



ISSN 2278 – 0211 (Online)

## Community Participation in Water Sector Governance in Kenya: A Performance Based Appraisal of Community Water Management Systems in Ngaciuma-Kinyaritha Catchment, Tana Basin, Mount Kenya Region

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### **Abstract:**

*The Republic of Kenya initiated key reforms in 1999 for its water sector governance, which culminated with the release of a water act in 2002. In compliance to the Water Act 2002 and to enhance their water security, local stakeholders in Ngaciuma-Kinyaritha came to create the unique Water Resource Users' Association (WRUA) in that catchment in 2006 amid many Water Service Providers (WSPs) and Community Water Management Systems (CWMSs). How would the Water Resource Management Authority (WRMA) integrate the existing CWMSs in the legal and institutional frameworks guiding the development, supply, utilization and conservation of local water resources by the new WRUA? Should these CWMSs seek registration to qualify as WSPs? This study sought to assess the performance of all the above key institutions involved in the management of water resources and supply of water services in Ngaciuma-Kinyaritha Catchment of the Tana Basin of Mount Kenya Region. It basically aimed to isolate the contribution of CWMSs to domestic water security in the catchment among other Water Service Providers (WSPs) and managers (WRUAs). Empirical tools of scientific research employed to achieve these objectives included a household survey of 165 farmers and 36 in-depth interviews. The analysis encompassed an appraisal of the performance of these water governance institutions based a Performance Assessment and Evaluation (PAE) approach. Findings revealed that CWMSs played and keep playing a key role in developing the existing water resources, thus increasing farming water profitability in the catchment. These CWMSs were achieving 30% of the targets of the water sector reforms in ensuring domestic water security in Ngaciuma-Kinyaritha Catchment among other WSPs and the WRUA. If their technological innovativeness on water supply and catchment management was enhanced, these institutions would perform better and make a greater contribution to the success of the water sector reforms therein. Hence, WRMA, WRUA and WSPs shall not neglect to integrate them in their legal and institutional frameworks for future collaboration.*

**Keywords:** *Catchment Degradation, Catchment Rehabilitation, Community Water Management System (CWMS), Legal and Institutional Framework (LIF), Performance Assessment and Evaluation (PAE), Water Sector Reforms*

### **1. Introduction**

Water is an essential natural resource that shapes regional landscapes and is vital for ecosystem functioning and human well-being (Emerton and Bos, 2004). The structure and functioning of aquatic and terrestrial ecosystems critically depend on the availability of sufficient amounts of water and its temporal distribution (Falkenmark and Röckström, 2004). Especially for mankind, it is the backbone of economic growth and prosperity, social well-being and welfare. Consequently, human overuse of water resources,

primarily in agriculture, has diffused contamination impact on freshwater for domestic use (Gleick, 2003). Sadly, community ability to effectively manage its water resources and enable easy access to water services is being compromised by men and women, who misuse water and land resources, finances, industries and other firms as well as their own governance (Crow and Sultana, 2002). This water insecurity puts water resources under considerable pressure, hampering the harmonious functioning of various ecological systems and altering the global hydrologic cycle. As a corollary, water pollution, especially in urban settings, has affected agricultural lands and the ecological functions of water bodies, soils and groundwater as well as their roles in the water cycle, since these pollutants are naturally decomposed and filtered thus reducing the buffer capacity of water bodies (DeWit and Stankiewicz, 2006). At the global scale, this water insecurity is affected by global changes, be they climatic, hydrological, geomorphologic, demographic and economic in nature, which has serious consequences on the people and their environment (Huggins, 2002; Gleditsch et al., 2004). Water insecurity in many parts of the world is increasing as water quantity and its quality decrease. Human appropriation of surface and ground water, changes in land use and land cover, release of harmful gases, agro-chemicals and solid wastes into the environment, and other pressures are also contributing to the decreased levels of water in streams and lakes (Shivoga et al., 2007). The resulting degradation of water resources impedes access to and affordability of safe water, and threatens human well-being and development, and are intimately linked to poverty in many parts of the world (Luwesi, 2010; Ngonzo et al., 2010; Luwesi et al., 2011; 2012). Thus, humans being become both the causes and casualties of water insecurity.

