to improve water supply in the district so that food production can be increased. And the need is urgent. *Source*

3.5 Geology of the Sand Dams Sites[1]

This section gives a general orientation of the sand dams site geology. Three main catchments were visited during the study and are categorized according to their geological characteristics. The characteristics depended on the topography of the riverbed. Other aspects like soil and rock-types which the dams are constructed, are taken into consideration.

The study was done mainly in the Central and Chuluni divisions of Kitui district where SASOL foundation has build sand dams. The main rivers studied were Kiindu, Kisiio (and their tributaries) and Mwiiwe. These rivers were divided into catchments depending on the general characteristics of the landscape and geomorphology.

[1] The expertise is sourced from Mr. Muinde Munyoki and TU-Delft Students

Mwiiwe and Kiindu rivers flow through gentle sloping land as compared to Kisiio whose gradient steep thus affecting the level and rates at which the rivers deposit their loads. Miiwe and Kindu are in their middle stages thus some deposition is taking place. Kisiio is in her youthful stage thus the most dominant activity is vertical erosion. The major soil type in the region is sandy loam with some pockets of black clay soils in the flat regions. These sandy loams's result from high rate of erosion that does not allow time for humus to form. Lateritic ironstones and kunkar limestone's are also present due to the leaching of the soils. These are mostly found on the flatter, lower lands and on some riverbeds.

In some places, down the river course below the dams, water oozes from the rocks on the banks of the rivers showing the presence of lateral recharge. A good example is Munandani dam. This is also shown by the rise in the water levels in the wells that are dug near the dams. Most wells have the same water level with scope-holes that are excavated in the riverbeds. Along some riverbeds, especially rivers on the hilly areas, there are large rock exposures mainly boulder rock. Some of the rocks are highly compacted while others are weathered, jointed and cracked. The rocks are metamorphic in origin. A good example of a river with such kind of large exposures is the Kavuo River at kyan'gombe in Ithumula sub-location.

In general, the study area is in the basement system of the *Mozambique* belt in the *ukambani* group series that occur in the axial zone of the belt. This belt forms an extensive part of the eastern Kenya and covers a great part of the central Kenya. This system is characterized by the presence of metamorphic rocks with gneissic structure that ranges from highly weathered to very hard rocks that have a structure almost similar to granite. These rocks are quite impermeable and don't let water pass through .The only way water passes through them is when they are jointed. These joints move parallel to each other and can be over a long distance. Thus they can act as channel ways for water for recharging the ground water systems. At some points they can as well act as a deterrent to the performance of the dams. This can happen when they facilitate the seepage of water from the dam to other areas where the water may not be required. This will affect the general objective of constructing the dam.

The other aspect of the rocks with influence to the dams performance is in the rock orientation. This is the way the trend of rocks takes in form of alignment. Rocks are normally arranged in a sequence. This sequence takes a specific direction and thus the rocks are said to be oriented. In between the alignments, there are points of weakness in the rocks that can allow water seep through them thus playing a part in recharging and maintaining the water in the reservoir. Also this can affect the performance of the dam.

Geology as an important factor in sitting the dam foundations. Dams sited on weathered rocks and unsuitable soils were weak and had seepage. This can be considered to be due to the permeability of the rocks. Most dams were sited on hard compacted granitoid gneiss. Others on kunkar limestone, which is a hard compacted soil that is similar to clay soil but does not soak with water like clay. Dams on this material are strong and are not affected by seepage. The sites with highly weathered rocks forming the foundation of the

dam are not very strong and most dams found with seepage in this area are these dams. Most of the dams in Kiindu River are located in hard compacted granitoid gneiss and biotite gneiss, which is good for the dams. The river has a general Trend of N-S and rocks are aligned across the river though at some bends the alignment is in line with the dam. The river has gentle gradient thus resulting to deposition of some of the River load. Having all its dams filled with sand evidences this. The dams backup from long distances some as long as three kilometres. The dams on the lower part of the river backup less than those upstream. The areas adjacent to the dams have quite greener vegetation compared to the surrounding.

