

**Economic Impacts of the Sand Dams of Kitui:  
Opportunity for Increased Incomes and Reduced  
Poverty**

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**Impact Study Proposal**

**Prepared for:**

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## **1. Introduction**

Kenya is among a group of countries faced with inadequate renewable resources. It is estimated that only 45 percent of Kenyans have access to clean water. Clean water does not designate portable water. Generally, communities living in 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 (ASALs) have limitations in accessing sources of water for domestic use and production. They use open water sources, more prone to contamination. Proximity to water source, quantity and opportunities for multiple uses are some of the most important considerations in choosing water source and provision technologies.

Water is a common denominator and a major development input; and thus remains the most essential development commodity in Kitui 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 seasonal rivers and springs to serve them. Water scarcity is Kitui's greatest limitation to development. Akong'a, (1985) saw water shortage as the greatest barrier to better conditions of living in Kitui both in the villages and in urban centres. Water scarcity in this district is linked to unfavourable weather conditions, non-availability of permanent rivers across the vast district, few seasonal streams

and inadequacy of both internal and external resources to develop alternative ways of water provision (O’Leary, 1979).

## **2. Sand Dams**

The story of sand dams in Kitui is an example of positive reaction to drought caused misery and distress. Since 1995, women and men in Kitui have taken action to assure their survival. To date, communities living in the Central, Eastern and Southern parts of Kitui district with assistance from SASOL have constructed over 450 sand dams. Globally, this is the highest concentration of sand dams.

Sand dam refers to a concrete barrier on an ephemeral river. Although the upper side of the wall may be hidden by sand, the lower side is usually exposed, either due to excavation by water when the river is flowing or by design. In the past, 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. The geology of an area determines whether the sand dam technology can be used for water provision.

In Kitui District, construction of sand dams has brought about a unique dimension in the whole water development process in the area. This is because the applied technology is simple and lends itself to participatory

development methodologies. Sand dams are not new in the district. The first ones were constructed during the colonial period in 1920's and 50's and most of them are still in existence (example: Mung'eeto wa Kwa Nzamba in Mathima, Mutomo Division, constructed in 1928). Thus this technology has thus gone through the most severe test of all - time.

### **3. Research Problem**

Results from a study conducted in 2002 indicate that after the sand dam project, distance to water sources, water quantities and quality, depth of scoop holes during the dry season improved. Cost of water also reduced as scoop holes infiltration rates and distances to water sources improved and reduced respectively. Increased economic activity driven by the availability of water is afoot. Households have planted fruit trees and engaged in vegetable growing. There are extensive introduction of new crops and activities. Perhaps most significant impact is the reduction in time and labour spent on water fetching chores. It is this saved labour that is now applied in assuring food security for the people of Kitui clearly understand that the key development constraints are water for production and food insecurity.

The study also established that sand dam technology is suitable in socio-economic terms for provision of water in Arid and Semi-Arid Lands (ASALs). They are easy to construct, operate and cheap to maintain. Its maintenance and operational needs meets the local expertise and resource endowment.

These findings are part of the reason why this experimental development project was undertaken. Its basic justification was to produce production water. It stands to reason then that the production parameters of the areas where the sand dams have matured have changed. This also logically has led to improvements in incomes and thus improvements in food security, nutrition and health. The need now then is to answer some economic questions in detail to identify future capacity building activities as well as to document the direct and indirect economic impacts of this technology.

#### **4. Objectives**

The main objective of this study is to systematically evaluate the economic impacts of the sand dam project and its potential to increase household incomes and to reduce poverty in ASALs. The specific objectives are:

1. To ascertain magnitude of time saved from water fetching activities.
2. To estimate the incomes accruing from enhanced old economic activities.
3. To estimate the incomes resulting from increased new economic activities.
4. To establish the implication of these incomes on household poverty levels status.

## **5. Research Questions**

- What is the magnitude of time and energy saved from water collections chores after the construction of the dams?
- How is this saving in time and energy used? Old or new production activities?
- Have incomes from old production activities improved?
- Are there new economic activities driven by the availability of production water?
- What are the incomes generated by these new economic activities?
- What is the impact of the dams on nutrition, health and food security of the households and communities with production water?

## **6. Rationale**

According to the Economic Recovery Strategy for Wealth and Employment Creation 2003-2007 and Poverty Reduction Strategy Paper (2001), the immediate objective of the Government is to increase income and food security of smallholders ASALs households. The inadequate and inefficient rural infrastructure, including limited accessibility to water for production, poor access roads and environmental degradation have been cited as some of the problems bedeviling the survival ASALs households.

While many resources are invested in water projects in developing countries, rarely are these investments subjected to rigorous social and economic analysis (Whittington, 1992). A review of the existing literature on economic and social benefits of improved water supply systems surprisingly shows that little empirical work has been done. Shrinking economic resources call for more attention to be paid to empirical analysis of water supply technologies. This will ensure that the limited available resources are devoted to worth projects.