In order to finding satisfactory solutions to this water crisis, a number of initiatives have been launched over the past decades (Subramanian and Ramanathan, 2001; Förch et al., 2005; World Bank et al., 2008). These include community development initiatives aiming at organising and managing natural resources in a sustainable way (Njonjo and Lane, 2002). Across Africa, it is increasingly recognised that both statutory and customary institutions shape water management (van Koppen, 2007). It is therefore important to understand the contradictions and complementarities between statutory and customary institutions supported by different types of authority (Lankford et al., 2004; Malzbender et al., 2005). In Kenya, the Water Act 2002 has introduced comprehensive and, in many instances, radical changes to the legal framework governing the whole water sector. These reforms revolve around the following four themes: (1) decentralization of functions to lower level state organs; (2) the involvement of non-governmental organizations in the management of water resources and in the provision of water services; (3) the separation of the management of water resources from the provision of water services; and (4) the separation of policy making from day to day administration and regulation; (Ngigi and Macharia, 2007; K'akumu, 2008).

The Water Act 2002 relegated the Ministry of Water and Irrigation (MWI) to a policy and coordinating agency and vested the Water Resources Management Authority (WRMA) with the daily management of water resources, and the Water Service Regulatory Board (WSRB) with that of regulating water supply. In this framework, community water is supplied through the Water Service Providers (WSPs), thus excluding Water Resource Users' Associations (WRUAs) from supplying water services. Section 53 (2) of the Water Act 2002 stipulates that WSPs shall only be either a company, a non-governmental organization or a person providing water services under and in accordance with an agreement with a licensee [the WRSB] (Republic of Kenya, 2002). Section 15(5) states that WRUAs will act as fora for conflict resolution and cooperative management of water resources (Republic of Kenya, 2002). Yet, most CWMSs are busy supplying water services while subsequently conserving the catchment area, as autonomous organized groups within their respective communities (Lelo et al., 2005).

That is the case for Ngaciuma-Kinyaritha Catchment, where only one established WSP serves part of it, namely the Meru Water Supply and Sewerage Services (MEWASS), the remaining water supply services being attributable to several CWMSs venturing therein. Even so, WSPs as well as WRUAs and WRMA are not willing to assign some tasks to well performing CWMSs to assist them in meeting the triple sustainability goals that foster economic profitability, social equity and environmental soundness in the catchment (Vishnudas, 2006). Thus, this study sought to assess community perception on the effectiveness of the management of their water services and resources in Ngaciuma-Kinyaritha Catchment of the Tana Basin (Mount Kenya Region) before and after the release of Water Act 2002. Why is such a study really needed?

First, the information on various parameters relating to CWMSs is only known to the people operating within their locality: operators, managers and those benefiting from their services. There is also a great need to study and document the dynamics and the performance of these systems in terms of effectiveness and efficiency to determine their ability to contribute to water security in the catchment. This may contribute to designing a strategy that will enable the attainment of the goals of the water sector reforms. The following sections present the materials and methods used in the study, as well as key findings arising from the analysis and their discussions.

## 2. Material and Methods

Material and methods presented in this section include the geographical setting of the study area, sampling strategy and sample size, methods of data collection and analysis that match the study objectives.

### 2.1. Geographical Setting of the Study Area

Ngaciuma-Kinyaritha is a sub-catchment of the Tana River emanating from the Mount Kenya Region. The latter is a water tower for three main basins of Kenya, namely Athi, Ewaso-n'giro and Tana catchments. Ngaciuma-Kinyaritha covers an area of 167 km<sup>2</sup>, its population was estimated to about 65,000 heads in 2009, which represents a density of 390 persons/ km<sup>2</sup> (KNBS, 2010). The catchment is mainly located around Meru Municipality, in Imenti North District of Eastern Province of Kenya. The catchment is geographically bound by latitudes 37.5° E and 37.75° E, and 0.04° N and 0.15° N (Fig. 1).

