EVALUATING WILLINGNESS TO PAY FOR WATERSHED PROTECTION IN NDAKA-INI DAM, MURANG'A COUNTY, KENYA

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ABSTRACT

Payment for Environmental Services is an incentive based approach in natural resource management linking the suppliers and consumers of goods and services from a natural resource in a way that both parties contribute to improved delivery Nairobi City gets 80% of water supply from Ndakaini dam but few of the residents are able to link availability of clean water in their pipes to conservation of water catchments areas. The objective of the study was to find out whether users of water from Ndaka-ini dam could participate in watershed protection scheme through Payment for Water Services. The study identified factors that could influence willingness of water users to pay for the environment services. Primary and secondary data were collected based on baseline survey and qualitative research approaches, interview schedules, questionnaires and focus group discussions. Results showed that 83% of farmers are willing to participate in scheme aimed at improving conservation. There was significant relationship between source of water and amount of money they could give but attached condition of clean and regular water. The government could make use of the findings of the study to develop a payment of environment service model for Ndaka-ini dam.

INTRODUCTION

Forests worldwide form vital catchments for rivers that provide water for irrigation, domestic, industrial and power generation thus contributing to growth of the world economies. The Millennium Development Goals (MDGs) had set the agenda for global world growth up to year 2015 (MDG, 2008). Goal number 7 aimed at ensuring environmental sustainability with the set targets of integrating principles of sustainable development into policies and programme, reversing the loss of the environmental resource, reducing biodiversity loss, and reducing by half the proportion of the population without sustainable access to safe drinking water and basic sanitation by 2015. The report noted that 1.2 billion people in the world lived under conditions of physical water scarcity whose symptoms include, environmental degradation and competition for water (MDG, 2008). Though access to improved drinking water has expanded, nearly one billion people do without it and its use has grown at more than twice the rate of the population for the past century (MDG, 2008). However, failure to recognize the economic value of water has led to its unsustainable use and degradation of its natural base in many regions of the world (NCCRS, 2010).

The MDGs were replaced with Sustainable Development Goals (SDG) that will guide world development up to 2050. Goal number six aims at ensuring water and sanitation for all. It recognizes that clean and accessible water for all is an essential part of the world and though there is sufficient fresh water on the planet to achieve this, bad economics or poor infrastructure lead to death of millions of people every year from diseases associated with inadequate water supply, sanitation and hygiene (Universal Sustainable Goals, 2015). The SDG aims at achieving universal and equitable access to safe and affordable drinking water for all; provide access to adequate and equitable sanitation and hygiene, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials. It also aims to half the proportion of untreated wastewater, , substantially increase water-use efficiency across all sectors, ensure sustainable withdrawals and supply of fresh water to address water scarcity, substantially reduce the number of people suffering from water scarcity by 2030 and protect and refurbish water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes by 2020 (UN SDG, 2015).

Millennium development and sustainable development goals in Kenya were operationalized through government blue print contained in Vision 2030, which set a road map

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for the country's development. It aims at making Kenya a newly industrialized middle-income country with high quality of life for all citizens by 2030 (Vision 2030, 2007). Conservation of water catchments and development of water resources is covered under the Water Act (2016) and the Forests Management and Conservation Act (2016). The Water Act provides a framework for development of water sector in the country with clear institutions for water providers, users and regulators. The Forests Act, provide a framework for involvement of the communities adjacent to a forest resource in conservation and management while addressing the society needs. The main sources of water in Kenya are the commonly referred to five water towers namely: the Aberdares, Mt. Kenya, Mau, Cherangani and Mt. Elgon. In 2012, the water towers were increased from 5 to 18 based on the need to capture other key water towers that supply water in the country (Kenya Water Towers Agency, 2012). According to Kenya Water Master Plan (2013), the main challenges facing conservation and protection of water catchment areas include weak institutional relations, conflicting institutional mandates, lack of funding mechanisms for Water Catchment Areas (WCA), inadequate flow of information , lack of integrated monitoring and evaluation systems, low capacity and awareness of stakeholders, land degradation, poor management of water resources and waste, insecurity, over-dependence on biomass energy and limited involvement of women and youth in WCA activities.

The major threats to water towers are degradation, change in land use and unsustainable management practices (KFWG and DRSRS, 2009). Degradation has resulted in reduced water supply making Kenya to be classified as water scarce country, with water endowment at 400 m^3/*capita*, which is far below the global UN benchmark of 1,000 m^3 per capital (MEMR (2012). By year 2012, the water supply in Nairobi was 580,000 m^3/day against a demand of 750,000 m^3/day. This demand was projected to increase to 860,000 m^3/day by 2017 and 1.2 million m^3/day by 2035, requiring large and sustained investments in expanding water supply to meet the growing water needs (Nairobi Water Master plan, 2012). Many dams and water-pans were dug to supply water for farming, domestic and industrial and these have become degraded, and silted . Rapid population growth has exerted immense pressure on the quality and quantity of water (Ministry of Environment and Mineral Resources, 2012).

To ensure sustainable conservation of water catchments areas, it is important to link the providers of environmental goods and services with the users. Payment for Ecosystem services (PES) which is the practice of proposing incentives to farmers/landowners or protected area managers in exchange for managing their land or resources, in exchange to providing some environmental service, provide this vital link (MEMR, 2012). National Forest Program identified opportunity to apply PES schemes to protect and conserve forest ecosystems noting that government institutions have responsibility to promote PES and support partnerships as well as ensure enabling legal framework is in place (Ministry of Environment and Natural Resources, 2016). Objectives of this study were to (i) determine the willingness of the downstream buyers to pay for watershed protection services and socio-economic factors influencing their ability and (ii) identify socio-economic issues influencing the willingness of the downstream buyers to pay for watershed protection.