This study would be of crucial benefit to various government ministries (especially in the envisaged decentralised system<sup>1</sup>), NGOs crusading for food security and improved ASAL households' livelihoods as well as other policy makers. The end product of this study will be a report and policy briefs to be shared widely with stakeholders in this sub sector.

## **7. Conceptual Framework**

Figure 1 below conceptualizes the impact of sand dams project and the interactions of various variables in understanding food security<sup>2</sup> and standards of living of households in the project area. A generally accepted definition of food security is a situation in which households at all times have access to adequate quantities of safe and nutritious food to lead a healthy and active life (Lynton-Evans, 1997; FAO, 1997; Ayalew, M., 1996;

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<sup>1</sup> The government is expected to decentralize decision processes with an intention of ensuring that the needs of the population living in an area are addressed in a democratic and transparent manner

<sup>2</sup> Food security definition has evolved over the years from simply preoccupation with supplies of food to national self-sufficiency to include household ability to feed itself.



Kigutha 1995; Ayelew 1988), and when households are not at undue risk of losing such access (Von Braun et al, 1998, Bahiigwa 1999).

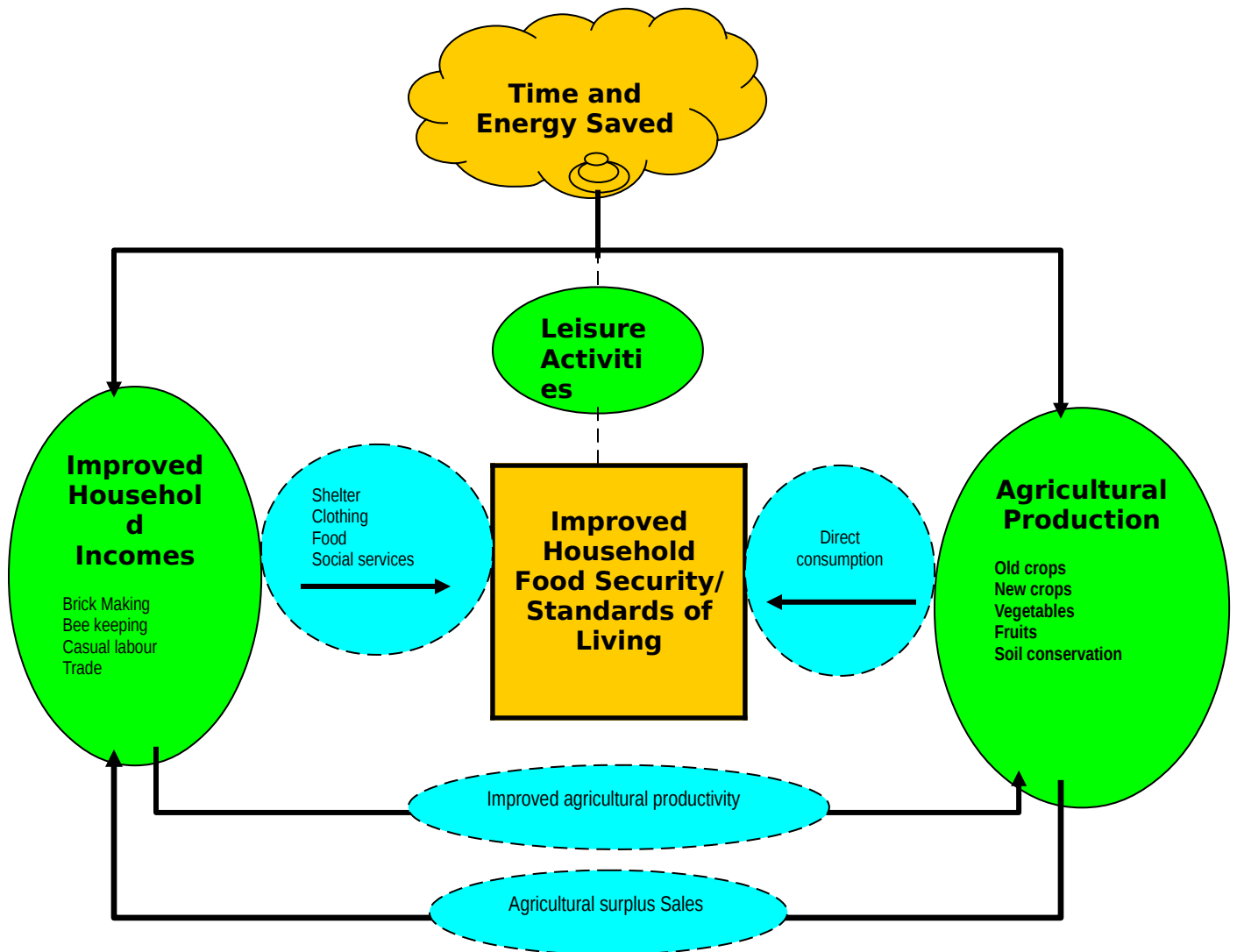
Sand dam project potential to reduce poverty rests in its ability to increase rural households incomes and improved food security status as a result of saved time and energy from water fetching activities. Households in the project area have several options on how to utilize this increased time and energy at their disposal. They could choose to engage in agricultural production activities as a result of increased productive water or to get involved in other economic non-agricultural activities<sup>3</sup>.