In general, the sand dams build by SASOL Foundation are build on very well selected sites. Most of the dams are build on the granitoid and biotite gneiss that are highly compacted rocks thus impermeable and which form strong foundation for the dams. Some of the dams are sited on kunkar limestone that is also a strong foundation. There are also dams build on laterite (marrum), which has also proved to work.

Anchoring of the dams was quite good especially where the banks are rocky. In some areas anchoring has to be done on loose soil on the banks. This system of anchoring was not very successful initially. SASOL has improved it by making the wings of the dams longer though at an extra cost. In most dams planting nappier grass on the riverbanks does protection against erosion.

CHAPTER TWO: LITERATURE REVIEW

2.1 Community Participation

Community participation is a strategy that encompasses beneficiaries sharing project costs, assisting in the design, implementation, operation, maintenance and management of resources. In this regard, the capacity of the community to manage their water supplies includes the talents of both men and women. Review of the existing literature show that it is becoming clear that the roles, responsibilities and access to and control over resources for men and women, however traditionally different, are now bearing some strong overlaps.

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2.2 Assessing the Gender Concept

Bolt (1994) asserts that one of the underlying assumptions behind this approach is that the community is the agent of its own development, with development agencies in a supportive role. She further argues that women in a number of respects are a subordinate group (see also DAC 1988). Thus the gender approach implies that attitudes, roles and responsibilities of men and women are taken into account: differential access to resources

and benefits based on gender. The gender perspective calls for an open mind to community development and is geared towards the fullest possible participation of both men and women.

Bolt says that in line with the gender approach, it is important to focus on women's involvement. This introduces another dimension to the debate, because this calls for programmes to uplift the disadvantaged women and bring them into the mainstream of development. The gender approach becomes an effective tool of development in that it gives more opportunities to women and gives men a chance to share the burden; and recognize and (re) value women as partners in the process of development. Further, it looks for possible actions to improve the balance in work sharing, control over resources and benefits.

The approach seeks to identify the differences and relationships in order to strengthen development projects. It further attempts to understand areas where discrimination between the two exist and how to narrow and eventually eliminate the gap. It is important to note that gender analysis has uncovered information that the women and development literature has long documented that women have less education, less authority, less access to land, credit and training than men do (FINNIDA 1990). Women should not be sidelined in development for three reasons: as a matter of equity, efficiency and sustainability. It is inequitable that women are sidelined from the benefits of development and it is inefficiency not to include women, as they often are critical to the success of many projects. This leads to unsustainability.

2.3 Partnership /Project Management

For any development effort to succeed, community and the development agencies (the government/NGOs) have to work together as partners[2]. Most communities find it difficult to improve their water supplies without outside support. This could be because of resource scarcity and lack of appropriate technologies. At the same time, governments and development agencies are finding it difficult to introduce, manage and maintain improved water supply systems without considerable inputs from the users. This calls for establishment of a good partnership between men and women; the government; and interested development agencies/agent. Working towards this end, the government/agent must not be tempted to think on behalf of the community concerning their problems and imposing solutions. All the parties must work together, with the community playing a leading role in various stages in the project cycle.

2.4 Women and Development

Women in many parts of the world have inadequate access to education and training; health and family planning services; information; and other resources. Improving opportunities for women is not only a matter of human justice, but also a sure route to faster and more sustainable development. Many people recognize that women have the

[2] IRC 1994, working with Women and Men on Water and Sanitation

right to participate in political and economic decision-making and to enjoy the fruits of social and economic progress (World Bank 1990). But in practice, they do not have the opportunity to do so.

Often, their legal standing is inferior and they are unable to participate in politics and in policy making. As a result, those women are denied choices in their own lives and are also prevented from contributing fully to the family well-being and to national progress. Expanding women's opportunities, especially in ways that enhances their productivity and earning potential, will raise their living standards and contribute to better economic performance, the reduction of poverty, and general improvement in family welfare.

Beside their work in the formal and informal labour force, women usually have the primary responsibility for the care of children and elderly; and for many other household chores. Women often spend several hours a day fetching water and fuel-wood. Because much of women's work is done at home or outside the formal economy, it is not fully recognized in the official statistics. Studies in Nepal and Philippines suggest that women production valued contribute to about half of the family income (World Bank 1990). To add on to this, many families are female headed- thus women's earning make a particular contribution to the alleviation of poverty, moreover, women perform such tasks as feeding the family, which directly relieve misery.