METHODOLOGY

Study Area

The study was carried out in the areas designated as catchment areas for Ndaka-ini dam which is located in Gatanga and Maragua districts, Murang'a County as shown in Figure 1. Gatanga District (36° 44' 39.46" E ; 37° 00' 58.03" E and 0° 42' 13.28" S ; 1° 01" 12.72" S.) lies in longitude This area is at an elevation of 1,340 -2,190 m asl within agro ecological zones UH0, UH1, LM1, UM1 and UM2 (MoA, Gatanga District, 2010). Water catchment areas for the dam include the entire Sub-locations bordering the dam and those situated between the dam and the forest of which Kimakia and Gatare forests stations are covered.

The study area is about 80 km north of Nairobi and 40 km west of Thika town on the slopes of Aberdare forest at the tip of Thika and Maragua districts in Murang'a County. The Ndaka-ini dam's catchment area measures 75 km^2. It consists of Kimakia and Gatare Natural forests which form Aberdare Ranges. The main rivers that drain into the Dam from this catchment are Thika, Githika and Kayuyu. Thika drains 50%, Githika 30% and Kayuyu 20% of the catchment into the Dam, respectively (Athi Water Profile, 2015).

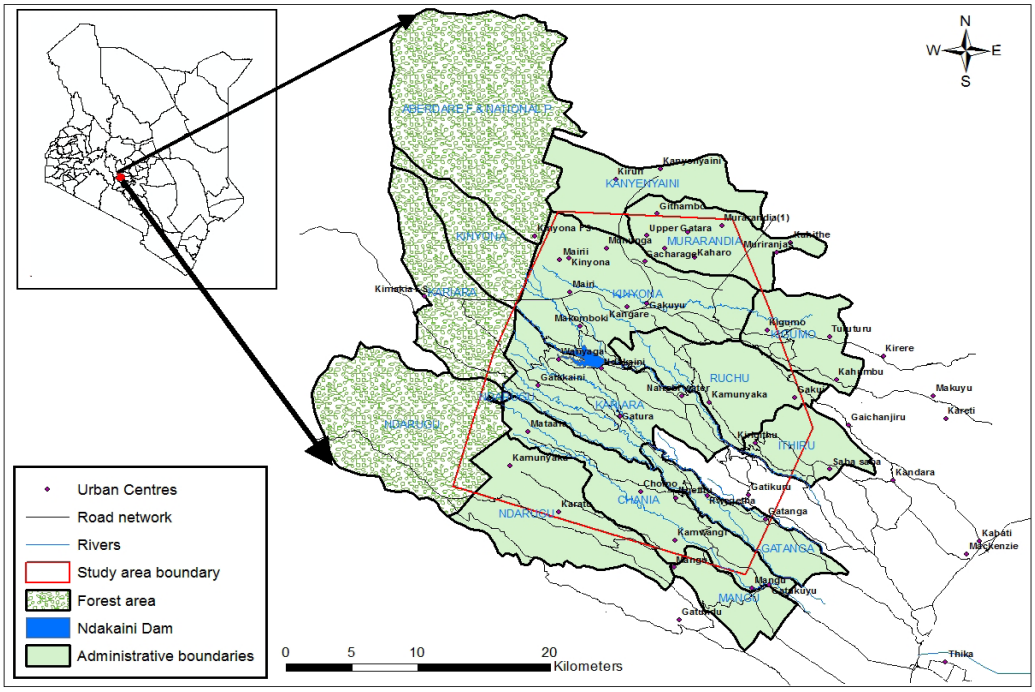

Figure 1. Location of the study area, Source: Kagombe and Kiama, (2012)

Sampling Design

Cluster sampling was used based on the data of water users that was obtained from Gatanga Water and Sewerage Company. The sampling frame was the number of water users supplied by Gatanga Water and Sewerage Company in the lower catchment of the dam. The data collection method was adopted from Waage *et al.* (2005) and Ruhweza and Wage (2002). Data collection methods included pre-testing of the questionnaire and collection of secondary data on climate variables and socio-economic trends in the area. Primary and secondary data were collected. Primary data were obtained from the study sites by use of semi-structured interview schedule, questionnaire and Geographical Information System (GIS). Primary data included; socio-economics household information, land use changes, conservation activities, willingness to adopt conservation practices, willingness to pay for ES, institutional and legal framework for PES.

Interviews were administered to land users and foresters in the dam catchments area, water users, key informants, managers of institutions supplying water, large consumers of water, and water treatment companies. The issues captured for consumer included: socio-economic household data that affect economic decision, quantity of water consumed per household, alternative water sources, reliability of water source, quality of water, relation of water supply and conservation activities and willingness of the water user to pay for conservation of watershed.

Secondary data were collected from reports, books, public records, data sets held by institutions. These included; rainfall trends, intake and outtake of water in the dam, physical planning, on-farm tree planting, infrastructure growth, community structures, livelihood options for the farmers, policy and legal frameworks, household characteristics, history of the dam, trends of water use by consumers and challenges in water provision.