Households improved food security is directly as an outcome of increased agricultural productivity, introduction of new and more nutritious crops such as spinach, kales, onions, tomatoes, sugarcane, arrowroots and as well as a variety of fruits. Household ability to feed itself is associated with increased incomes accruing from engagement in other economic activities such as brick making; bee-keeping; proceeds from surplus tree seedlings, vegetables and fruits sales. Enhanced incomes afford households better shelter, clothing, access to social services, access to other types of foods not grown in the area but available in the near markets. These relations are summarized in figure 1 below.

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<sup>3</sup> Some households devote their extra time to certain non-economic activities, which the current study is not keen to pursue.

Figure 1: Conceptual Framework



## **8. Methodology**

This is will be a qualitative and quantitative social survey and adopts cross-sectional<sup>4</sup> design. The study will focus on the specific conditions in these areas using a range of tools including in-depth household surveys. Although the unit of analysis to answer most of the economic questions will be households, it will be necessary to carry out field observation and focused group discussions in the areas to get a complete picture of sand dam impacts.

The first stage will be literature review and secondary data collection to refine the survey design and instruments. The second stage will involve reconnaissance visits and formal survey with use of questionnaires by a team of eight (8) enumerators supervised by two (2) a researcher for four weeks (20 days).

The study will focus the old Central Division since the construction started there. Four river catchment areas will be involved in this study, namely: Ithumula, Wii, Kyangunga and Tungutu. These communities in these catchments have been most active in utilizing production water. A total of 400 structured questionnaires (100 per catchment) will administered to sampled households in the study area. Based on population density of each catchment, stratified random sampling will be used to identify households

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<sup>4</sup> Entails the collection of data on more than one case and at least at a single point in time in order to collect a body of qualitative or quantifiable data in connection with two or more variables, which are then examined to detect patterns of association.

for interview. The probability of a household to be interviewed will be proportional to the catchment's population size. Data collected in 2001 will serve as basis for comparisons.

Both univariate and bivariate statistical techniques will be applied in data analysis. Frequency tables and graphs, cross tabulations, correlation and analysis of variance (ANOVA) will be used. The main output of this study will be a consultancy report.

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## Financial Proposal and Work Plan

### Work plan

	First Month				Second Month				Third Month				Fourth Month				Fifth Month				Sixth Month				Seventh Month				Eighth Month							
	Week				Week				Week				Week				Week				Week				Week											
Activity	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Literature Search	■	■	■	■																																
Develop Research Tools					■	■	■	■																												
Pre-test and revise tools									■	■	■	■																								
Training of Enumerators													■	■																						
Actual Data Collection													■	■	■	■	■	■	■	■																
Data entry and Cleaning																					■	■	■	■	■	■	■	■								
Data Analysis																													■	■	■	■				
Report Writing																																	■	■	■	■

### Proposed Study Budget

<b>Activity</b>	<b>Item/Particulars</b>	<b>USD</b>
<b>Pre-testing</b>	Travel-Hire of 4WD @ USD66/day for five days	330
	Fuel Costs @ USD0.1/Km for 1,200Kms	120
	Subsistence- 2 Researcher @ USD66/day for 5 days	660
	Driver @ USD46/day for 5 days	230
<b>Field Work</b>	Salary-8 Enumerators @USD55/day for 20 days	8,800
	Subsistence- Researcher @ USD66/day for 20 days	1,320
	Subsistence- Driver @USD46/day for 20 days	920
	Travel-Hire of 4WD @USD66/day for 20 days	1,320
	Fuel Costs @0.1/Km for 5,000Kms	500
	10 paged questionnaire photocopying (4000 pages @USD0.04/page)	160
	Stationery-20 pens, 20 pencils, 10 folders, 20 erasers, 8 sharpeners, 15 note books	30
	Data Entry and Cleaning- 2 Assistants@55/dayfor 20 days	2,200
<b>Researcher Time</b>	Literature Search- Researcher @USD135/day for 5 days	675
	Development of Research Tools- 2 Researchers @USD135/day for 5 days	1,350
	Pre-testing and Revision of Research Tools- 2 Researchers @USD135/day for 5 days	1,350
	Training of Enumerators- Researcher @USD135/day for 2 days	270
	Actual Data Collection- Researcher @USD135/day for 20 days	2,700
	Data Analysis & Report Writing - 2 Researchers @USD135/day for 10 days	2,700
	Administrative Costs	4,000
<b>TOTAL</b>		<b>29,635</b>