Women make a crucial contribution to the health and learning of children thus improving future economic performance. In early stages of development, women tend to bear many children and work in or near the home, whereas men are allowed greater choice of occupational mobility.

2.5 Women Initiatives in Africa n *collapse as intro to the above*

From the foregoing, it is important to look at the role of women under traditional rural conditions in Africa. Women in Africa often are instrumental in shaping both the cultural, economic and physical environment of all the inhabitants (Habitat 1990).

Generally, women create the economic base of rural settlements by providing farm labour, transport and marketing of farm produce by organizing mutual assistance groups. Women also prove household goods, clothing, and food for their families, often. Women influence and make their physical environment by collecting, adapting and/or manufacturing the required building materials, by actually building their families' dwellings, by assisting in choice of sites for communal facilities and taking part in their erection, by decorating their homes, by planting shade trees and ornamental gardens.

Women have always contributed to the social life of their communities in their traditional roles of midwives, herbalists, traditional doctors, dancers, singers, storytellers, basic level teachers and perpetuators of traditions. Towards this end, women contribute quite a lot to employment and income, which is not registered in the gross domestic product of their respective countries. It is assumed that their labour doesn't bear opportunity cost.

2.6 Gender and Participation

It is important to note that woman and men are affected differently by physical and economic conditions. In the same vein, they respond differently to the challenges they face. For example, in arid and semi arid areas, during famines and droughts, men are tempted (most of them give in) to take refuge in towns, never to come back or to re-appear after harvests. Due to their natural responsibilities, women are forced to remain behind fending for the children in ways commensurate with their abilities. The following boxes highlight different results of balanced/imbalanced gender participation.

Box 1: Men- Total exclusion

The Women of Kibwezi (Kenya)[3]

This is a successful story of women reacting to natural calamity (Habitat 1990). It is a story of desperate women who under the guidance of the government and some non-governmental organization organized themselves to realize their life dreams namely: increased food; better health and shelter; and increased cash incomes. This approach allowed them, at a time of great despair and helplessness in the face of a natural calamity beyond their control (the sahelian drought) to become mentally and physically self-reliant and aware of their potential through their own hard work, honesty, perseverance, and willingness to accept new ideas.

Box 1 is about a case in which men were excluded. Box 2 contains two cases. In the first case men played a role, but women deliberately failed to acknowledge them. In the second case, men where included late.

Box 2: Men- unacknowledged (case 1) and afterthought inclusion (case 2)

Women Experience in Machakos (Kenya)[4]

a) Water Tanks Project

Women's groups together with a local NGO, discussed possibilities for an improved water supply. Rainwater harvesting was seen as the best solution. The women were trained in technical skills for making tanks. Within three years about 2000 tanks were constructed. When the funding ended the communities were still motivated to continue, with women taking the lead. Since then another 1000 tanks have been built, e*xclusively with funds from the women and the communities*[5] (section in italics quoted from page 14).

b) Training for Women and Men

Women in Machakos felt that their participation in development was low due to poor levels of education and skills. They requested the Diocese Development Programme

[3] Read more about this in Habitat (1990): The Story of Women of Kibwezi

[4] IRC 1994, Working with Women and Men on Water and Sanitation

[5] Why use the word 'exclusively' when we have 'community' at the end of the sentence. One may be tempted to think that 'community' does not include men, so women succeeded with the help of community, without men!

(Catholic) to offer them PRA training in 1979. After about ten years of separate training and activities, the women felt that their men had to be equally involved. They asked " What about our husbands?" they went on to ask "If we had been getting the training together with our men, we could have been sharing ideas, plans, and development activities in our villages. The results would have been *even more wonderful*!" The idea was accepted and implemented.

Box 3: Women- afterthought recognition

Mtwara Lindi Water Supply Project (Tanzania)[6]

Mtwara Lindi water supply project started in 1972. In 1984, influenced by the UN decade for women, a study was conducted on the effects of the projects on the lives of women. The results pointed out that women's participation in planning and implementation of the projects had been very low and that the proportion of women in the project training had been minimal. This led to women to be involved in the fourth phase of the project. The evaluation of 1987 equated the success of the project with the participation of the rural women.