RESULTS AND DISCUSSION

Demographic characteristics of Water Consumers

Water consumers included individual households and large institutions within and around Thika town. Out of the 339 water consumers interviewed, 59% were males and 41 % were females. A study by Grafton *et al.* (2009) have shown that household characteristics that include the number of people in the household (adults and children), size of household, level of education and household

income has significant and positive effects on household water consumption.

Conservation of Watersheds and willingness of Water Consumers to Pay for Management of Watershed

The first objective of the study was to find out whether downstream water consumers were able to link water they consumed to conservation of watersheds and their willingness to pay for management of watersheds. To address this objective, study respondents were asked to indicate main sources of water for household use. Table 1 shows water consumers' responses on the main sources of water for households use.

TABLE I- MAIN SOURCES OF WATER FOR HOUSEHOLD USE IN LOWER CATCHMENT OF NDAKA-INI

Sources of water	N	Percent
Tapped water	116	34.2
Borehole	93	27.4
River/streams	73	21.5
Shallow well	33	9.7
Rain water	24	7.1
Total	**339**	**100.0**

As shown in Table I, 34.2 % water consumers used tapped water in their homes, 27.4 % used borehole, 21.5% used river/streams while 7.1% used rain water. This implied that most of the households in the lower catchment Ndaka-ini were not supplied with tapped water. As a result, significant proportions of them opted to use ground water sources such as boreholes, shallow well and stream water. It further emerged that in some areas where good quality water was lacking, farmers harvested rain water for domestic use. The study sought to determine whether consumers with piped/tapped water were aware of the sources of water supplied in their homesteads. In response, 98.3% indicated that they were aware (Figure 2).

The study sought to know regularity of water supplied to the household. Table II shows consumers' responses on frequency of water supplied to their homesteads.

TABLE II - FREQUENCY OF WATER SUPPLIED TO CONSUMERS IN LOWER PARTS OF NDAKA-INI DAM

Water supply	n	Percent
Everyday	8	6.9
Once per week	38	32.8
2 days per week	25	21.6
Once per month	33	28.4
3 days per month	12	10.3
Total	**116**	**100.0**

In this study, it was clear that 32.8 % of the consumers got water once per week, 28.4% had water once per month, 21.6% were supplied with water two days a week, and 10.3% three days per month while 6.9 % water consumers were supplied with water every day. This implied that most households were not frequently supplied with

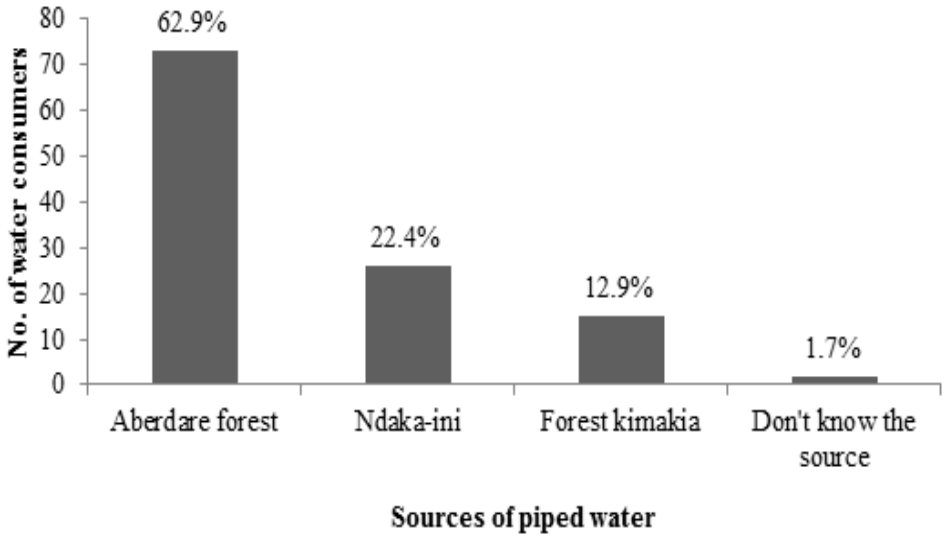

Figure 2. Sources of piped water for consumers in lower parts of Ndaka-ini dam.

water resulting to them exploring alternative sources of acquiring water. Irregular supply could be associated with shortage of water from catchment areas, high population of water consumers in the community and also poor water supply management.

To establish level of respondents awareness on water supply information, the researcher asked respondents to indicate whether there was a link between water supplied in their homesteads and conservation of water sources. In response, 58.6% consumers confirmed that there was a link between the supply and conservation while 41.4% consumers felt that there was no link between the two. Furthermore, those who indicated there was a link gave details of the connection of household water and conservation as in Table III.

TABLE III - CONNECTION OF HOUSEHOLD WATER AND WATER SOURCE CONSERVATION IN LOWER PARTS OF NDAKA-INI DAM.

Link	n	Percent
Tree planting	22	19.0
Aberdare forest	16	13.8
Water catchment conservation	15	12.9
Riparian area conservation	11	9.5
Farming systems	4	3.4
No link	48	41.4
Total	**116**	**100.0**

This study revealed that 19.0% of the consumers indicated that the link between water supply and water source conservations was through planting of trees(Table IV) It was clear that 41.4% of respondents had no link between water and conservation activity. This could have adverse effect on any conservation linkage efforts as they may not support such activity. Awareness creation on payment for ecosystem service will provide this vital link to enable households to appreciate that positive conservation activity can lead to improved water services. One way of achieving long term protection of watershed is ensuring good conservation management and providing incentives sufficient to discourage further encroachment on and degradation of natural ecosystems (Rebecca *et al*. 2012). The study sought to know threats to conservation of water catchment areas. Table IV shows consumers' responses on threats at water catchment areas.