The catchment area is mainly dominated by undulating terrains highly dissected by streams, and with altitudes ranging from 1,120 m to 2,600 m. Kinyaritha is one among other tributaries of Kathita, which drains in the Tana River. The other tributaries include Ngaciuma, Kambakia and Gachiege. It is dominated by basaltic volcanic rocks with volcanic tuffs and pyroclasts of Nyambeni eruption of the Pleistocene (Agwata, 2006). As a result, soils in the catchment are geologically young, poorly consolidated and susceptible to erosion and mass movement, except for the forested parts. These soils are as well subject to high infiltration and seepage rates, especially on hillslopes (Förch, et al, 2008). This justifies the little or no significant permanent surface drainage in the upper catchment area, with exception of Lake Nkunga crater that is fed by three springs and has a sub-surface outlet.

Climatic conditions in Ngaciuma-kinyaritha range from humid to semi-humid with mean annual rainfall estimated from about 1,100 mm (in the lower zone) to 1,600 mm (in the upper zone), with an average of 1,315 mm, and annual temperatures ranging from 10°C to 30°C. The catchment lies under three coffee agro-ecological zones (AEZ), namely the Upper Midland AEZ 1 (UM 1), which is suitable for the coffee-tea cropping; the Upper Midland AEZ 2 (UM 2), which is the main coffee zone; and, the Upper Midland AEZ 3 (UM 3), the marginal coffee zone (Jaetzold et al., 2007).

Socio-economic activities are dominated by farming for both subsistence and commercial purposes. Subsistence farming includes bananas, maize, beans, potatoes, yams, arrow roots, sweet potatoes, finger millet, peas, cowpeas, sugarcane, and a wide variety of fruits and horticultural crops. Commercial farming involves the cultivation of horticultural crops, macadamia nuts, coffee and fruits. Lumbering is another source of income where trees such as eucalyptus, cypress and grevillea and other indigenous trees are grown for timber and firewood.

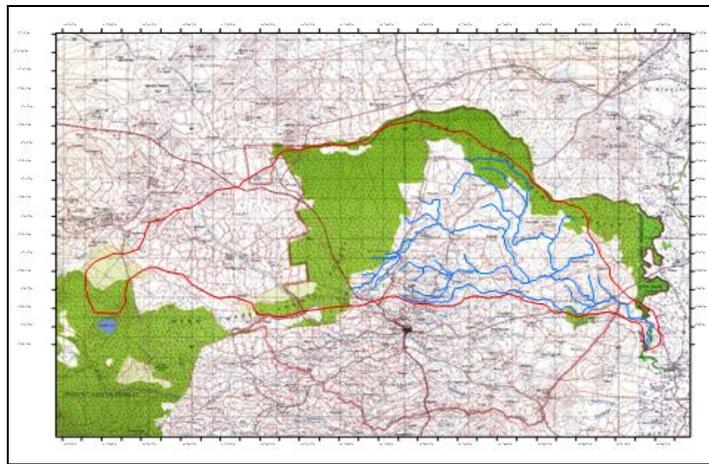


Figure 1: Map of the Ngaciuma-Kinyaritha Catchment (Förch et al., 2007)

The demand for more firewood coupled with the demographic pressure and economic activities have contributed to the reduction of the forest cover from 37% to 24% between 1987 and 2000, and to the depletion of wildlife in the forest reserve (Förch, et al., 2008). Apart from Meru Town, which is the major commercial centre in the catchment, small market places spread across the catchment, including Gitimene (Naari), Muruguma, Kienderu, Chugu, Kauthene, Rwanyange, Ndiine, and Mugeene. These market centres are connected by earth roads, which are often affected by roadside erosions, gullies and other complications due to water disasters. The major tarmac roads, Meru-Maua and Meru-Nanyuki, traverse the catchment, and serves as a major linkage between Ngaciuma-Kinyaritha and the rest of the country.