In Mtwara Lindi case, women were involved at later stage when village water committees had already received training on the project, rendering women committee members disadvantaged. Women as main users of water will be a special recipient group and the success of project will greatly depend on their attitude and participation. FINNIDA (1990) notes the following concerning the inclusion of women and the success of the project:

> "Efforts to improve water use practices in the villages should have the support of the women in order to be successful… to encourage the participation of women, at all stages of water supply development from planning through implementation to operation and maintenance, is to be endorsed… If the project fails to inform and involve this level adequately little actual benefits can be derived from the water supply facilities development however high their technical quality."

However, this does not justify the exclusion of men. FINNIDA (1990) reports that although water is considered a woman's responsibility, men reiterated that they would give money to women to purchase water if paying for it would guarantee an easy access to a reliable source.

Box 4: Men- making their presence felt!

Jealous and threatened men (Zambia)[7]

In rural water project in Zambia the staff decided to give special training courses for women in maintenance and management of the new wells. It was felt that water being a women affair, women would feel more responsible to look after the wells than men. It was also a requirement that at least half of the members of each village water committee were to be women. However, it became apparent that many men were quite jealous of this special attention accorded to women. They boycotted the election of able women in the water committees, and tried to prevent as much as possible women's participation in training.

[6] FINIDA (1994), *Looking at Gender: Water and Sanitation*
[7] Reported by IRC's occasional paper No. 25 on Working with Women and Men on Water and Sanitation.

Box 5: Women and maintenance

Women doing it (Sri-Lanka)

In Sri-Lanka, repairing hand-pumps until recently was a job for men. When hand-pumps were installed in villages they would break down (as many as ten times in two years), the community had to wait for the 'specialist' (men) for repairs. Through the support of Sarvodaya (NGO), women have been trained and they do repairs.

Box 4 provides a clear example of the fruits of open discrimination. The men could not accommodate it, and had to make sure that their presence was felt! It has to be pointed out that the decision to train the women alone was based on a very weak and gender insensitive assumption. One wonders as to whether a needs assessment study had been carried out to justify the exclusion of men from the training. Box 5 presents evidence of women penetrating to what was once considered a male domain in Sri-Lanka. Similarly, women in India (IRC 1994) took up the challenge to change the traditional role of women as helpers in the construction work to actual masons, thus being able to earn wages as men.

2.7 Assessing Socio-economic Costs and Benefits

While billions of dollars are invested every year in water projects in developing countries, only rarely are these investments subjected to serious social and economic analysis. A review of the existing literature on the economic aspect of water supply improvements suggests that surprisingly little empirical work has been done on the subject (Whittington 1992, Kamminga 1991). The introduction of improved water supply not only generates benefits for the community members but costs too. The costs are incurred over a long period of time from the planning, implementation, and maintenance.

Some of these costs include the provision of labour and materials for construction; time invested in community management activities, training and construction; the reduction of employment opportunities in water vending, water carrying and well digging; increased inequality and conflicts among users. The benefits are realized after the completion of the project. These may include reduced distance in search of water; increased time availability for other activities; increased water availability; improved health; and reduced risks resulting from some water sources, for example deep sand wells (scope-holes).

However, no attempt has been made to quantify these costs and benefits (IRC 1991). Given that investment resources are becoming limited, more attention should be focused on cost/benefit analysis of water projects in a bid to make intelligent choices on technology; to assess the level of service; and to consider avenues of pricing and setting user charges. This will ensure maximum utilization of the limited resources available for the water supply systems development.
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2.8 Summary

Water is seen as a female domain, but the emerging physical and economic realities call for cooperation of men and women in search of improved water supply systems. Differences in capacity, ability, time and resources demand the contribution of both parties. From the foregoing literature it is evident that women should not be addressed in isolation. Men should also be incorporated and their opinion sought in relation to water projects. Addressing women in isolation will lead to establishment of 'small women empires' which men can not penetrate thus creating another problem of gender inequality. In Africa, such 'empires' are not popular with men and they (men) do not hesitate to fight or sabotage their activities. For any project to succeed, it is crucial that all members of the community, men and women, are involved and share the work and responsibilities. It is, therefore, important for projects to include some specific programmes for supporting women, and overcoming possible "weaknesses" or disadvantages (IRC 1994).