TABLE IV -RESPONSE TO CONSUMERS' IN LOWER PARTS OF NDAKA-INI ON THREATS TO WATER CATCHMENT AREAS.

Threats to water catchment areas	N	
Unfriendly trees	29	25.0
Climate change	19	16.4
Drought	15	12.9
Deforestation	14	12.1
Riparian cultivation	12	10.3
Lack of awareness	12	10.3
Poor farming practices	6	5.2
Land size	4	3.4
Pollution	3	2.6
Policies	2	1.7
Total	**116**	**100.0**

In this study, 25.0% of the water consumers indicated that major challenge faced at water catchment areas was concerning environment where unfriendly tree species like *Eucalyptus* led to drying up of water catchment areas and reduction of aquatic organisms that depend on critical thresholds of water (Dugan *et al*. 2010). Irregular climatic change was another threat that was a concern to most farmers. According to 16.4% of the water consumers, climatic change threatens the survival of species and the integrity of ecosystem. For instance, global warming has led to increased rainfall in some areas, with others experiencing severe droughts. An increasing frequency of extreme climatic conditions is aggravating the state of the available freshwater resources. Furthermore, two similar proportions (10.3%) of the respondents indicated that cultivation of riparian areas and lack of awareness among farmers, were other major threats at water catchment areas, respectively. This implied that lack of awareness among the community members on importance of conservation of catchment areas negatively influenced farmers' utilization of watershed resources. In an attempt to probe acceptable amount of cash incentive, farmers were required to indicate levels of incentives that would make them take PES initiative (Table V).

TABLE V - AMOUNT FARMERS WERE WILLING TO BE OMPENSATED TO PARTICIPATE IN THE PES SCHEME IN NDAKA-INI.

Amount compensated	Yes		No		Not applicable	
	n	%	n	%	n	%
KES 5, 000	0	0.0	279	82.8	58	17.2
KES 10, 000	13	3.9	266	78.9	58	17.2
KES 20, 000	21	6.2	258	76.6	58	17.2

The results of this study showed that all farmers who were willing to participate in the scheme indicated that they would not participate if compensated KES 5,000 per year. However, 3.9 % farmers would participate if compensated 10, 000 while 6.2% farmers would participate if compensated KES 20,000. This showed that the amounts of money farmers were compensated had a great impact towards their willingness to participate in the scheme. This is related to the annual income of households in the area who are predominantly in tea farming which gives high returns. A similar study conducted in Nairobi showed the mean WTP was about KES 275/month, which is equivalent to approximately US$3. This was almost 25% of the average survey monthly water bill. This apparently large WTP value reflected the extent of water shortages in the survey area and people's preferences to pay for reliable water supply. The study showed a wide variation of water bills for households (from KES. 120 -900 i.e., approximately from USD 1.5 to 11.25 per month) and likewise a wide variation in WTP (Balana and Catacutan, 2012). Farmers were more willing to accept rewards in kind as shown in Table VI.

TABLE VI - INCENTIVES FARMERS WERE WILLING TO TAKE TO PARTICIPATE IN CONSERVATION IN NDAKA-INI.

Reward system	n	Percent
Water supply	161	47.8
Carbon credit	37	11.0
Power supply	36	10.7
Firewood provision	33	9.8
Tree seedlings	26	7.7
Fodder provision	23	6.8
Water pumps and storage tanks	21	6.2
Total	**337**	**100.0**

The results of this study shows proposed reward system that gives farmers incentives to participate in conservation activities. Majority (47.8%) of the farmers suggested that provision of water supply could influence their participation in water conservation activities, 11.0 % indicated carbon credit while 10.7 % indicated power supply. Other reward systems mentioned included water pumps and storage tanks, fodder provision, tree seedlings and firewood supply. The type of reward was consistent with earlier baseline information that showed that most of farmers around the dam were not connected with tapped water.

Large-scale Water Users

Among the 30 large-scale water users sampled in Thika, 46.7% were industries, 16.7% were educational institutions, 16.7% were catering providers, 10.0 % were health institutions and 10% were rental units. All the institutions were supplied with tapped water.

Results indicated that most (53.3%) of the institutions were paying an average bill of KES. 5,001 to 50,000 per month while an additional 20% were paying between 50,000 to 100,000 per month. Water bill paid by an institution could be an indicator of their dependence on water source and their likelihood to support conservation effort in the catchment areas. The managers of institutions further reported that there was a link between the quantities of water supplied to conservation activities. Main link (33.3%) was bills they received for water supplied and tree planting/reforestation activities. The other link was conservation of water catchment areas (20.1%) and afforestation (20%) followed by creating awareness on good water conservation activities and efficient use of water resources. This provides a leeway for PES as conservation and tree planting activities that contribute to 40.1% could be tied to the incentive provided through payment of water bills.

These links could build a case for the conditions that may be attached to PES as they are likely to influence the water institutions in supporting conservation practices. The users of water services are likely to support incentives aimed at sustaining and/or strengthening an identified link. While a

third of the users could connect water supplied with water bills, the other two thirds indicated a connection of water supplied to conservation efforts. This means that activities aimed at improving conservation would be welcome by consumers. The managers of the institutions indicated that there are major threats to water catchment areas as shown in Table VII.