## 2.2. Sampling Methods

Ngaciuma-Kinyaritha Catchment was purposely selected owing to the fact that it was among the pilot catchments selected by the WRMA for rehabilitation, and saw the emergence of a WRUA in 2006. The catchment was divided into three different hydro-ecological zones: Ngaciuma, Kinyaritha Minor and Kinyaritha Major. Some 177 households were selected in three zones using Gregg (2009) sample size formula [Equation 1]:

$$\begin{aligned}
 n &= Z^2 * \frac{p(1-p)}{\epsilon^2} \\
 &= \frac{3.84 * p(1-p)}{\epsilon^2}
 \end{aligned}
 \tag{Equation 1}$$

Where,

- $\epsilon$  is the precision of the estimate within a particular confidence interval (in this case  $\epsilon=5\%$ )
- $Z$  is the Z-score for the selected significance level ( $Z=1.96$  at 5%)
- $p$  is the true proportion of the population represented by the sample (in this case 10%)

The above representative sample was estimated at 95% confidence interval based on a total number of households of 14,440. Survey units were randomly selected in the three sub-catchments indicated above using the table of random numbers. Hence, 87 farmers were selected in Kinyaritha Major, 45 in Kinyaritha Minor and 45 in Ngaciuma. These farmers belonged to about 32 CWMSs that were involved in this evaluation.

It shall however be noted that the researcher was only able to administer a total number of 165 questionnaires, owing to the fact that 4 farmers were not disposed to answer to the questions and returned the questionnaires at the very last minute, while 8 among them provided wilful misleading responses, leaving thus to a total number of 165 genuine respondents, 95.5% in Kinyaritha Major (83 instead of 87), 93.3% in Kinyaritha Minor (42 instead of 45) and 88.9% in Ngaciuma (40 out of 45). Thus, the final sample size reported below amounts to 165 farmers, who successfully replied to the questionnaires.

### *2.3. Methods of Data Collection*

Data used in this study encompassed socio-economic data as well as physical data. Socio-economic data were collected during a household survey (based on 165 questionnaires), in-depth interviews (involving 36 local administration officers) and a Focus Group Discussion (FGD) held with 8 key informants from the 32 CWMSs. The questionnaires and interview guides were structured in such a way that they could provide both qualitative and quantitative data sets. They compounded both close and open ended questions administered on randomly selected 165 households. A pre-test of the questionnaires was done in order to make useful adjustments or clarifications of some questions that were not clear. A structured interview was conducted with 36 local administration officers contacted at each sub-catchment, namely Ngaciuma, Kinyaritha Minor and Kinyaritha Major. A model for Performance Assessment and Evaluation (PAE) was developed to provide a basis for panel discussions (during FGDs) involving only 8 representatives of CWMSs of the location. The consolidation of these data provided a background on the nature, efficiency and effectiveness of CWMSs, WRUAs and WSPs operating in Ngaciuma-Kinyaritha Catchment (Ochieng, 2005). Recommendations from the study will hopefully assist in developing a robust PAE for Mount Kenya Region in the future.

Secondary data were mainly collected using a documentary review on the Tana Catchment Management Strategy (CMS) and Ngaciuma-Kinyaritha Water Resource Users' Association (NGAKINYA WRUA) Sub-Catchment Management Plan (SCMP) (Forch et al., 2007; 2008; WRMA, 2010). Other secondary data were collected from libraries and the internet, mainly from the Kenya Meteorological Department (KMD), the Ministry of Water and Irrigation (MWI), the Water Resource Management Authority (WRMA), the Meru Water Supply and Sewerage Service (MEWASS) and other public bodies. Finally, computational data were collected using GPS, photographic devices, satellite images and topographic maps.

### *2.4. Methods of Data Analysis and Results Interpretation*

All data collected above enabled the development of a database in SPSS and MS Excel spreadsheets. On-farm survey files displayed 165 cases times 67 variables, while the FGDs and in-depth interviews generated some 448 and 504 cross-sectional data, respectively, for 20 variables each, 8 participants to the FGDs and 36 key informants. These data were first pre-processed than processed using adequate methodological approaches.

#### 2.4.1. Methodological Approaches of the Study

Data pre-processing was done by activating Data View and Variable View spreadsheets in the Statistical Package for Social Science (SPSS) and data input in MS Excel spreadsheets. This was followed by the coding of information and data entry into files. Once finish, data outliers, mistakes and errors were checked, identified and cleaned. Finally, the assessment of the overall quality of the dataset concluded the exercise to enable quantitative data analysis.

The actual analysis involved both qualitative and quantitative techniques along with a triangulation of data and methods. The only qualitative technique used in this study involved pattern/ content analysis, the remaining part of the analysis being quantitative. Quantitative techniques of data analysis mainly involved a Performance Assessment and Evaluation (PAE) of water management in the catchment. The latter was supported by a scorecard of key water management systems operating in the catchment, and occasionally by descriptive statistics, mainly frequencies, means and cross-tabulations.

#### 2.4.2. Focus on Performance Assessment and Evaluation (PAE)

Performance Assessment and Evaluation (PAE) was conducted to induce a performance utility ratio of the CWMSs' contribution to domestic water security in Ngaciuma-Kinayaritha. The focus of existing Performance Assessment and Evaluation (PAE) approaches utilized for Community Water Management Systems (CWMSs) is on continuous improvement of internal core-processes without having regards for an industry standard for comparative service benchmarking (Kazbekov et al., 2009). In order to monitor and evaluate consolidated CWMSs a formalized data collection and monitoring system named "Robust PAE" needs to be put in place to facilitate uniform evaluation across various CWMSs based on consistent performance metrics (HM Treasury, 2011). A robust PAE among consolidating CWMSs requires a formative or summative process for making policy adjustments from initiatives or through gap and trend analysis (Morra-Imas, and Rist, 2009). Rogers (2005) notes that the robust PAE method differs from existing PAE approaches by using robust performance assessment to construct consistent efficiency-based metrics. These robust metrics objectively quantify the CWMS' abilities to attain the Regional Drinking Water Supply (RDWS) systems' goal. These outcomes of the robust PAE model help decision-makers to make effective policy adjustments or efficient resource allocations among the water governance institutions within a larger water resource management system (Furubo, 2009).

Among socio-economic factors affecting water allocation efficiency in Mount Kenya Region figure the affiliation to a CWMS and the role of gender effectiveness in the management and conservation of water resources (Förch, et al., 2005; 2007). Other significant socio-economic factors have been emphasized in this study and submitted to a performance utility ratio scale that moves into the foreground the contribution of local CWMSs in ensuring domestic water security among other water service providers and water resource managers. A robust PAE was used to determine the efficiency and effectiveness of each one of these actors involved in water resource management and water services provision. The latter include MEWASS, NGAKINYA WRUA and anonymous CWMSs. Their ability to contribute to water security in Ngaciuma-Kinyaritha was assessed against the attainment of the goals set by the Tana CMS and the NGAKINYA WRUA SCMP (2007-2010). A rating of the utility of these institutions by local stakeholders was done during the FGD to enable a PAE of each actor involved in the management of water security in the catchment. A triangulation of all these results helped in recommending the development of model for benchmarking and monitoring CWMSs' service delivery and their incorporation in the formal institutional frameworks of the Mount Kenya Region.

### 3. Findings and Discussion

This section presents and discusses findings on the performance appraisal of water governance institutions in Ngaciuma-Kinyaritha Catchment in the year 2012. It comprises five basic building blocks of the score matching approach used, namely: (i) Overall performance of community water governance institutions; (ii) Water services provision and its environmental sustainability; (iii) Water resource management and social inclusion; (iv) Economic development and business success; and (v) Farming water development and profitability.

#### 3.1. Key Results From the Study

Regarding the Overall performance of community water governance institutions, Fig. 2 shows that CWMSs operating in Ngaciuma-Kinyaritha Catchment globally performed fairly well in both water resource management and farming water development (62%) and ensuring water supply sustainability (50%). However, they fared badly in achieving economic development in the catchment (36%).

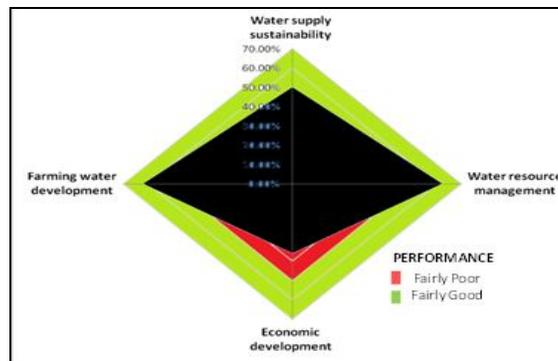


Figure 2: Community water management systems performance in Ngaciuma-Kinyaritha<sup>1</sup>

Note: <sup>1</sup> The blackish polygon in the centre of this figure shows CWMS Performance in Ngaciuma-Kinyaritha

Table 1 shows a total rate of 53.6% for CWMS performance in management of both water resources and services, while their contribution to water security amounted to only 30.3%. The services provided by the WRUA and WSPs were rated “fairly well” (62.2% and 54.4%, respectively), while CWMSs’ contribution to water supply sustainability and environmental management was rated “fairly poor” (50%) (Table 2). However, all these community water governance institutions recorded a “fairly poor” contribution to water security in Ngaciuma-Kinyaritha. This was likely due to insufficient and inadequate technological means and the lack of contingent plans to curve water disasters.

INDICATOR	NGAKINYA WRUA		MEWASS		CWMS	
	Rate	Performance	Rate	Performance	Rate	Performance
Water supply sustainability and environmental management	62.2%	Fairly well	54.4%	Fairly well	50.0%	Fairly poor
Water resource management and social inclusion	71.1%	Fairly well	60.0%	Fairly well	62.2%	Fairly well
Economic development and business success	68.0%	Fairly well	68.0%	Fairly well	36.0%	Fairly poor
Farming water development and profitability	62.0%	Fairly well	46.0%	Fairly poor	62.0%	Fairly well
Total Points out of 2800	1500		1600		1850	
Average Percent (%) out of 100	66.1%	Fairly well	57.1%	Fairly well	53.6%	Fairly well
Contribution to Water Security(%)	37.4%	Fairly Poor	32.3%	Fairly Poor	30.3%	Fairly Poor

Table 1: Water institutions' utility based performance rating in Ngaciuma-Kinyaritha

No	PREDICTOR	CWMS	MEWASS	NGAKINYA WRUA
1.	Distance to water source	50	80	60
2.	Water quality	40	70	40
3.	Water services affordability	80	50	70
4.	Water supply system self sufficiency in management	30	80	60
5.	Water catchment management authority capability	80	30	90
6.	Drought Prevention/ disaster preparedness	30	0	40
7.	Traditional methods replaced by modern methods	40	80	60
8.	Soil conservation effective	60	20	80
9.	Water conservation effective	40	80	60
	TOTAL POINTS OUT OF 900	450	490	560
	AVERAGE PERCENT (%)	50%	54.4%	62.2%
	PERFORMANCE RATING	Fairly Poor	Fairly Well	Fairly Well

Table 2: Water supply provision and sustainability in Ngaciuma-Kinyaritha

All water institutions performed “fairly well” in water resource management and social inclusion with overall rates above 60% (Table 3). CWMSs were particularly lauded for being culture friendly and gender sensitive (100%), to some extent socially inclusive, when it came to decision-making and conflicts resolution (60%). However, their technological inefficiency would not allow them contributing very much to improvement of life and health, drought control as well as to reducing the time and distance for fetching water (50%). Thus, they were rated “fairly well” (62.2%).

No	PREDICTOR	CWMS	MEWASS	NGAKINYA WRUA
1.	Water supply/ management system respects local culture	100	75	80
2.	Water supply system/ catchment management gender sensitive (different roles for women, youth and men)	100	75	100
3.	Contribution to life improvement	50	50	60
4.	Decreased frequency of drought	50	0	60
5.	Reduced distance for fetching water	50	90	60
6.	Reduced time for fetching water	50	80	60
7.	Reduced cases of water borne diseases	40	80	60
8.	Public consultation/ involvement in decision-making	60	20	80
9.	Decreased cases of conflict on water use	60	70	80
	TOTAL POINTS OUT OF 900	560	540	640
	AVERAGE PERCENT (%)	62.2%	60%	71.1%
	PERFORMANCE RATING	Fairly Well	Fairly Well	Fairly Well

Table 3: Water resource management and social inclusion in Ngaciuma-Kinyaritha

The assessment of CWMSs' success in economic development and business management revealed that these traditional institutions were not cost-effective (50%) and thus could not add value to the existing infrastructure in the catchment (25%) and reduce water price fluctuations due to seasonality (50%) and foster new businesses (35%). Hence, their overall performance in the economic and business sector was rated "fairly poor" (36%) (Table 4).

Table 5 reveals that CWMSs alike Ngakinya WRUA have a fair capability (62%) in developing water resources to ensure farming profitability, which WSPs do not have. They have a strong influence on community beliefs and motivations and can play a key role in mobilizing community members, especially women, to participate in the implementation of water and soil conservation measures in the catchment, beside encouraging farmers to harvest rainwater and pay for environmental services. However, their ability is very limited when it comes to managing water cost and increasing farming yield.

No	PREDICTOR	CWMS	MEWASS	NGAKINYA WRUA
1.	Water supply/ management network covers the whole catchment	20	60	90
2.	Use of water charges (tariff/ price)	50	100	100
3.	New investments in irrigation schemes in the area	25	20	35
4.	Increased economic activities due to water development	35	75	40
5.	Reduced seasonal variability of water cost	50	85	75
	<i>TOTAL POINTS OUT OF 500</i>	<i>180</i>	<i>340</i>	<i>340</i>
	<i>AVERAGE PERCENT (%)</i>	<i>36%</i>	<i>68%</i>	<i>68%</i>
	<i>PERFORMANCE RATING</i>	<i>Fairly Poor</i>	<i>Fairly Good</i>	<i>Fairly Good</i>

Table 4: Economic development and business success in Ngaciuma-Kinyaritha

No	PREDICTOR	CWMS	MEWASS	NGAKINYA WRUA
1.	Water conservation and harvesting for agriculture	60	20	60
2.	Reduced water cost in farming	50	30	40
3.	Increased yield in farming	40	60	50
4.	Encourage farmers to adhere to community water management system	100	20	80
5.	Encourage farmers to pay for more effective and efficient management of water resources in the catchment area	60	100	80
	<i>TOTAL POINTS OUT OF 500</i>	<i>310</i>	<i>230</i>	<i>310</i>
	<i>AVERAGE PERCENT (%)</i>	<i>62%</i>	<i>46%</i>	<i>62%</i>
	<i>PERFORMANCE RATING</i>	<i>Fairly well</i>	<i>Fairly Poor</i>	<i>Fairly well</i>

Table 5: Water development and farming profitability in Ngaciuma-Kinyaritha

### 3.2. Discussion

With the ongoing implementation of the water sector reforms, it appears that Water Service Providers (WSPs), notably MEWASS, and the Ngaciuma-Kinyaritha Water Resource Users' Association (NGAKINYA WRUA) are wholly able to achieve nearly 70% of water security targets in Ngaciuma-Kinyaritha Catchment. The remaining one-third can be attributed to the CWMSs, mostly known as "Self-Help" groups. Though, CWMSs particularly lacked technological innovativeness to ensure that water is brought near homes (50%) in a self sustaining way (30%), and conserved with improved quality and quantity (40%), it is a fact that they provide affordable water services. In effect, it was observed by the local farming community that water services provided by Ngakinya WRUA and CWMSs were affordable to 70% and 80% of the population, respectively, while MEWASS services were generally rated expensive. These two community water governance institutions (WRUA and CWMSs) also excelled in the management of the water catchment (90% and 80%, respectively), and the application of effective soil conservation measures (80% and 60%, respectively). However, none of all these organizations was found capable of preventing drought of any kind or any other type of water disaster. Hence, the contribution

of CWMSs to the success of the water sector reforms in Ngaciuma-Kinyaritha shall not be neglected, if water security is to be achieved at any time. These organizations control one-third share of water security in the catchment and need to find their place in whatever legal and strategic mechanism to be put in place by WRMA to enable them align their activities within the reforms agenda. Therefore, the future well-being of the riparian zone is closely linked to how well cooperation can be established between national and regional policy-makers, on one end, and local community leaders, on the other end, to define a coherent management framework and enforcement mechanisms (Ayling and Kelly, 1997). Lelo et al. (2005) provided a case of the ecological degradation of the riparian zone that occurred in River Njoro Catchment when governmental policies and laws tended to conflict with local people's traditions and cultural practices. Typical of the semi-arid basins in the Rift Valley of Kenya, this catchment area was undergoing a new phase of rapid land use change in part of the lands located in the upper sub-catchment, and continued significant growth in both rural and urban populations and associated economic activities. Shivoga et al. (2007) testify that considerable negative environmental impacts are generally noted, in particular with regard to the quality and quantity of water flowing in the river, when national laws conflict with local practices. The resolution of the many problems facing the River Njoro Catchment and others in the region sharing similar problems requires a multi-pronged approach. This includes new institutional frameworks to bring together government agencies, NGOs and other stakeholders of the riparian resources in dialogue and negotiation. Therefore, the future condition of riparian resources and services will be closely linked to how well all the stakeholders can cooperate to define a coherent management structure and enforcement mechanisms that will be acceptable to all (Lelo et al., 2005). Thus, the need for understanding Community Water Management Systems (CWMSs) prior to defining any management rules in the water sector is repeatedly highlighted in this study to increase the sustainability of development projects amidst concerns for environmental degradation.

In Kenya, the Water Act 2002 has empowered local communities to engage in the supply and management of water resources. However, it is not clear how these legal and institutional frameworks may be adapted to enable local CWMSs (traditionally known as "self-help" groups) to influence institutional efficiency, responsive service delivery and equitable distribution of benefits. The new water law also fails to recognise the importance of gender relations, and specifically the participation of women, in managing water resources. This is against the backdrop that women are the main users and managers of water across the nation (Suda, 2000; Katui-Katua, 2004; Were et al., 2006). Zwarteveen and Meinzen-Dick (2001) argue that as a source of power differences, gender influences effective management of natural resources but is often ignored when states decentralise the management of natural resources to communities (Meinzen-Dick and Zwarteveen, 1997; Bouwer, 2003). Vernooy (2006) argues that the exclusion of women in decision making not only delays delivery of benefits but also affects equity and institutional efficiency unfavourably. This disparity in management and usage of water has resulted in poor performance of water projects in Kenya and other developing nations (Maharaj et al., 1999; Suda, 2000; Nishimoto, 2003).

#### 4. Conclusion and Recommendations

To ensure domestic water security a CWMS need not to be legally registered as a Community Based Organization (CBO) under a WRUA neither be permitted as a WSP to supply water services a certain target community, which members consensually agreed on its formation. The above results demonstrated that, though informal, self-help groups play a very important role in assuring social consensus for the "sustainability" of communal water resources. Owing to the volatile status of water security in Ngaciuma-Kinyaritha Catchment, these CWMSs may have a significant contribution in ensuring social inclusion in water supply, catchment management and water disaster preparedness. They have played and will keep playing a key role in the development of water resources through increasing farming water profitability in the catchment. Their achieving 30% of the targets of the water sector reforms reinforce local stakeholders' determination to ensure domestic water security using socially acceptable and economically feasible organizations such as these "self-help" groups, WSPs and the WRUA, among others. Not only they partly achieve the targets of the water sector reforms, they also empower local community members to take their own destiny at hand, without waiting for governmental interventions. Moreover, under their leadership, community members are more inclined to subject to governmental regulations and authorities, namely WRMA and WRUA, in order to achieve to their full potential the targets of the water sector reforms in Ngaciuma-Kinyaritha Catchment. If their technological innovativeness on water supply and catchment management was enhanced, these institutions would perform better and make a greater contribution to the success of the water sector reforms. Hence, WRMA shall train WRUAs and CWMSs in group formation and capacity development to upgrade their traditional technologies and uphold modern technologies for managing water resources and mitigating environmental risks. WRMA, WRUAs and WSPs shall not neglect CWMSs, but rather integrate them in their legal and institutional frameworks for future collaboration. Policy-makers shall therefore find a way to restructure WRUA's operations to ensure a close co-operation with CWMSs, especially where the efficiency and effectiveness of WRUAs are hampered by natural, socio-political and technical constraints. Other WSPs, including MEWASS, need to take into consideration local people affordability when setting their prices, and set a budget aside for supporting activities related to the management and conservation of the catchment by WRUAs and/or CWMSs.

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