In Mtwara Lindi case, when women were left out of the project, almost collapsed. The first beneficiaries of improved water system are women thus sometimes men might lack the drive. In the Kibwezi, it was noted that rural societies seemed to collapse when the capacity of women to carry out their manifold duties and responsibilities were diminished or challenged by drought. The project was a success. Men accepted lesser domineering positions. If men were involved in this project, probably the success could have been enhanced. In selecting technology, attention must be accorded to the technologies allowing community participation and gender balance to ensure sustainability of projects.

It is clear that projects where no attention is paid to gender differences chances of success are limited. Gender awareness would help the project staff and field workers to distinguish between needs and interests of women and awareness in a project. It also brings into focus the importance of including women as well as men in the project staff at all levels from the top management down to the field workers. Involvement of both women and men in the staff ensures that different gender interests are catered for. This approach also incorporates single men (widowers or men opting to remain single) whose interests are not represented in women projects. This is because in some cases, husbands' interests influence wives' interests in projects. In the present situation, economic development in rural areas will be enhanced through improved water supply systems and by pursuing a more balanced gender approach. This will release women's energy and time spend fetching water to more productive activities.

It is interesting to note that in most of the gender related literature, most of the cases encountered pointed to successful women projects or failing projects because of exclusion of women. Does it really mean that there are no cases of successful male projects, or female projects failing because of excluding men? IRC (1994, pp18) says that if women are excluded from projects, they will have no interest in the them, and consequently may abandon or neglect any improvements that the project is supposed to provide. So do the men! It is therefore crucial that both women and men should be included in all aspects and stages of a project to ensure that both contribute in its implementation and sustainability, and that the accruing benefits are shared by all.

4.0 OBJECTIVES AND THE SCOPE OF THE STUDY

This study is more complex than an ordinary impact assessment study for it seeks to analyze data being collected by communities, collect historical data about the area and then deal with specific impact data to generate policy options for similar areas which form 83% of the country. The central aspects of concern in this study are sustainability, gender participation and poverty eradication.

4.1 Main Objective

The main objective of the study is to systematically establish whether the project has had social and economic impact in terms of: -

- Increased land output through sustainable agriculture based on optimal use of local resources and natural processes and safe efficient use of external inputs;

- Empowerment of local communities (female and male farmers) who seek to build their future on basis of their own knowledge, skills, value, culture and institutions; and

- How the production is impacting on the standards of living of the local inhabitants.

4.2 Secondary Objectives

- Carry out a constant production share analysis to establish whether there exists trade-off between agriculture and livestock production in the period before and after the construction of the dams.

- Establish how the time and effort saved from reduced water distances is utilized.

- Assess how the increased incomes accruing from increased land output impact on the stability of the family unit, the youth and the welfare of the women and children in the project area.

- Establish how the communities constitute and balance (gender and social stratification) in the dam committees; and the attitude of the community members towards the management style and sustainability of the dams.

- Measure the degree of integration among stakeholders (community, government, and development agencies) in the project area.

- Investigate whether the created opportunities act as incentives to attract people living outside the project area to either acquire or lease land for strategic reasons.

- Identify whether there is organizational, production and social scaling up including influencing policy at the micro, meso and macro level; and to establish the policy implications of all of the above at micro, meso and macro levels.

5.0 JUSTIFICATION OF THE STUDY

While so many resources are being invested every day in water projects in developing countries, only rarely are these investments subjected to serious social and economic analysis. A review of the existing literature on the economic and social benefits of improved water supply systems suggests that surprisingly little empirical work have been done on this subject. However, due to the emerging challenges prompted by changing economic, social and physical realities, more attention should be focused on thorough analysis of improved water supply systems as a way to make intelligent choices on level of service.

Providing water means serving many people through improved water supplies for day-to-day use and for development purposes. A development strategy without multiplier effects is meaningless and more so irrelevant in this era of poverty eradication in Africa. Provision of water has greater externality (spillover effects) compared to other resources. Most of the production problems faced by inhabitants of the project area stem from water scarcity.