TABLE VII -INSTITUTIONS PERCEPTION ON THREATS TO NDAKA-INI WATER CATCHMENT AREAS.

Threats	**Frequency**	**Percent**
Pollution	9	30.0
Mis-management of farms	6	20.0
Deforestation and forest encroachment	6	20.0
Climate change	4	13.3
Ignorance	2	6.7
Illegal water connections	2	6.7
Land use change	1	3.3
Total	**30**	**100.0**

As shown in Table VII, the respondents indicated that the main threats to water catchment areas were pollution (30 %), mis-management of farms (20%) and deforestation and forest encroachment (20%). This indicates that there are areas PES could intervene to improve the catchment areas. All the managers agreed that they had a role to play in order to improve water supply in institutions and also contribute towards conservation activities. The response from managers reflected challenges faced by water catchment areas as contained in Water Masteplan that include land degradation and soil erosion, poor management of water resources, water insecurity, poor waste management, and livelihood insecurity stemming from land degradation of water catchment areas among other (MENR, 2012).

The institutions were willing to provide incentives towards conservation of water sources as shown in Figure 3.

Among the 30 managers who took part in the study, 50.0% were willing to offer support in kind, 33.3% were willing to support community project while 16.7% were willing to give cash. Further enquiry showed that cash of incentives managers were willing to provide per month varied from KES. 1000 to 200,000 as shown in Table VIII.

TABLE VIII - CASH INCENTIVES MANAGERS IN THIKA WERE WILLING TO GIVE TO SUPPORT CONSERVATION.

Amount in KES. Per month	**Frequency**	**Percent**
1000 to 10,000	8	26.7
10,001 to 30,000	16	53.3
30,001 to 50,000	1	3.3
50,001 to 75,000	3	10.0
150,001 to 200,000	2	6.7
Total	**30**	**100.0**

As shown in Table VIII, over 50.0 % of the managers were willing to offer over KES. 10,000 per month to support water conservation activities. In return to supporting conservation activities, the institutions attached conditions as shown in Table IX.

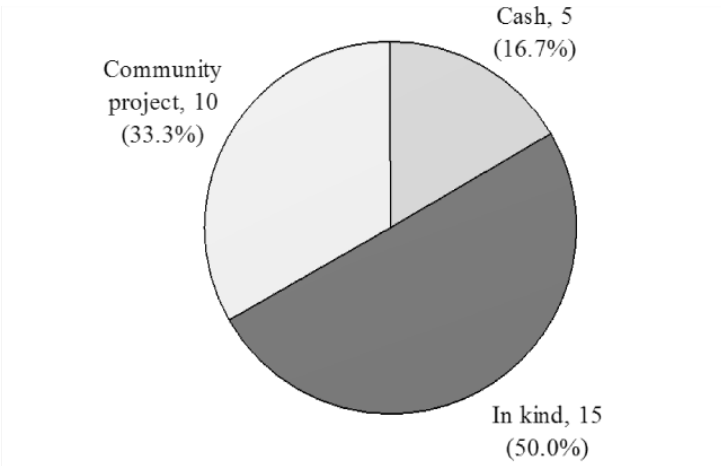

Figure 3. Types of incentives managers are willing to give to support conservation activities in Ndaka-ini

TABLE IX - CONDITION ATTACHED TO INCENTIVE BY MAIN WATER USERS IN THIKA.		
Condition	**Frequency**	**Percent**
Conservation efforts	13	43.3
Constant water supply	8	26.6
Collective responsibility	6	20.0
Maintain planted trees	2	6.7
Reduction in water bills	1	3.3
Total	**30**	**100.0**

As shown in Table IX the main conditions managers were attaching to the incentives they were willing to provide were to see efforts put in place for water conservation activities (43.3%), having constant water supply (26.6 %) and the collective responsibility of the water consumers (20.0%). Conditions attached were in line with enhancing conservation and improving water supply. Study conducted in East Usambara showed that there was a trade-off between the conditionality level and payment required to encourage participation (Karczan *et al*., 2012).

Economic Incentives Provided by Consumers to Farmers in Support of Watershed Protection

The second study objective was to find out economic incentives provided by the consumers to farmers in support of watershed protection. To respond to this objective, water consumers were asked to indicate whether they were willing to support conservation activities. In response, all (100.0%) respondents reported that they were ready to offer their support in order to ensure there is continued water supply in homesteads. Figure 4 illustrates incentives given to support conservation activities.

As shown in figure 4, 47% water consumers supported community projects, 37.9% offered in kind support whereas 14.7% consumers offered their support through giving out money. For those willing to give support in cash; 15.5% were willing to support conservation activities by paying KES 50-100 per month, 29.3 % by paying KES 101-300 monthly while 0.9 % indicated KES 301-500. However, 54.3% consumers never supported conservation activities. This shows that less than half of the respondents were willing to pay the amount specified for watershed protection. Further analysis revealed a relationship between the amounts of money farmers are willing to give in support of conservation activity to the main source of household water as shown in Table X.

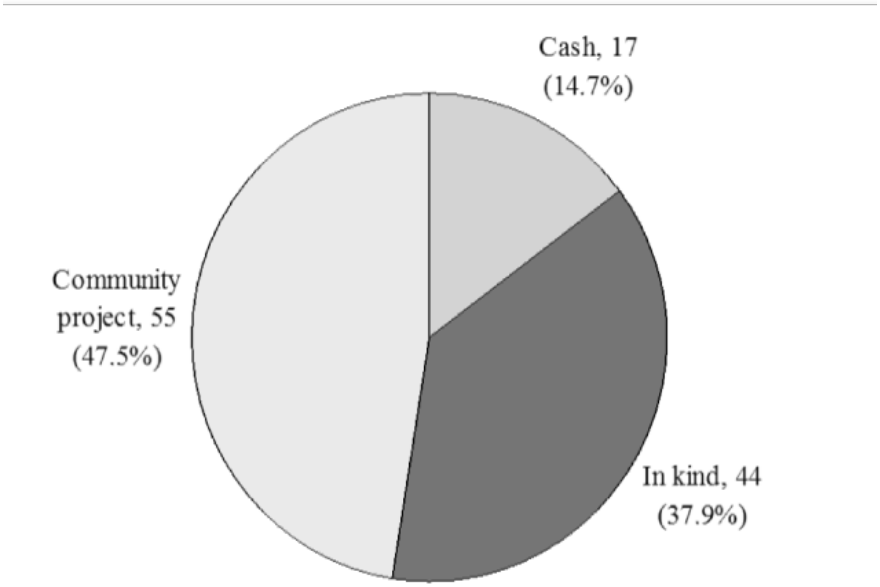

Figure 4. Incentives given to support conservation activities by consumers in Gatanga.

TABLE X -MAIN SOURCES OF WATER FOR HOUSEHOLD USE AND AMOUNT OF MONEY WATER CONSUMERS ARE WILLING TO GIVE TO SUPPORT CONSERVATION ACTIVITIES

Main sources of water	**Amount of money willing to give to support conservation activities in KES.**				**Total**	**Chi-square statistics**
	None	50 - 100	101 - 300	301 - 500		
Rain water	16	2	5	1	24	χ^2=103.719
River/streams	45	18	10	0	73	
Tapped water	9	31	67	9	116	df =12
Borehole	54	17	22	0	93	
Shallow well	18	8	7	0	33	Sig.=0.000*
Total	142	76	111	10	339	

*Significant at p<0.05 level

The results revealed that there was a significant relationship between farmers' sources of water and the amount of money they were willing to give to support conservation activities (χ^2=103.719, df=12, p=0.000) (Table X). In particular, among the 24 farmers who harvested rain water for domestic use, 16 were not willing to support conservation activities, 2 suggested that they would support with KES. 50-100, 5 would support with KES. 101 to 300, with only 1 indicating KES 301 to 500. Among the 116 with tapped water, majority (67) of them indicated that they would support with KES 101 to 300. This shows that farmers with tapped water were more likely to support conservation activities compared to those whose sources of water were rain, river/streams, borehole and shallow well. In a study conducted in Sasumua showed that water users in Nairobi were willing to pay an incremental US$1.25 over their normal water tariff to support conservation activities (FAO, 2013a). Consumers of water who were willing to give incentives in support of conservation activities attached conditions for their support as shown in Table XI.

TABLE XI - CONDITIONS ATTACHED TO INCENTIVE PROVIDED BY CONSUMERS IN GATANGA SUB-COUNTY.

Conditions attached to incentives	**n**	
Clean water	15	12.9
Regular water supply	22	19.0
Irrigation water	11	9.5
Alternative water projects	5	4.3
Not applicable	63	54.3
Total	**116**	**100.0**

Table XII shows that Conditions attached to incentive is very important in implementation and this study showed that 19.0% stated that they would support conservation activity in return to regular water supply, 12.9% gave clean water at their homesteads as condition, whereas 9.5% of consumers preferred irrigation water projects. A key aspect of PES is the extent of conditionality as it is the main key differentiating feature between PES and other non-coercive conservation approaches such as integrated conservation, development projects, and community based natural resource management (Ferraro and Kiss, 2002). However conditionality can be applied at different levels. Van Noordwijk and Leimona (2010) defined conditionality on a spectrum, where payment can be linked to (1) the consequence of an improved ecosystem service (for example, cleaner water), (2) improved system performance (for example, increased tree cover), (3) improved actions (for example, replanting in the runoff zone), (4) improved management plans (for example, an intent to replant in the runoff zone), or (5) improved management objectives. Choosing an extent of conditionality required to deliver fully the required ecosystem service at the least cost to farmers is an important component of PES design. The merits of conditionality are clear: it ensures service provision or, alternatively, avoids wasting resources by paying 'money for nothing' (Ferraro and Pattanayak, 2006), and it ensures that the practices paid for generate net benefits for users, as presumably the latter would otherwise not be willing to purchase those services at the given price.

On the other hand, among the 54.3% water consumers who showed that they never supported conservation activities, 45.7% indicated that the major factor which hindered them was lack of finances whereas 8.6% stated

that services offered were very poor. Table XIII illustrates group incentives household heads are willing to participate in conservation activities.

TABLE XIII. -GROUP INCENTIVES IDENTIFIED BY CONSUMERS IN GATANGA.