The resources committed by local communities and the funding facilitators (development partners) warrant a systematic study of the social and economic effects of the project to draw policy lessons. The obtained results will be of central importance and will determine the viability and replicability of similar projects elsewhere in a bid to fight poverty in Kenya.

6.0 METHODOLOGICAL CONSIDERATIONS

This study drew data from sampled household of both participants and non-participants in the project area. A representative number of households (10% of the total number of households) were sampled using stratified random sampling technique. For the purpose of obtaining a comprehensive picture of social and economic impact of the sand dams, inter-method triangulation (application of both qualitative and quantitative methods in data collection) approach was adopted.

The construction of the survey instrument was done in four stages. First was desk study on all past research in the project area. Data on local production, collected by community groups were analyzed. In the second stage, a limited number of questionnaires were administered to elicit information from the sampled households in the catchment area.

Data analysis employed both descriptive as well as econometric regression analysis. This l yielded both descriptive and inferential statistics used in making predictions and conclusions necessary to answer the study questions. Probabilistic variables were analyzed using discrete choice methodology.

In this first analytical report, data from three sub-locations in Nzambani and Mulango locations is analyzed. Data for dam committee members from Ithumula and Kiindu catchments is analysed.

Sub-location	***No. of Households***	***Sample***	***Justification***
Kyangunga	581	58	❑ Lack of maximum utilization of the facility (observed) ❑ Social disorganization ❑ Social decay
Maluma/Ithumula	1969	197	High level of utilization in terms of domestic consumption and production purposes
Wii	370	37	❑ Organised marketing system
Total		**292**	

Catchment	***Committee members***	***Sample***
Kiindu (includes Wii)	520	52
Ithumula	442	44
Total		**96**

Total: 292+96= 388

ANALYTICAL FRAMEWORK[8]

Studying benefits means identifying casual relationships. This study to analyzes the social and economic impact of sand dams in Kitui district. At the same time it collects baseline data for the areas of Kitui district where sand dams are yet to be constructed. To carry out this multi faceted study, an analytical framework developed by International Water and Sanitation Centre is adopted. However, it must be admitted at this stage that post-construction socio-economic benefits are difficult to capture***. It is difficult to prove that changes occurred because of the improved water supply rather than some other causes. This complexity is handled by analysis of areas not yet constructed.***

The model below shows the steps that have been followed to assess the economic and social benefits derived from the sand dam project and to analyze the influencing factors. It must be noted that factors of influence are partly project related and partly related to the local conditions and dynamics. To bring this idea into perspective, the study area is divided into four catchments representing different ecological zones for analytical

[8] This section draws literature from Kamminga (1991). Useful comments guiding the analytical framework were received from Christine Van Wijk, Senior Researcher at IRC, Delft, The Netherlands

purposes.

A distinction is made between immediate effects on the resource base of communities and the ultimate impact on income levels of communities. For example, possible effects on the resource base are increased availability of time and human labour (energy) and of water for production purposes. These gains can have potential impact on social and economic outputs in terms of increased productivity, income, well-being of the households and/or water collectors, etc. through the devotion of time and energy saving and of more water to production.

STEP A: Concerns the project planning and design. What are the project goals? Are the economic and social needs of the target group taken into consideration, in addition to health problems? Are economic opportunities identified? To what extent will accessibility, quantity, and reliability of the water supply be improved? Is it multiple water use included in the system design (construction; source yield etc.)? Are auxiliary inputs planned to support and promote income generation (that is, credit schemes, skills training, marketing promotion). What are the expected outputs?

STEP B: Deals with implementation. Have the facilities been installed according to the set goals? Has accessibility and quantity of water been improved according to the plans? Have the auxiliary programmes been executed as planned?

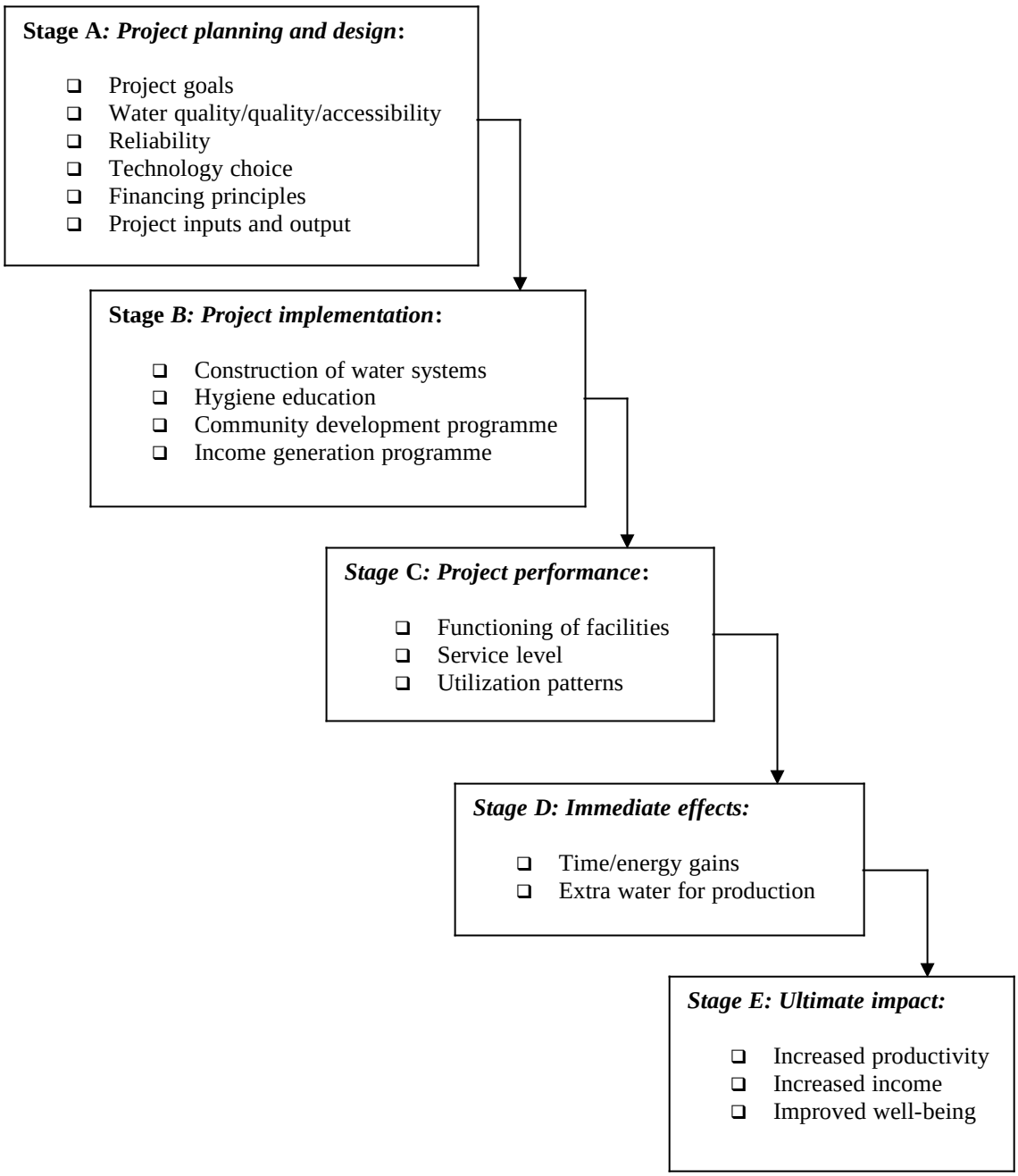
STEP C: Concerns the functioning and utilization of water facilities. Are the water supply facilities and utilized in such a way that benefits can be obtained and sustained in the short and/or long term?

STEP D: This step assesses whether immediate economic benefits occur, and if so, to what extent. How much time and energy are saved and how much has access to water for productive use been improved? How is access and control over these extra resources distributed?

STEP E: Concerns the measuring of the ultimate impact. Have economic and/or social conditions improved? Have the extra resources been used to increase productivity and incomes, or for social purposes? How much income is being generated? Are there any negative impacts, for example on the environment?