Group incentives	**n**	**Percent**
Improvement in road network	29	8.6
Putting up of schools	54	16.0
Provision of tapped water	88	26.1
Improve on health facility	56	16.6
Electricity provision	56	16.6
Capacity building	24	7.1
Provision of seedlings	30	8.9
Total	**337**	**100.0**

Table XIII illustrate group incentives households would engage in in return to conservation. Results showed that 8.6% households identified improvement of the road network, 26.1% provision of tapped water, 16.6% activities that would improve health facility and 16.6% capacity building and 8.9% households were willing to participate in provision of seedlings.

Type of incentive farmers expect in order for them to participate in PES is very important (Figure 6). Water provision was rated highest followed by firewood supply, power supply and carbon credit. Despite the catchment being the source of water for Nairobi, the community is still under supplied with water showing an inequity in natural resource distribution. This negatively affects the community view of the dam and so more efforts aimed at enhancing incentive is required in the area. As a result, the most preferred individual and group reward incentive was provision of water. The main group incentives were provision of tapped water (Figure 4). The other group incentives preferred were schools, health facilities, supply of electricity, capacity building, improved road network and provision of seedling. There is need to balance individual and group incentives as both are key to conservation. The results compare well with a recent study which showed that the most preferred reward system were in kind and an emerging paradigm shift towards co-investment instead of payment (Namirembe *et al*., 2014). Co-investment would bridge the gap in rewards given that it is difficult to drive PES using contributions from consumers alone as they are far below the opportunity cost of the producer. Lessons from Naivasha was that PES has potential to be used as a vehicle to create local markets for environmental good through contribution of high value fruit trees and fodder crops that has led to improved livelihoods for the WRUA and farmers these areas. The additional income through improved farm production were more than what farmers received directly as incentive in PES (FAO, 2013).

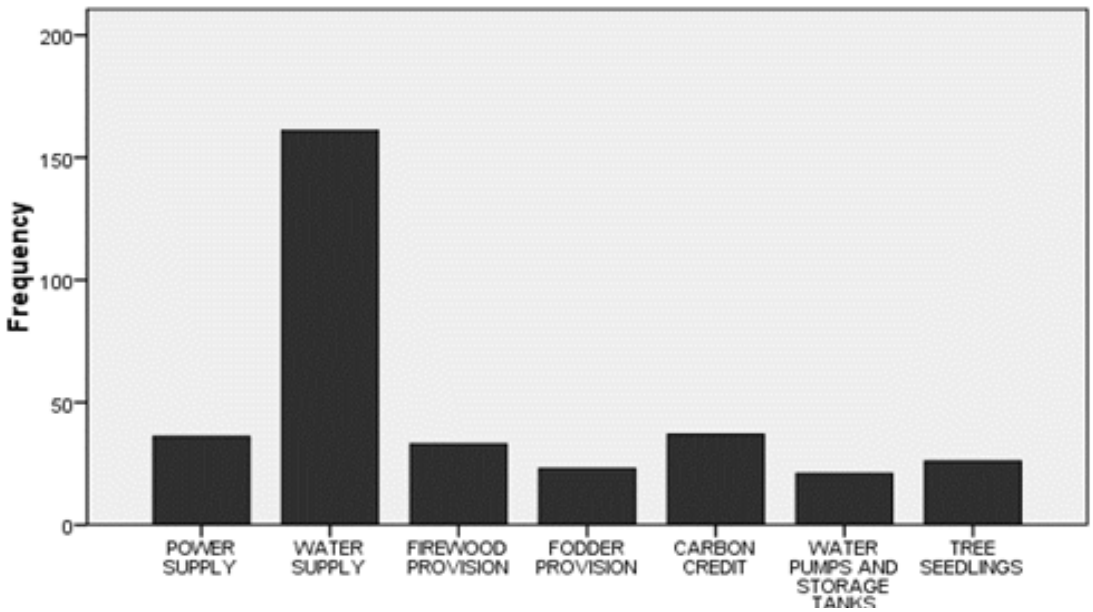

Figure 6. Proposed reward system to participate in conservation in Ndaka-ini

Studies conducted in Naivasha in Rift valley of Kenya showed that farmers wanted to see direct benefits from their own efforts, not just hearing about how conservation is important to the wider area, or to downstream stakeholders. The economic case for conservation should be used to promote more sustainable farming practices (carrots instead of sticks). Roger and Risk (2012) noted that extension agents and NGOs need to think about how they communicate the conservation message to farmers as it may be more effective to talk with farmers about 'boosting production through good practices', than about conservation especially when initially conservational benefits are not clearly understood and a loss of productive land may be feared. This is the case for Ndaka-ini where more efforts should be put to direct benefits for farmers that can in return give them motivation to support conservation activities. The type of incentive is likely to be influenced by the income level of the household and this led to assessment of net income levels of the respondent as shown in Table XIV.

As indicated in Table XIV, In the last 12 months, 4.2% respondents had a net income of KES20, 000 - 50, 000 in the cropping activities, 21.1% had a net income of KES 150,001 - 200,000, 13.1% had an income of KES 300,001 - 400,000 while 9.8% made an income of KES 500,000 and above. In relation to livestock activities, 15.4% respondents made an income of KES 20,000 - 50,000, 18.1% made an income of KES 100,001 - 150,000, 5.6% made a net income of KES 300,001to 400,000 while 3.9% made an income of KES 500,000 and above (Table XIV).

Chi-square test results revealed that there were significant differences among the farmers' level of income generated through cropping activities and livestock product per year (χ^2=97.356, df=64, p=0.005). The findings showed that while majority of the farmers were getting a net income ranging from KES. 20,0000 to 200,000 from livestock products, most of those engaging in cropping activities were getting a net income of KES. 100,000 to 400,000 (Table XV) .

Majority of the households did not get any net income from off farm sources and other sources (off farm sources (59.30 %) and other sources (76.6%) (Table XV). Among the few respondents who made net income, 8.0% made a net income of KES 1,000 to 5,000 from off farm sources, 5.9 % made an income of KES 15,001 to 20,000 whereas 5 % made a net income of KES 50,001 - 100,000. From other sources, 8.9 % household heads made a net income of KES 1,000 - 5,000, and 5.3 % made KES 10,001 to 15,000, with only 0.3 % household head reporting that they made an income of KES 50,001 to 100,000. This calls for diversification of income sources.

Conclusions and recommendations

Conclusions

The first objective was to evaluate the willingness of downstream consumers to pay for watershed protection. Majority of consumers were willing to participate in a scheme aimed at providing incentives to upstream farmers. In conclusion, results showed a relationship between willingness of farmers to accept conservation activities in return to incentives provided. There was a significant relationship between the consumers source of water to the amount they were willing to give to conservation activities with farmers who were connected with water from the Ndaka-ini catchment willing to give more. In addition, large water consumers were willing to give incentives in conservation in return to being assured reliable water supply. However, there was no framework in which consumers willing to pay could use to provide incentives to the providers of environmental services. The study indicated that majority of respondents, both small-scale and large-scale water users were willing to pay additional fees that would go to conservation. The mechanism for such payment must be worked out jointly by the users, Water Company and WRSB. The second objective was to identify incentives consumers were willing to provide to farmers in return to improved conservation practices. In conclusion, the main incentives offered by users of water were in support of community projects (47 %), in kind (38 %) and in cash (15 %). There was a significant relationship between the source of water in the household and willingness to support conservation, with household with tapped water supply more willing to provide incentives. This relates well with providers of ES whose main preferred group incentive was provision of tapped water to the households.

TABLE XIV - NET INCOME GENERATED BY THE FARMERS THROUGH CROPPING ACTIVITIES AND LIVESTOCK PRODUCTS										
Net **income through cropping activities**	**Farmers' net income through livestock products in KES.**									Total
	20,000 - 50,000	50,001 - 100,000	100,001 - 150,000	150,001 - 200,000	200,000 - 300,000	300,001 - 400,000	400,001 - 500,000	500,000 and above	None	
20,000 - 50,000	3	0	0	0	1	0	0	0	10	14
50,001 - 100,000	2	8	4	1	4	0	0	0	11	30
100,001 - 150,000	12	6	12	9	3	1	1	0	18	62
150,001 - 200,000	13	12	9	11	2	8	0	2	14	71
200,000 - 300,000	7	3	7	6	2	5	0	2	10	42
300,001 - 400,000	4	4	12	9	2	2	0	4	7	44
400,001 - 500,000	6	3	6	6	2	3	0	5	6	37
500,000 and above	5	4	11	4	1	0	1	0	7	33
None	0	0	0	1	0	0	0	0	3	4
Total	**52**	**40**	**61**	**47**	**17**	**19**	**2**	**13**	**86**	337
$\chi^2 = 97.356$,	df = 64, Sig. = 0.005* (Measured at $p<0.05$ level of significance)									

TABLE XV - FARMERS' NET INCOME FROM OFF FARM SOURCES AND OTHER SOURCES IN GATANGA.

Net income	Off farm sources		Other sources	
(KES)	n	%	n	%
1,000 - 5,000	27	8.0	30	8.9
5,001 - 10,000	31	9.2	17	5.0
10,001 - 15,000	18	5.3	18	5.3
15,001 - 20,000	20	5.9	5	1.5
20,001 - 30,000	13	3.9	8	2.4
30,001 - 40,000	7	2.1	0	0.0
40,001- 50,000	4	1.2	0	0.0
50,001 to 100,000	17	5.0	1	0.3
None	200	59.3	258	76.6
Total	**337**	**100.0**	**337**	**100.0**

RECOMMENDATIONS

Farmers Engagement: Engage farmers in PES using a combination incentives in-kind supported by a proportion of cash rewards. Conservation practices that should be sold out to farmers are terracing, contour farming, planting of grass-strips and planting bamboo along the rivers. Farmers' awareness towards conservation should be enhanced to improve uptake of PES packages. In addition, cost benefit analysis for adopting different conservation practices should be carried out.

Mechanism for passing on incentives: The collection point for the incentive would be through water bills charged by Water Company. To reach the supplier of the service, there would be need to develop a very clear mechanism on how the incentives will be passed over while also developing a monitoring system to ensure compliance. Experience from Brazil showed that payment was the most effective tool with 25 % of revenue being reinvested to support PES.

Types of incentives: Promote PES using existing rewards in conservation but reorganize them to include conditionality so as to gain the additionality out of the provided incentives. In addition, develop a framework for tapping incentives provided by users and another one for giving back to the providers. Where possible, promote bundled approach in ES as it's more cost effective.

Recommendation for Further Research: Further studies need to be conducted on mechanisms for financing PES, combining public and private sector inputs. In addition, develop mechanisms for pooling resources from the willing individuals and corporations ready to support PES that would go towards supporting a voluntary scheme. Further, National and County governments to set aside funds that would support PES implementation.

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