Finally, information on positive and negative changes (spin offs) occurring as a result of the impact of the project will be analyzed. Although, one has to note here that such changes might not be noticeable immediately but only after a number of years. Positive changes could be: the position of women has improved; overall ability and willingness to pay for water fees has increased; users feel more motivated to participate in community management; sustainability increased, etc. Possible negative changes are increase of women's workload, environmental degradation around the water sources, etc.

Figure 1: Analytical framework



CHAPTER x: CONCLUSION

The story of sand dams is also a story of another example of positive reaction to drought caused misery and distress. Since 1992, women and men have taken action for survival. This community has proved less conservative and more adaptive to change. Men are accepting a less dominant role. The community has realized its potentials. There is nothing to hold them back and nothing seems to be too difficult to them.

The success of the sand dam project in Kitui is based on community participation, which is strongly rooted in greater understanding of the differences and overlaps between male and female roles and responsibilities. The fact that almost all women involved are housewives suggests that their new roles were accepted and supported by the male members of their respective households and the community at large.

It is worthy to note that times are changing; it is impossible to underestimate or disregard women in rural development. Women are becoming increasingly vocal concerning their rights and expectations in life; their needs; and wishes. This is prompted by the new challenges placed before them by changing physical and economic conditions. In face of the increasing scarcity and hardships in securing family survival, the norms that dictate the behaviour of women and men appear to change. Norms that make women remain invisible and bar them from engaging in productive activities and those, which discourage men from participating in kitchen, duties are getting relaxed.

However, this is not to be misconstrued to mean that women in Kitui are becoming domineering or uncooperative in their families. Rather, this has given them a chance to reason out together for the survival of the family unit in front of these new challenges.

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STRUCTURE OF ANALYSIS

Abstract

1.0 Introduction
1.1 The study area

2.0 Objectives

3.0 Methodology
3.1 Type of data collected
3.2 Sample frame
3.3 Sampling
3.4 Analytical framework

4.0 Findings
4.1 Time Savings and the Reallocation of Saved Time
4.1.1 Water collection and time potential (Measure improvements in the following aspects after the sand dam project)

* Time and energy on water collection- walking to water source (distance), waiting (queuing, rationing), water lifting (depth of scoop holes), carrying of water (mode of water fetching).
* Time budget (time allocations- proportion of time allotted to water fetching activities)
* General impact on water carriers (mostly women and girl child)- Quality of sleep, school attendance punctuality and absenteeism)

4.1.2 Volume of time and energy gains

* Accessibility
* Functioning and level of the new supply (sufficient discharge, adequate outlets, reliable functioning, maintenance)
* Water use: Data on quantities of water the households fetch and how it is broken down into its various uses will be analysed in this section. Strength of correlation between water quantity and means of fetching will established.

4.1.3 Reallocation of time and energy gains for production

* Releasing labour to other productive activities

4.1.4 Distribution and control of benefits

4.2 Availability and Use of Water for Production

4.3 Water source choice

4.3.1 Choice: This section will examine the impact of sand dams as far as distance to water source, number of trips is concerned. Data on household water source in both dry and wet season (before and after the construction of sand dams) will be analysed. This will be compared to data collected from a similar area (baseline).

4.3.2 Reason: Ranking of reasons as to why households prefer certain sources will be analysed in this sub-section.

4.3.3 Water source choice model

Choice of water source will be regressed on the following variables to establish the statistical strength of each variable both in dry and wet season in the period before and after the sand dams construction. A similar regression will be carried out in the baseline area:

* Household size
* Proportion of females
* Distance to water source
* Daily water use
* Household expenditure

4.4 Importance households attach to their present water source and willingness to pay for improved water supply system

4.4.1 WTC: This will be measured by community's willingness to accept compensation (WTC) for the loss of their main water source. Comparison will be made between the sand dam catchments and other areas (baseline).

4.4.2 WTP: Data on willingness to pay (WTP) will be analysed in this section. This will seek to establish

whether households living with and without the sand dams are ready to pay for improved water source and the respective amount they are actually willing to pay.

4.5 Water related diseases

Data on quality of water and incidences of water borne diseases will be analysed in this section. Further, this section will zero in on the mitigation measures a household takes against water borne diseases.

4.6: Community organization and mobilization

APPENDICES: