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“Management of Protected Areas”

Prospects and Challenges of Developing Payment For Ecosystem Services in Kenya

Local Community Perspectives in Kikuyu Escarpment, Aberdare
Region



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SUMMARY

Payments for ecosystem services schemes are gaining attention as promising and innovative market based mechanism for protecting biodiversity and contributing to sustainable development. Besides offering land and protected areas manager's chances for sustainable financing, it presents communities living adjacent to protected areas opportunity for livelihood improvement. This study was therefore carried out to explore the prospects and challenges of developing payment for ecosystem services at local level by examining community perspectives at Kikuyu Escarpment forest in Aberdare ecosystem, Central Kenya. It was carried out in the months of October to November 2008 and involved assessing community awareness and perception of ecosystem services, community institutions and available ecosystem services. This was accomplished by administering questionnaire to 253 community members, literature review of payment for ecosystem case studies and transect walk. The results revealed low recognition of ecosystem services among the community, favourable community view on payment of ecosystem services schemes, existence of ecosystem services and community institutions that can play part in the development of such schemes. The community should be made aware of the opportunities that exist from supplying ecosystem services. Communities understanding and awareness of Ecosystem services and payment for ecosystem services could be enhanced by more education. Recommendations for pilot payment for ecosystem services scheme, awareness education and strengthening of community institutions is made for the potential to be realized at Kikuyu Escarpment protected area.

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LIST OF ACRONYMS AND ABBREVIATIONS

CBO	Community Based Organisation
ICDPs	Integrated Conservation and Development Projects
IPES	International Payment for Ecosystem Services
KENVO	Kijabe Environment Volunteers
KNBS	Kenya National Bureau of Statistics
MA	Millennium Ecosystem Assessment
NRM	Natural Resources Management
NGO	Non Governmental Organization
PES	Payment for Ecosystem Services
REDD	Reduced Emissions from Deforestation and Degradation
UNEP	United Nation Environmental Programme

DECLARATION OF HONOUR

I herewith declare that I am the sole author of the current master thesis according to art. 51 par. 2 no. 8 and art. 51 par. 2 no. 13 Universitätsgesetz 2002 (Austrian University Law) and that I have conducted all works connected with the master thesis on my own. Furthermore, I declare that I only used those resources that are referenced in the work. All formulations and concepts taken from printed, verbal or online sources – be they word-for-word quotations or corresponding in their meaning – are quoted according to the rules of good scientific conduct and are indicated by footnotes, in the text or other forms of detailed references.

Support during the work including significant supervision is indicated accordingly.

The master thesis has not been presented to any other examination authority. The work has been submitted in printed and electronic form. I herewith confirm that the electronic form is completely congruent with the printed version.

I am aware of legal consequences of a false declaration of honour.

Klagenfurt, 15 June 2009

Signature:

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1 INTRODUCTION

Degradation of the natural resources and ecosystems is evolving as one of the most pressing environmental problem with global consequences. This is especially true in the rural areas because they harbour the bulk of natural ecosystems. These regions hosts protected areas that provide important ecosystem services such as biodiversity, water, scenic beauty and carbon sequestration. Most of these services are required by society for it well being. Despite this importance, these regions together with the protected areas and other landscapes face degradation caused by unsustainable use of the ecosystems.

Strategies and measures adopted to counter the degradation so far have not succeeded in providing sufficient incentives and motivation to communities living adjacent to this protected areas and resource managers to arrest the situation. Programmes such as command and control by government and linking development to conservation have failed to stimulate conservation and increase the income of the local populations. For instance, the Integrated Conservation and Development projects (ICDPs) have been initiated but too have not succeeded in relieving pressure on the natural resources (Kremen et al 1998, Engel 2008). Many projects have been introduced in recent decades in peripheral areas of protected areas to reverse the rapid loss of biodiversity, deterioration of livelihood resources, and deepening of rural poverty with less successful results. The failure of the conventional approaches to conservation have given rise to a concept that to “maintain the flow of environmental goods and services for society incentives are

needed to induce local people to forego more disruptive land and resource use practices”(Bond and Frost, 2005).

Payment for ecosystem services (PES) offers emerging and promising conservation approach that provides land and natural resource users payments upon delivery of environmental services. This innovative approach has the potential for bringing positive changes to environmental management, conservation, contributing to sustainable development and eradication of poverty. The PES is a shift from traditional approach of marketing only tangible products such as timber to ecosystem services that are mainly intangible. Proponents of PES argue that compensating land user for ecosystem services would make markets to consider such services in decision making processes, thereby increasing chances of arresting land degradation and other environmental problem such as erosion and floods (Pagiola et al, 2005). At the same time PES arrangements can offer opportunities for linking local conservation efforts to regional and global markets that consume these services and who are in position to provide financial resources. The emergence and growth of PES mechanisms such as those in carbon markets and now the opportunity for reduced emissions from deforestation and degradation (REDD) make more appealing cases for the developing countries to exploit this potential. The motivation behind development of PES schemes is driven by the need for alternative sustainable financing of protected areas, demand for ecosystem services, corporate interest in ecosystem services investments and supportive changes in natural resources governances (Scherr et al, 2006). The potential for PES schemes in developing countries is especially apparent in rural areas where the bulk of biodiversity and poor communities reside. PES is being promoted across the

developing world to support environmental stewardship (World Bank, 2004). Developing countries have the possibility of designing projects that will help them to tap into emerging markets for environmental services.

The Aberdare region of Kenya is a typical protected area in Kenya that stands to benefit from PES schemes. This is because it is an important forest ecosystem in Kenya where unsustainable human activities threaten its continued existence. Some of the threats include opened areas or cultivation, excessive resources extraction, overgrazing indicating that the ecosystem is not healthy (Lambrechts et al., 2003). These human induced threats to the protected area have led to degradation and will compound climate change impacts on the region. The ecosystem host's biodiversity of global significance is an important watershed and provides other vital ecosystem services. The community adjacent to the ecosystem is dependent on the forest for subsistence and peasant farming. Many conservation approaches have been tried and implemented in the area. Natural resource managers in Kenya have tried to address the problem by imposing ban on tree felling, restricting use of forest, incorporating community in the management and erecting electrical fences. The Government of Kenya passed legislations on community based natural resources management in early 2000, which have increased the responsibility of local community for natural resource management and environmental protection. These projects have not succeeded in relieving pressure on the natural resources. The Aberdare forest community still continues to shoulder the bulk of biodiversity conservation and provision of other ecosystem services.

It is against this background that I intend to explore the prospects for the community in the Aberdare ecosystem in exploiting PES schemes. It is important to

address the potential of the region so that the information can be used to suggest ways of promoting PES schemes and supporting community conservation. The study explored the extent prospects developing Payment of Ecosystem Services (PES) in Aberdare forest ecosystem region in Kenya to ascertain the current awareness of PES schemes, existence of ecosystem services, and community expectations and perceptions of such schemes, and their expectations of such schemes. The study is motivated by opportunity in developing countries for emerging markets in PES to help solve some of their problem with poverty and degradation of natural resources.

This was accomplished by a review of existing literature, questionnaire survey and field observation. The study limited itself to villages adjacent to a protected area and covered Kamae and Kereita.

This study is important in informing PES opportunities and challenges at local level. Having good information on opportunities, challenges and community perspectives is essential for developing PES schemes that community can participate in order to preserve the ecosystems in Aberdare. While restricted in geographic scope to Aberdare the study would be useful to assist the Non Governmental Organizations (NGOs) and other stakeholders in gaining community insights ecosystem services and PES schemes in other forest adjacent communities in Kenya.

1.1 Objectives and Purpose

The purpose of the study was to explore the prospects and challenges of developing payment for ecosystem services (PES) scheme in Aberdare region. The aim was achieved by the following specific objectives:

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- To identify the key ecosystem services provided by the Aberdare region that can potentially benefit from payments for these ecosystem services.
 - To assess the local community's perceptions, awareness and expectations on such PES schemes
 - To assess the existence of community institutions that can assist in the PES scheme adoption.
 - To use findings to make recommendations on way forward for PES schemes to the community and resource managers

1.2 Area

Kenya is located in East Africa with latitude of 1°00'N and a longitude of 38°00'E. It neighbours Uganda to the west, Tanzania to the South West, Sudan and Ethiopia to the North, Somalia to the East and Indian Ocean to the South East. Kenya covers an area of 582,646 KM² (Kenya National Bureau of Statistics (KNBS), 2009), of which approximately 569 250 KM² is land surface and inland waters 11,230 KM². The population of Kenya based on 1999 population census projections is estimated at 35, 698,640 in 2009 with a growth rate of 2.7% (KNBS, 2009). The network of protected areas occupy an area of 6,103,288 Hectares or 8% of the country total surface area (Kenya Wildlife Service, 2009) and range from the coral reefs at coasts to alpine moorlands in the mountains. The country economy is a developing and has gross domestic product (GDP) per capita in 2007 adjusted by purchasing power parity (PPP) been US\$ 1200. Agriculture and tourism makes the biggest contribution to GDP 24% (CBS, 2007). The main agricultural products are tea, coffee, wheat, sugarcane, vegetables, fruits and flowers. The main export products include tea, coffee and horticulture.

The Kikuyu Escapment protected area (Figure 1) covers 37, 619 ha. It is situated 100 km North of Nairobi (Capital City) in South Eastern slope of Aberdare, Central Kenya. The region cut acrosss several districts among them Lari, Kiambu East, Limuru and Thika.

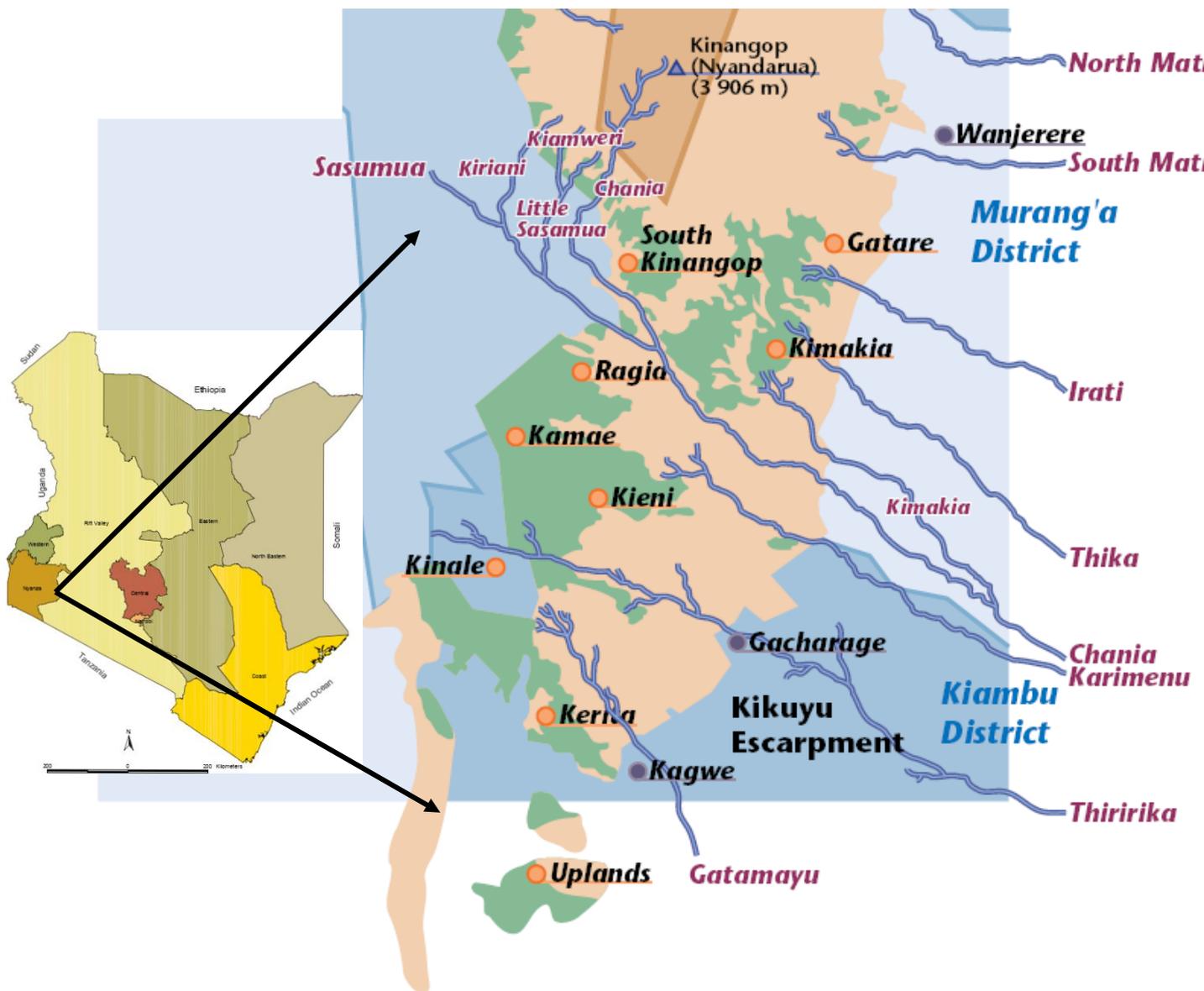


Figure 1. Map Showing the Location of Study Area in Kenya.

Source: Aberdare Natural Resources Development Project, 1998

The climate is modified by the high altitude and is cooler and wetter than most of the parts of Kenya. Rainfall in the region is about 2,200 mm per year, with the South East of the range receiving the highest precipitation. The rainfall distribution is bi-modal, with peaks in April-May and October-November, and only one-two dry months each year. The estimated annual mean temperature is 20 C.

The topography of the region presents undulating hills, deeply dissected river valleys and remnants of volcanic vents and sheets. There are numerous rivers originating from the area that includes Bathi, Gatamaiyu and Thirika among others. The Sasumua and Ruiru dams in the area provide the main water supply for the city of Nairobi. There are a number of spectacular waterfalls, of which the main ones are Gatamaiyu, Thiririka and Chania

A rich diversity of vegetation types that result mainly from the wide range in altitude and rainfall is present. The natural vegetation of the region forms part of the Afromontane phyto-geographical region, a region consisting of numerous endemic or near endemic plant species. Various vegetation zones can be distinguished among them montane, submontane and sub alpine vegetation,

Within the site a wide variety of plant and animal species are to be found. Common hardwood and softwood tree species include Camphor *Ocotea usambarensis*, Cedar *Juniperus procera*, and Podo *Podocarpus Spp*. The area host a number of threatened fauna species. Among the threatened mammals of global conservation concerns that occur in the area include elephant *Loxodonta africana*, leopard *Panthera pardus* and varieties of duikers and bushbabies. The ecosystem is rich in primates, the notable ones are black-and-white Columbus monkey *Colobus guereza*, Sykes monkey *Cercopithecus mitis* and baboons *Papio anubis neumanni*.

The Aberdare Range is internationally recognized as an Important Bird Area (IBA) (Birdlife International, 2000). The region holds 52 of Kenya's 67 Afrotropical highland species and six of the eight restricted range species in the Kenyan montane endemic bird areas. Three near-endemic butterfly species are also found, namely *Charaxes nandina*, *Neptis kikuyuensis* and *Neptis katana* (Larson, 1994).

The region is a critical watershed for the country and forms one of the five main water towers in Kenya (Njuguna et al, 1998). The region is the main catchments for Sasumua and Ndakaini dams, which supply water to a third of Nairobi inhabitants. The many adjoining districts and, in particular, the high densely populated areas rely primarily on the water flowing from the area.

The forest-adjacent areas have diverse agro-ecological zones that characterize the social economic environment of the region. The landscape is comprised of intensely farmed small acreages of land, nestled among undulating hills and valleys, and interspersed by a network of small streams. The ecosystem yields a wide range of non-timber forest products, many of which are consumed at household level. These include medicinal plants, wild honey and fibers among many others. The economic benefits of the ecosystem for forest adjacent households are immense (Emerton et al, 1998).

The ecosystem is undergoing many human disturbances due to steadily rising population and its close proximity to urban centers. With increasing population pressures it brings increasing demand for ecosystem services such as supply of water, land for grazing and destruction activities such as charcoal burning. The livelihood of the people adjacent to the reserve is wholly dependent on the region ecosystem services and its health.

The two Blocks under study, Kamae and Kereita are situated adjacent to the reserve (Figure 1). Each block has several villages adjacent to it. Both sites are composed of peasant farmers who grow mainly subsistence food crops and make subsistence use of the forest. At Kamae, the inhabitants were squatters from various forests in the district that were settled in 1989. The area is mainly a water catchment. At Kereita the settlement took place earlier in 1930s. The communities have embraced Participatory forest management (PFM) and other government pro community strategies for conserving the area. Various project have been in operation mainly conceived to strengthen conservation by involving and empowering local people in the management of the reserve. PES would represent an opportunity to increase the benefits and incentives to support effective protected area management.

2 LITERATURE REVIEW

PES approach is being hailed worldwide as an innovative conservation tools for providing an efficient and sustainable solution to environmental problems. There are experiences worldwide for pilot projects in various stages of development. PES can play an important role in providing incentives for conservation and hence Kenya and other developing countries in Africa are should embrace it. The design of these PES schemes can benefits from knowing the community perspectives in rural areas. The section looks at PES context in definition, market for ecosystem services, developments in Kenya and world.

2.1 Ecosystems Services

Society benefits from resources and process provided by natural ecosystems. The importance of ecosystem services for human well being was highlighted by the

Millennium Ecosystem Assessment project. These has in turn attracted both public interest and stimulated market incentives in PES. Ecosystem services are broadly defined as “the benefits people obtain from ecosystems” (MA, 2005). Ecosystem services are vital because they provide society with important goods and services for livelihood, economic development and health. According to the Millennium Ecosystem Assessment (MA, 2005) these ecosystem services can be classified into provisioning, regulating, cultural and supporting services (Table 1).

Table 1. Main Ecosystem Services by Type of Services.

Type of Service	Examples
Provisioning services <i>(products obtained from ecosystems)</i>	Food Freshwater Fuelwood Fiber Biochemicals Genetic resources
Regulating services <i>(Benefits obtained from regulation of ecosystem processes)</i>	Climate regulation Disease regulation Water regulation Water purification Pollination Spritual and religious Recreation and Ecotourism Aesthetic
Cultural Services <i>Nonmaterial benefits obtained from ecosystems</i>	Inspirational Educational Sense of place Cultural heritage
Supporting Services <i>Services necessary for production of other ecosystem services</i>	Soil formation Nutrient cycling Primary production

Source: Millennium Ecosystem Assessment, (2005)

Food, water and timber constitute some of the provisioning services. The regulating services include climate, floods, among others while cultural services provide

recreational, aesthetic, and spiritual benefits. Supporting services are necessary for production of other ecosystem services and include soil formation, nutrient cycling among others.

Lately, (Pagiola et al., 2005 and Wunder, 2005) have adopted the classification for ecosystem services based on the following.

- Carbon which is the sequestration of carbon in biomass
- Water encompassing the provision and regulation of freshwater quantity and quality
- Biodiversity mainly the conservation of habitat for wildlife
- Scenic beauty essentially involving cultural, recreational and aesthetic value of the landscape

2.2 Market for Ecosystem Services

The capacity of ecosystems to provide ecosystems services are hampered by their ever-growing degradation, which diminishes the prospects of sustainable development (UN, 2007). This is caused by the increasing demand of the ecosystem services. It is noteworthy that between 1960 and 2000, while the world's population doubled and the global economy increased six fold, the Millennium Ecosystem Assessment documented a decline in over 60 percent of the world's ecosystem services (MEA, 2005). Protecting and improving society well being requires wiser and less destructive use of natural resources. Traditionally society did not recognize ecosystem services in making and implementing decisions because they were thought of as free goods, abundant and under no threat. Such perception of ecosystem services made the markets for such services to be neglected and taken for granted.

As a result, no efficient price mechanisms arose for scarcity and deterioration of most ecosystem services except for the provisioning services such as timber. Market failure related to ecosystem services occurs because they are public goods (e.g. Natural heritage) and non-excludable, are affected by externalities (e.g. pollution) and have undefined property rights (e.g. open access resource like fisheries). Since ecosystem services are positive externalities i.e. benefit to people not paying for them and supplied by people not compensated it results in them being undersupplied. These explain why there is interest to develop markets mechanism to ensure their delivery. The markets and payments for ecosystem services create incentives for investing in the long-term flow of ecosystem services because the services are positive externalities (Markandya *et al.*, 2002). Payments for environmental services (PES) translate external, non-market values of the environment into real financial incentives for local actors to provide such services (Engel *et al.*, 2008). PES then tries to rectify the market failure of ecosystem services. Markets can then be used to offer rewards to encourage communities to protect and supply ecosystem services.

The markets for ecosystem services worldwide are being driven by a number of motivations. One of the motivations behind PES is the desire to have other options for financing protected areas. Currently financing of protected areas at US\$ 10billion (Gutman and Davidson, 2007) per year are inadequate compared to suggested figures of US\$ 31 – 70 Billion annually. The protected areas are faced with problems of looking for alternative financing against the conventional government budgets and donors aid. Another motivation of market for ecosystem is the ongoing adoption of supportive policies in natural resources management. There are local resources

management by communities and government at local level that are ensuring community participation in NRM, and ownership of natural resources. At international level investments by World Bank will spur PES while various civil societies and government are embracing better integrity and recognition of ecosystem services. Besides alternative sources of finances and improving natural resources governing issues, the corporate world is also embracing investments in ecosystem services either because of emerging regulation, corporate social responsibility or earn return on their investments.

2.3 Definition of Payment of Ecosystem Services

While there is no consensus on the definition of PES schemes, the term can be applied to a set of basic principles. According to Wunder, (2005) PES should meet the following basic principles.

- A voluntary transaction between ecosystem services buyers and sellers where
- A well-defined environmental service (or a land use likely to secure that service)
- Is being bought by at least one well defined ecosystem services buyers
- From a defined ecosystem service providers
- The payment is conditional upon the environmental service provider delivering ecosystem service provision

In practice, however many PES do not fit all the criteria outlined. PES is differentiated from the other conservation instruments by the criteria on conditionality.

The diversity of PES mechanisms can be broadly classified into four main types (Richard and Jenkins, 2007). First Public payment schemes to forest owners or managers in which the government is the main or only buyer. Secondly there is

trading between buyers and sellers of ecosystem services around cap and trade mechanisms. Thirdly, Private market-based deals in which beneficiaries of ecosystem services contract directly with the service providers (e.g., for watershed protection services). Lastly there are certification schemes of forest or farm products where a premium is paid. The payments may take different forms such as individual payments, improvements in public services, local infrastructure improvement and improved land tenure rights.

PES presents many advantages and opportunities which make them a promising conservation tool when compared to other traditional and conventional conservation approach such as integrated conservation and development projects (ICDPs), command and control regulations and environmental taxes. The failure of conventional approaches to conservation is attributed to lack of conservation incentives, complexity in their implementation and lack of conformity with temporal and spatial dimensions of ecosystem conservation incentives (Ferraro, 2000). On the other hand PES is a direct approach to conservation and target project outcomes (Ferraro, 2001). Other good aspects of PES schemes include improved ecological conservation and improved livelihoods for poor people (Landell-Mills and Porras 2001) and positive social outcomes through increased cooperation among participants in a PES schemes. Other opportunities include bringing new financing not previously available for conservation for instance REDD.

However a caution, some authors have noted that PES should not be taken as panacea for all conservation problems (Engel et al, 2008). PES schemes should be seen as playing a complementary role to other instruments rather than a substitute.

2.4 Ecosystem Services Targetted by PES

There are many ecosystem services from natural ecosystems (Figure 3). Nevertheless not all of them are marketed owing to technical and economic hindrances. PES mainly focuses on those ecosystem services with market demand or with potential ones. To date the main ecosystem services targeted by PES for the market are watershed, biodiversity, carbon, landscape beauty and bundled services (Landell-Mill and Porras, 2002).

Watershed services results from forests and wetlands ecosystems and include flood control, water quality and quantity services. Markets for watershed protection involves financing land uses that generate watershed benefits and are mostly localized. Water services can be marketed to downstream users, hydroelectric facilities and municipal water authorities. This is because they are the ones concerned about its quality and quantity as it becomes scarce. Because of the local nature of demand and the presence of a limited number of well-organized beneficiaries (e.g., water or hydroelectric utilities, irrigation commissions), it is relatively easy to mobilize downstream beneficiaries and involve them in PES schemes (Mayrand, 2002). The payments mechanisms can be inform of cash, financial, technical assistance and sharing benefits accruing from the protection of the watershed. There is potential for growth in watershed markets to encourage watershed conservation especially in developing countries because of increasing need of clean water caused by growing population, many people living downstreams making them susceptible to watershed degradation and finally investment in sustainable watershed conservation are cheaper than in water supply and treatment facilities.

Biodiversity services markets are to be found at local, national and global scale. These payments result from recognition of the important role played by biodiversity in the functioning of ecosystems as well as their continuing degradation. Specific land uses that are thought to protect species, ecosystems or genetic diversity are adopted and paid for. For instance some land use practices such as silvipasture which are more compatible with conservation than others. Several agencies and organizations can support biodiversity conservation through PES. Some of the mechanisms under biodiversity market include paying to access habitat or species e.g. ecotourism and bioprospecting, biodiversity conserving management e.g. community concession on public protected areas and conservation lease (Ferraro, 2007). The community could benefit come inform of certification of products coming from areas adjacent to protected areas. The growth potential in this markets are in the field of ecolabeling for products from tropical countries. Biodiversity offsets by corporate are also rising and annual growth is 25% (Ecosystem Market Place, 2006)

Carbon sequestration services of the ecosystems are also marketable. Ecosystems sequester carbon dioxide from the atmosphere, which helps in climate change mitigation. A number of land use changes can results in carbon sequestration. Some of these practices include grasslands, no till agriculture, agroforestry and planting bare lands with trees. Carbon markets are global in scale, well developed and most transactions involve international buyers. Demand for these services may arise from government, individuals and Industries who can pay landowners and communities to adopt land use practices that promote carbon sequestration. The market can further originate from Industries under offset

regulations, companies, agencies, and municipalities seeking to improve air quality. These markets for carbon are either regulated or voluntary.

Markets for landscape beauty result from natural areas that provide scenic beauty. These markets are either national or international. For example the tourism companies are among the beneficiaries and can pay local communities for land use practices aimed at increasing landscape beauty. Currently protected areas or the protection of natural or cultural heritage sites can supply this scenic beauty services. Scenic beauty involves a ecosystem services for consumptive like fishing and nonconsumptive eg birding use. The concept of scenic beauty can also include cultural practices, traditional land uses or architectural features. For instance the government establishment of protected areas and therefore those managing or adjacent communities get a share of of access fees charged and development support in terms of local infrastructure. Though this markets are not well developed, Landell-Mills and Porras' (2002) survey of PES schemes in the world showed some 51 experiences in payments for landscape beauty.

Finally ecosystem services can be bundled and sold. This is because ecosystems provide many kinds of ecosystem services simultaneously. For example ecosystem such as forest can sequester carbon, provides water services, scenic beauty and conservation of biodiversity. Consequently these services can be sold in bundles because it may not be possible to separate them. Local conservation practices normally produce many different ecosystem services. In this case merged bundles of ecosystem services are easier to manage and reduce transaction costs associated with PES schemes. Bundling can be especially applied on developing payments for REDD, which has the potential to both mitigate climate change and

maintain biodiversity. However, they are less effective since merging services makes it impossible to target payments to individual services and buyers. For example some ecosystem services like watershed may have localized buyers while others like carbon and scenic beauty may have global buyers. The problem with bundled services is lack of complementarity in some ecosystem services whereby for instance increasing the production of one may lower the supply of another e.g planting monoculture tree plantations that may increase carbon yield while lowering watershed services.

PES markets are on growing trend. The potential for the PES market especially to the rural communities in the coming years is illustrated in Table 2 below.

Table 2. Potential for PES Markets for Poor Communities in 20 Years.

Compensation for	Public Sector	Private under regulatory requirement	Buyers		
			Private, Voluntary (business case for use values)	Philanthropic (non use values)	Consumers of eco-certified products
Carbon (land use, land use change and forestry)	XXX	XX	XXX	XX	X
Water Quantity/Flow	XX	X	XX	X	x
Water quality	XX	x	XX	X	X
Biodiversity Conservation	XXX	X	XX	XX	XX
Landscape beauty or Recreation	XX	0	XX	X	x

XXX- Potentially Millions of low-income providers could benefit.

XX - Potentially hundreds of thousands of low-income providers could benefit.

X - Fewer than 100, 000 of low-income providers likely to benefit.

X – These market segment likely to develop but affecting small numbers of low-income providers could benefit.

0 – This market segment unlikely to develop.

Source: Borges, (2007)

2.5 PES Experiences in the World

There are many PES programs that have been established all over the world (Table 3). Some of the well-known examples include national PES programs in Costa Rica (Pagiola, 2008) and agri-environmental schemes in Europe and the USA.

Table 3. Examples of PES-type Schemes in the World.

Scheme	Location(s)	Service(s)	Land uses Paid for	Seller Agency	Scale of Transaction	Start Year
RISEMP	Colombia Costa Rica Nicaragua	Biodiversity Carbon	Restoration silvipasture	NGOs, IO state	International	2002
Pimampiro	Ecuador	Watershed	Conservation/ minor restoration	Municipal government	Local	200
Working for Water Programme	South Africa	Watersheds, biodiversity	Restoration	Central State	National	1995
Conservation Reserve Program	USA	Watersheds, biodiversity, soil protection	Restoration (agricultural practices; land retirement	Central State	National	1985
PROFAFOR	Ecuador	Carbon	Restoration (plantation)	Private company	Regional -- mostly Andes	1993
PSA	Costa Rica	Carbon, watersheds, biodiversity, Landscapes	Conservation/ minor restoration	Public sector+	National	1996
Vittel	France	Watershed	Conservation/ restoration (agricultural practices	Private company	Local	1993

Source: Wunder et al, (2008)

The PES markets in different parts of the world are at different phases of development and experiences gained so far in various aspects can be used to assist countries that are adopting the practices. These experiences could be in terms of community involvement and participation, how to reduce costs among others. The development of PES shows Africa lagging behind the other continents. A number of factors attributed to this scenario include lack of technical and market information, limited institutional experience, inadequate legal framework, limited successful business models, suspicion of markets for public goods and equity concerns (Ferraro, 2007)

2.6 PES Developments in Kenya

While PES are being promoted across the developing world to support environmental stewardship in agricultural and forest-based landscapes (World Bank, 2004; World Resources Institute, 2005), Kenya like elsewhere in Africa is lagging behind in the development of PES mechanism. An inventory study in 2005 by Katoomba group highlighting PES status in the Eastern Africa documented 13 projects in Kenya. Few of these projects meet the PES criteria and are being carried out on pilot basis with support coming mainly from donors. The PES schemes in Kenya (Table 4) deals with carbon, biodiversity and water project (Mwangi, 2008). The majority of the biodiversity projects fall within the area of ecotourism. Though most of the PES projects are at early stages it suggests that significant potential and interest exists for PES schemes in Kenya.

Table 4. Current PES like Projects In Kenya

Name of Project	Market Type
Bamburi-Lafarge Fuel Conversion	Carbon
Arabuko Sokoke Forest management and Conservation Project	Biodiversity
Kwale Forestry Project	Carbon
Machakos & Kitui Local Community Forest Initiative	Carbon
Amboveli project	Biodiversity
Shompole Ecotourism Development Project	Biodiversity
The Kitengela Wildlife Lease Programme	Biodiversity
Mount Kenya & Tana Basin Payments for Water Services	Water
Lake Naivasha Watershed Management Project	Water
Sasumua Water Treatment Plant project	Water
Kinangop Grassland Project	Biodiversity
Lake Bogoria Catchments Management Programme	Water
Il Ngwesi Group Ranch	Biodiversity
Western Kenya Integrated Ecosystem Project	Water
Kikopey Water and Conservation Project	Water
Narok Conservation and Drought Recovery Programme NCDRP	Water

Source: Mwangi, (2008).

Some of the key barriers cited as impeding the PES in Kenya include poverty, insecure tenure and property rights over ecosystem services, inadequate information, lack of technical and institutional capacity, and inappropriate policy and regulatory regimes for PES. Generally the potential providers of ecosystem services are generally unaware or have little information on PES opportunities.

PES has the potential to offer the Kenya rural people rewards for restoring and maintaining ecosystem services. Many benefits can accrue to the rural people participating in PES schemes. Some of the expected benefits include increased income, increased knowledge of sustainable resource use practices and improved resilience of local ecosystems (Wendy, 2008). The forest adjacent dwellers in Kenya

are resource constrained and are therefore most often poor communities (KIFCON, 1992). Some of the suggested PES opportunities in Kenya could include upland poor providers of watershed protection services via sustainable agriculture, reforestation and small farmer agroforestry in the voluntary carbon market, sustainable charcoal production as an avoided deforestation strategy, certified organic products which should earn market premiums; 'conservation concessions' in situations where communities are sufficiently empowered and experienced; participatory eco-tourism approaches. The PES in this area could either go towards supporting the existing management of natural resources especially by the community and to encourage conservation actions through economic incentives.

2.7 PES Schemes Design Issues

The underlying rationale of PES schemes is relatively simple and appealing, but implementing them may not be easy (Pagiola and Platais, 2003). The basic principle behind PES (Figure 2) is that resource users and communities that are in a position to provide environmental services should be compensated for the costs of their provision, and that those who benefit from these services should pay for them, thereby internalizing these benefits.

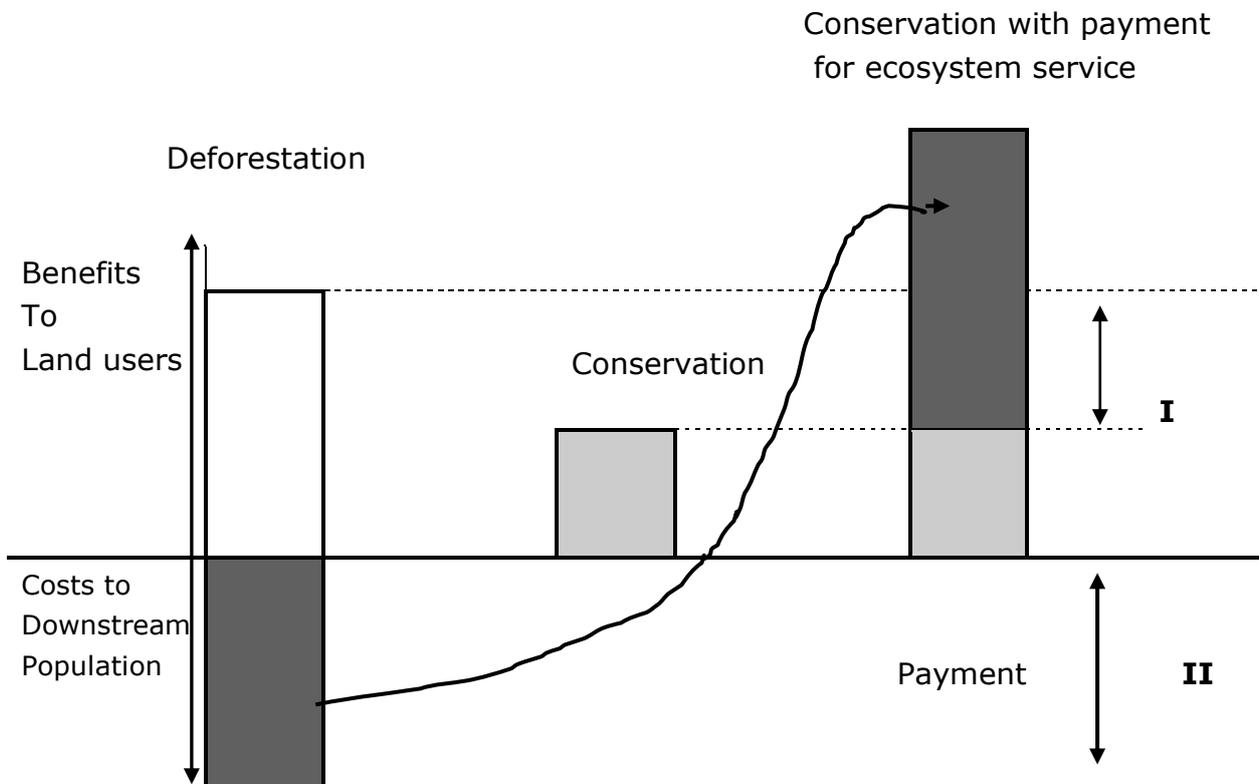


Figure 2. The Logic of Payments for Environmental Services.

Source: adapted from Pagiola and Platais, (2002)

The figure 2 illustrates deforestation (through tree cutting and other land uses) by the upstream communities resulting in externalities for down streams communities in terms of increased flooding. However the upstream communities may not be willing to conserve if the benefits are not much. If the upstream communities are paid by downstream the incentive can prevent them from converting to cutting trees and other destructive practices. The given payment it should exceed benefits from destruction by upstream users and less or equal to costs downstream users face due to upstream deforestation II

When designing a PES schemes, several things need to be taken into account. The literature proposes criteria that include ,voluntary transaction, environmental service or a land use likely to secure that service, a buyer, environmental service provider and conditionality clause (Pagiola, 2008: Wunder 2005 and Pagiola 2008). Besides the key considerations other desirable conditions include awareness, stakeholders organization (Gutman, 2003) and a secure property rights. The institutions also play fundamental role in supporting operation of PES particularly in countries with weak governance structures (Wunder, 2005: Pagiola, 2007).

3 METHODS

The method chosen involved collection of primary data through questionnaire Interviews with community members, literature study and field observations using transects walks.

3.1 Sampling

Community farmers living within three Kilometres from the edge of the protected area and in their own farm were sampled. The sample size was 253 respondents. One principal per household either husband or wife was interviewed. Two study sites were chosen. Both sites are located adjacent to Aberdare ecosystem and are involved in some form of community-based management of natural resources.

3.2 Interview

The study used interview questionnaire for data gathering delivered to the respondents. The respondents were interviewed with the help of two local assistants attached to KENVO, a community based organisation (CBO) working on sustainable nature conservation programmes. We all spoke the local Kikuyu language as we are from the area. We could explain the purpose of the study and question in Kikuyu.

Participants were then asked if they wished to take part in the study. If they chose not to participate the next household was tried. Most of the interviews were conducted in the farms and this helped in asking questions in relation to what was on the ground .The questionnaire was administered by being read out to the interviewer.

A close-ended questionnaire was designed to get the relevant information from the community members. The types of questions were a mix of one response and multiple part questions. Data were collected between October and December 2008. Appendix I show the interview questions used in this study. It took approximately an hour to administer it to the community members. The questionnaire was divided into 4 sections.

The first section Q1 to Q 7 covered information on general issues such as land ownership, size, use and land use. The second section Q8 to Q16 gathered respondents' knowledge and perceptions on ecosystem services. The third section containing Q18 to Q35 assessed the community awareness of biodiversity and ecosystem services. The fourth section Q36 – Q51 gathered information on community institutions in the area. And finally section 4 with Q52 to Q59 covered demographic information such as age, sex and marital status.

The questionnaire was pre-tested on a small number of people characteristic of those in the survey. A few changes were made to the structure and wording of the questionnaire to reflect the needs of the community. The final survey was carried out on a total sample of 253 respondents of which 95 and 158 were interviewed in Kamae and Kereita forest reserve blocks respectively.

3.3 Field observation

To assess and identify the ecosystem services provided by the area, a transect walk using check list developed from literature covering provisioning services, regulating services, supporting services and recreation services was carried out. This was done to supplement the information gathered in the questionnaire. The transect walks were conducted in the community landscapes and the protected area. This was to establish observable degradations in the farms and ecosystem services in the region.

3.4 Data Analysis

The data collected was analyzed by statistical package for social sciences (SPSS) while graphs and charts were developed using Excel spreadsheet.

4 RESULTS

This study explored prospects and challenges community living adjacent to protected areas ecosystem have towards adoption of PES schemes. The result consists of five sections. The first section describes socio demographic features of the village communities living in the study area. The second section includes general issues such as land and land use. The third deals with ecosystem services section. The fourth covers the community institutions and lastly the PES perceptions.

4.1 Demographic Characteristics of the Respondents

A total of 253 respondents were interviewed from the administrative units adjacent the protected areas. Those interviewed included community groups and community members. The survey respondents were 158 for Kereita and 95 for Kamae. Kereita had 4 villages while Kamae had 3 villages (Table 5.)

Table 5. Area Breakdown of Respondent Interviewed.

Study Area	No of respondents in the study sample	% Of the respondents population
Kereita n = 158		
Bathi	39	15.4
Magina	39	15.4
Kamba	40	15.8
Gatamaiyu	40	15.8
Kamae n = 95		
Kinale	25	9.9
Kamae	70	27.7
Total	253	100

Survey respondents in the two study sites were 18 years and above with nearly half (45%) falling within the age category of 36 – 44. Male and female respondents were nearly equal 51% and 48 respectively. Majority of the respondent (81%) were married. About half of the respondent (52%) had secondary level of education while those with primary level accounted for 31% of the respondent. About half of the respondents (51%) had households of between 3 and 5. Majority of the respondent (84%) were farmers with 67% falling in income categories Kshs 10000-50,000. Table 6 summarizes the sample demographic characteristics that included age, marital status, occupation, household numbers, and occupation among others.

Table 6. Respondents Socio Demographic Characteristics.

Characteristic	Kereita n = 158		Kamae n = 95	
	Male n = 84 %	Female n = 74 %	Male n = 56 %	Female n = 39 %
Age				
18 – 26	5.1	4.4	7.4	3.2
27 – 35	12	15.8	7.4	11.6
36 – 44	23.4	19	30.5	20
45 – 53	8.9	5.7	10.5	4.2
54 and above	3.8	1.9	3.2	2.1
Gender	53.2	46.8	58.9	41.1
Marital Status				
Married	46.8	36.7	53.7	26.3
Single	3.8	6.3	4.2	9.5
Windowed	2.5	3.2	1.1	5.3
Divorced	0	0.6	0	0
Education Level				
Primary	10.8	19	14.7	18.9
Secondary	26.6	23.4	38.9	16.8
Tertiary	15.8	4.4	5.3	5.3
None	0	0	0	0
Household Members				
1 – 2	4.4	5.7	4.2	2.1
3 – 5	21.5	25.9	34.7	22.1
6 – 10	25.3	12.7	17.9	13.7
Over 10	0.6	0	0	0
Occupation				
Farmer	51.3	46.2	55.8	41.1
Business	1.3	0.6	2.1	0
Employed	0.6	0	1.1	0
Other	0	0	0	0
Main Income Source				
Farming	46.2	39.9	47.4	33.7
Business	3.2	1.9	6.3	2.1
Employment	3.2	5.1	5.3	4.2
Other	0.6	0	0	1.1
Monthly Income				
0 – 999	0	0	0	0
1000 – 4999	7	6.3	10.5	8.4
5000 – 9999	12	11.4	10.5	7.4
10000 – 19999	7	16.5	16.8	10.5
20000 – 49999	23.4	10.8	16.8	11.6
50000 and Over	3.8	1.9	4.2	3.2

The sample had a literacy level of 89% compared to the countrywide average of 85.1 %. The household number in Kenya is approximately 4.8 (KNBS, 2007) while sample had 3- 5. This is slightly less than the national average. The gender is also slightly biased towards male. This can be explained by the fact that men are more likely answer even if the wife is present. The Income of household 10,000 – 50,000 is slightly lower than average 50,000 (Emerton *et al* social economic study in the similar areas adjacent to region). Overall the sample is generally representative and similar in the two study areas.

4.2 General Land Issues

All the respondents owned land. The farm sizes were between 0 – 5 acres (91%). The farms were owned individually (47%) or by family (53%). Crops and livestock were the main land use (Figure 3) in the study sites (98%). Only 2% of the farms were covered with forest.

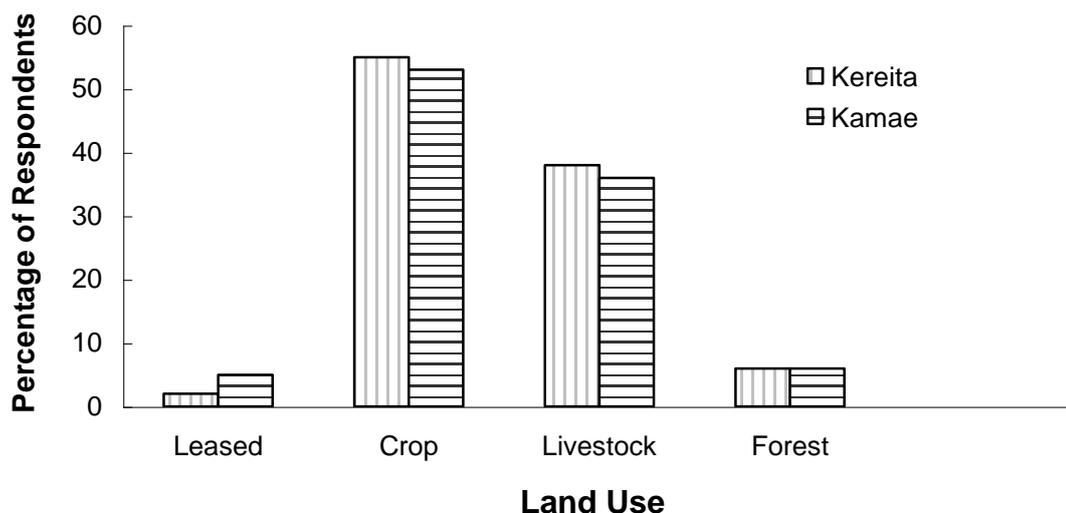


Figure 3. Land Use Categories at the Study Sites.

There were land degradation threats or partial degradation except in 20% of respondents' farms. The threats reported included overstocking, overexploitation of forest and loss of soil productivity. Most of the respondent indicated that environmental conservation is important to them. Table 7 below summarizes some general issues at the two study sites.

Table 7. General Issues at the Study Sites.

Characteristic	Kereita n= 158		Kamae n = 95	
	%	Frequency	%	Frequency
Farm size				
0 – 5	92.6	146	88.4	84
6 – 10	9.4	12	11.6	11
11 – 15	0	0	0	0
16 and Over	0	0	0	0
Land degradation				
Yes	40		38	
Partial	40		40	
No	20		22	

4.3 Ecosystem Services in the Area

The respondents' interest in conservation was high. All those who were interviewed ranked environment conservation as important (100%) to them (survey question Q9). Table 8 shows the distribution of responses moderately important to very important.

Table 8. Respondents' Perception of the Important of Environmental Conservation to them

Responses	Kereita n = 158		Kamae n = 95	
	Percent	Frequency	Percentage	Frequency
Very Important	50.6	80	61.1	58
Important	37.3	58	29.5	28
Moderately Important	12.0	19	9.5	9
Of little important	0		0	
Not Important	0		0	

51% of the respondent ranks environmental conservation important to them probably because of staying close to a reserve. From this question it can be seen that the communities and other stakeholders neighbouring the parks value the ecosystem. The entire respondents had knowledge of the Aberdare ecosystem and believe it is an area of special interest to them. 39% and 24% of the respondent believe agriculture and industry respectively are among the major issues that should drive conservation in the area (Figure 4).

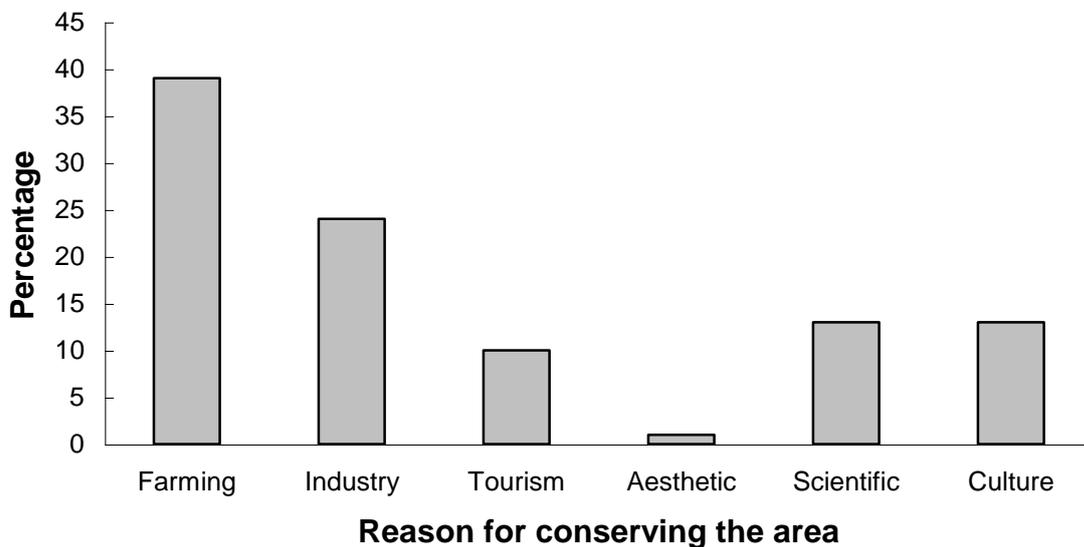


Figure 4. Major Issues of Conserving the Region.

Majority of the respondents are engaged in conservation activities, they feel they are not well informed (80%) on the resources from the protected area among others, they also cited exploitation of the forest as a threat, that the forest is important for water conservation (20%) and they believe it influence the climates 30%. On being asked to indicate agreements with a number of statement they strongly agreed global warming is an environmental problem, there is decline in stream flows in the

recent past, temperature are becoming extreme and degradation of forests and other natural resources. On familiarity with ecosystem services, Figure 5 summarises the responses.

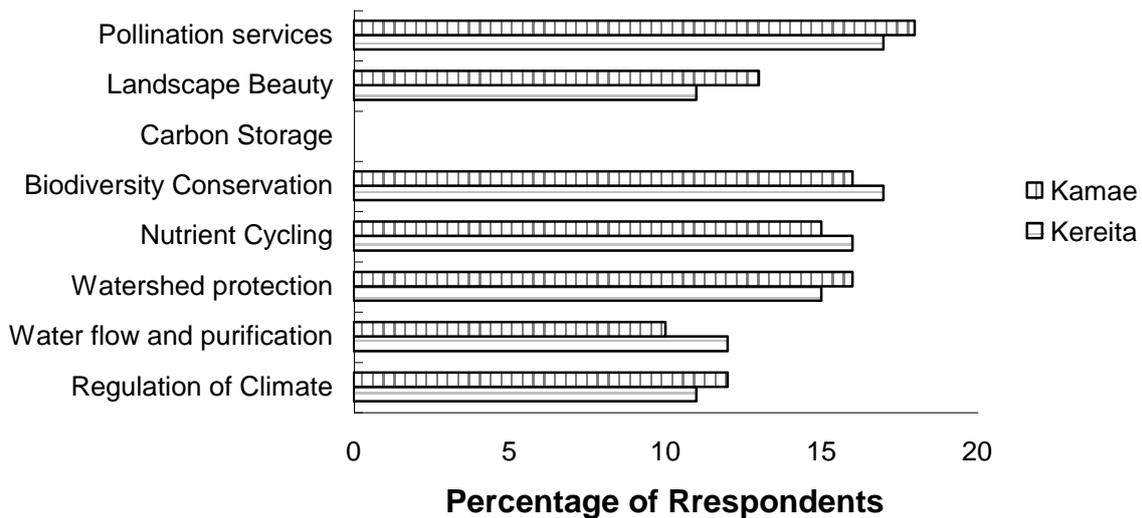


Figure 5. Respondents Familiarity with Ecosystem Services.

The respondents were familiar with some of the ecosystem services. 30% were willing to produce more of ecosystem services. From these responses we can see that the people are familiar with some ecosystem services. It is surprising however they are unfamiliar with carbon, which is high in global agenda as mean of reducing climate change. A checklist of relevant ecosystem services in the study site was further prepared guided by the literature, through field observation and transect walk (Table 9).

Table 9. Result of Transect Walk

Ecosystem Services	Kereita	Kamae
Provisioning		
Food	✓ <input type="checkbox"/>	✓ <input type="checkbox"/>
Water	✓	✓
Fibre	✓ <input type="checkbox"/>	✓ <input type="checkbox"/>
Firewood	✓	✓
Medicine	<input type="checkbox"/>	<input type="checkbox"/>
Genetic Resources	✓	✓
Regulating		
Carbon sequestration	✓	✓
Soil erosion protection	✓	✓
Water Purification	✓	✓
Pollination	✓	✓
Pest and diseases control	✓ <input type="checkbox"/>	✓ <input type="checkbox"/>
Supporting		
Seed dispersal	✓ <input type="checkbox"/>	✓ <input type="checkbox"/>
Nutrient cycling	✓	✓
Biomass (primary production)	✓	✓
Recreation		
Scientific discovery	✓	✓
Recreational experiences	✓ <input type="checkbox"/>	✓ <input type="checkbox"/>
Cultural, intellectual, spiritual inspiration	✓	✓

Observed ✓, Reported

4.4 Community Institutions

Among the respondent interviewed 34% did not belong to any community organisation. For those with membership in various community institutions their membership was diverse. They mainly belonged to Community based organizations (CBOs), Self help groups and cooperative societies (Figure 6). Their popular activities (Figure 7) are community education and awareness rising (63%) while other projects are in agriculture (30%). 20% of the community organisations collaborate with local/foreign institutions for community development (51%) and conservation (49%). They had some knowledge on other organisations involved in biodiversity

protection (10%) and carbon sequestration (5%). The respondents had no knowledge of market for ecosystems (96%), cited there is no available source of information (70%) and are willing to know more on environmental services. The respondent got information from government (10%) and recommended NGOs to lead on the initiatives and thought there was potential for such schemes in the region

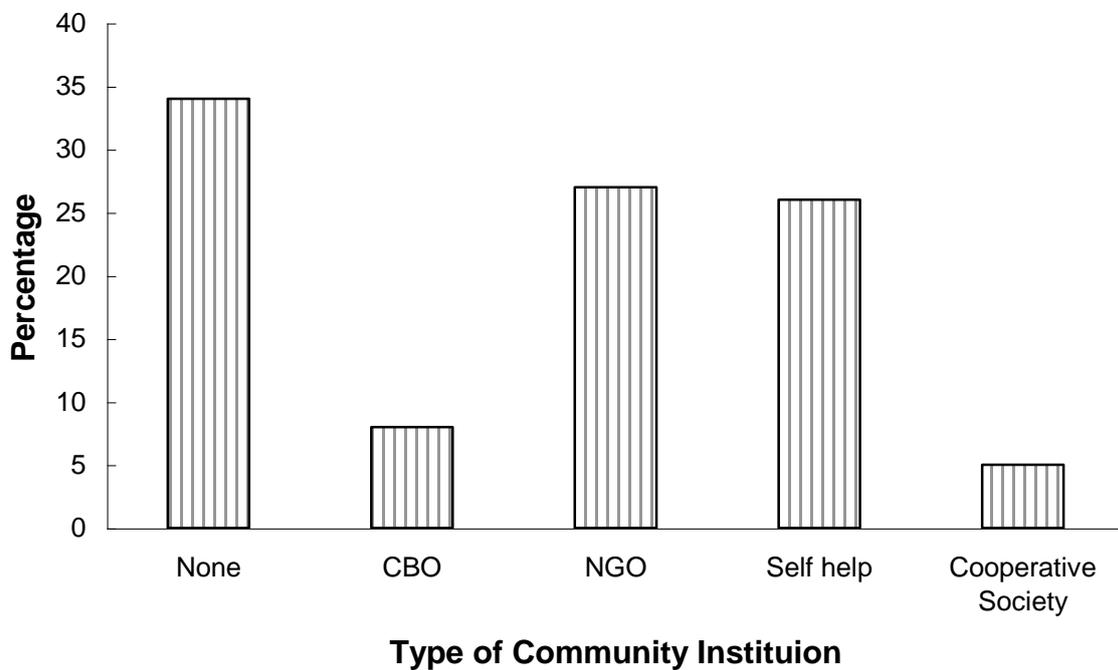


Figure 6. Community Institutions

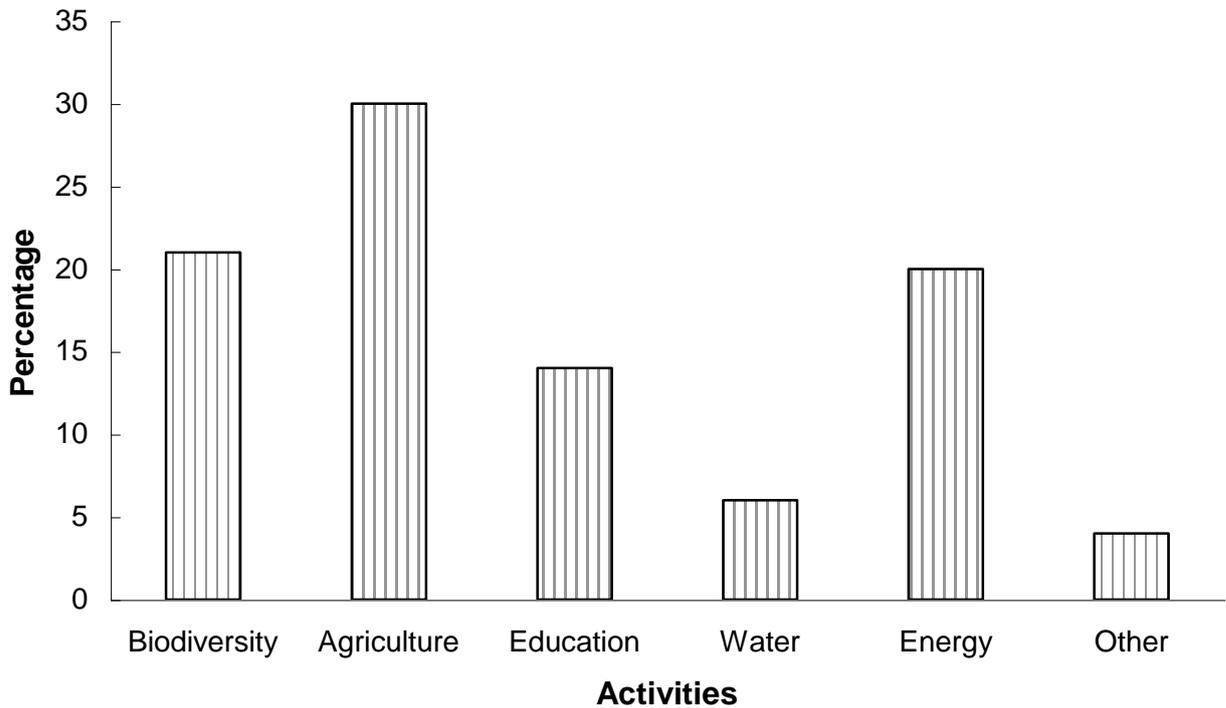


Figure 7. Activities and Projects Carried out by Community Institutions.

4.5 Perception on PES

Nearly all the respondents (90%) were not familiar with the PES concept when it was explained to them. Only 8% percent said they were familiar. All the respondents indicated they were willing to be involved in PES design and were ready to change land use (90%). The respondents expect such schemes to bring infrastructure (22%), market for products (20%), and additional income (19%)(Figure 8).

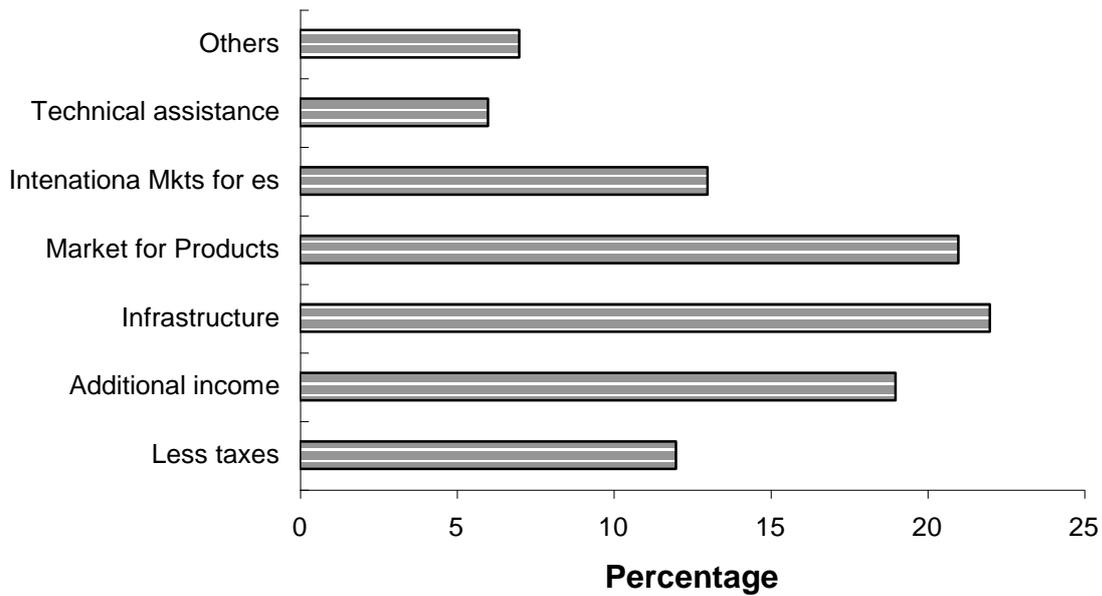


Figure 8. Respondents Expectations on PES.

The interview revealed that the main barriers the community view as likely to work against adoption of PES schemes are lack of market information, lack of capacity and lack of community organization. They viewed as barriers lack of market information and capacity as barrier in adopting such schemes. Only 5 % cited lack of community organization as barrier (Figure 9).

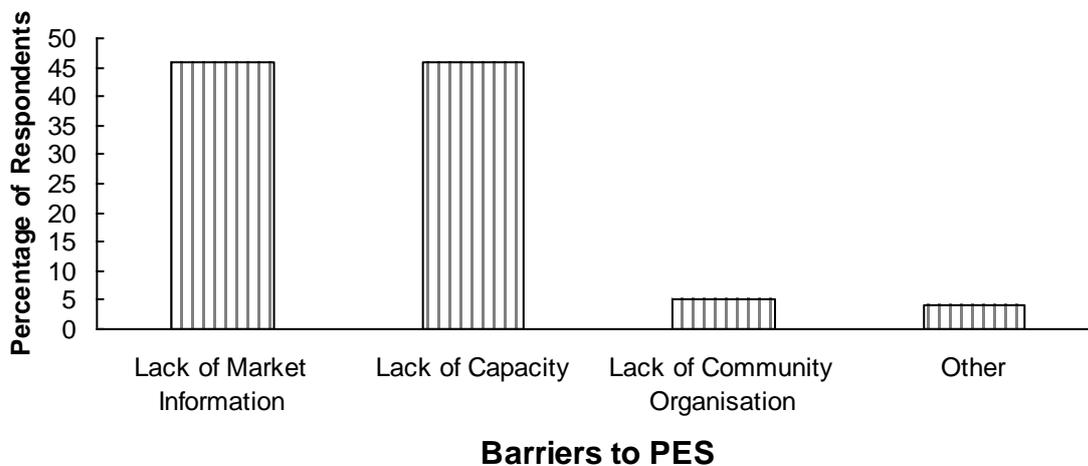


Figure 9. Perceived barriers to PES Adoption

The respondents showed some knowledge on beneficiaries of ecosystem services. 38% and 44% of the respondents indicated hydroelectric facilities and municipal water (consumers) respectively as the beneficiaries (Table 11). None of the respondents could name polluters as beneficiaries.

Table 10. Perceived Potential Beneficiaries of Ecosystem Services in the Area.

Responses	Kereita n = 158		Kamae n = 95	
	Percent of Responses	Count	Percent of Responses	Count
Carbon emission				
Polluters	0	0	0	0
Voluntary buyers	0	0	0	0
Watershed Benefits				
Hydroelectric facilities	38.6	139	38.2	79
Municipal water facilities	43.1	135	44.9	93
Biodiversity conservation				
Consumers of eco-labelled products	16.1	58	15.0	31
NGOs	2.2	8	1.9	4

The respondents also indicated that they do not feel the continued existence or supply of other resources from the reserve was secure. Lastly the respondents were asked to give their opinions on whether they were willing to change their current land-use to sustainable land use practices such as agroforestry. All the respondents showed willingness to change their land use practices to more sustainable ones.

5 DISCUSSION

The study is on local community perspectives on prospects and challenges of PES schemes in Kikuyu Escarpment Area. The study main findings are that there are good prospects for PES in Kikuyu Escarpment forest although there are some barriers to be overcome for the potential to be realized.

5.1 Potential of Developing PES in Kenya

For the region to have potential for it has to meet some basic principles proposed by Wunder et al, 2005 and Pagiola, 2005. The results show the site possess some favourable conditions for PES schemes. To begin with the two study sites the land is owned individually or by family. In this case the individuals and families owning the land adjacent to the protected areas have a secure land ownership. The importance of land tenure in PES schemes is important for the buyers of ecosystem services to have confidence that the community can supply ecosystem services over a long time. Moreover, secure property rights in PES is important so that capture of benefits by powerful actors is avoided. This in turn ensure that the benefits reaches the community. Though the land owned is very small and the community are small holders and hence face considerable barriers such as economies of scale, they can collectively manage and market their ecosystem services. On the side of the protected area the community is in the process of securing property rights or tenure over both the forest and the ecosystem services through a management plan with government. This is through community forest associations which is set to sign agreement with the government for the co management of part of the forest. Rosa et al 2003, suggest conservation focused PES schemes if the communities have secure

rights to natural resources at a significant scale and quality. However establishing property rights over environmental services could still pose some challenges in the area given some people have no lands (some squatters in the area) and could be denied access. Any PES scheme design ,however need good structures to be representative of the community.

5.2 Ecosystem Services in Kikuyu Escarpment

The local community at Kikuyu Escarpment can play the role of providing environmental services provision. From community respondents' answer to question 11 on which ecosystem services they can produce, the respondents indicated they could be able to supply biodiversity and water and carbon. The availability of ecosystem services was further confirmed by field observation and transect walk. These are some of the ecosystem services under market currently (Mayrand and Paquin, 2004). The availability of the ecosystem services is one of the basic criteria for PES schemes (Wunder, 2005). Since there is degradation of ecosystem services and scarcity some of the promoted actions for PES in the region could be protection of the existing ecosystem services such as water, biodiversity, carbon sequestration and scenic beauty or the bundled services.

Another action to be promoted by PES in the area could be restoration or establishment of environmental services in the degraded sites .The community can supply carbon sequestration services through adoption of suitable land use practices. Already woodlots and agroforestry and their willingness to adopt to other land use changes. This could be land use change that is compatible with environmental conservation for instance agroforestry. On water services they can participate in protection of watershed both in farm in the reserve. This can results in increased

water quality and quantity. This can involve practices such as general protection e.g. patrolling and patrols, rehabilitating or restoring degraded water catchment sites and adopting compatible agricultural practices compatible with conservation. PES for watershed experiences in Asia and Latin America shows them succeeding. This is because it is easy to identify the beneficiaries. It also has clear linkages with land use practices. On biodiversity offsets the community can pursue ecolabelling and certification of their products such as crops, livestock etc as coming from tropical and benefiting from good practices. Since this market is growing there is some potential as shown by Forest Stewardship Council (FSC) and Rainforest Alliance (organizations in charge of ecolabeling and certification of tropical forest products). PES for biodiversity protection could be applicable with communities bordering the protected areas to also reduce illegal activities, increase their farm biodiversity produce, improve protection and monitoring of Aberdare reserve, and compensate the communities for existence of reserve which have had negative impact on their livelihood. On scenic beauty the community can lobby for charges and revenues accruing from access rights and entrance rights to reserves. As single service may not be enough to offset for opportunity costs of alternative land uses the community can pursue the bundling of the services. Again through organization they can benefit from the emerging REDD programs.

5.3 Awareness of Ecosystem Services

The study shows that ecosystem services are not well understood by the community. However some respondents could recognize the benefit provided by the area such as pollination, nutrient cycling, water and others. A notable observation was little or no knowledge on carbon sequestration as ecosystem service. Only 1% of the respondents mentioned carbon. This is surprising given the ongoing global campaigns

on climate change. Additionally, carbon sequestration is one of the promising in PES given opportunity offered by Kyoto protocol, Reduced Emissions from Deforestation and degradation (REDD) and the UNEP championing of International PES. The lack of familiarity with ecosystem services calls for awareness and education efforts on the ecosystem. Since some respondents are engaged in conservation activities and are potential ecosystem providers the education programs may improve functioning of PES by adopting ecosystem services production methods. For the local community living adjacent to the forest to be involved they require some information which can be accomplished in form of education and training.

PES schemes in the area could target those engaged in other conservation and community work or participating in conservation programs. Most of the conservation organizations in the area are engaged in community projects e.g. beekeeping, agriculture as shown by responses. This can offer a good entry to PES schemes in the community.

Although the locals may not be familiar with the term (only 5 percent have heard of the term) they all of respondents indicated that they were potentially interested in a PES Program after it was explained to them. Local community have favourable perceptions on ES and PES with varying expectation that can be taken into account when developing payment for ecosystem services schemes. It should be taken into account that selling environmental services look very foreign to ecosystem service providers and users

5.4 Community Institutions

The survey showed existence of community institutions in the area. The community institutions have some experiences with managing and running project at the site.

Although most of the community institutions deals with community based natural resources management (CBNRM) they come in handy in the implementation of PES programs. For instance they can assist in identification of other organizations working in the area, biodiversity conservation and restoration of degraded areas, local economic development, agriculture incentives for agroforestry and environmental management and education. They come after government embraced CBNRM and includes groupings of water users, grassers, beekeepers among others. In addition there have already jointly with government developed management plan for the forest and likely to manage the site once they sign agreement. These efforts shows the community willingness to the conservation of ecosystem services. The institutions in community are good for monitoring, management committees and prioritisation of projects.

As noted by Rosa et al (2003), communities usually need to strengthen organizational and administrative structures before they are able to negotiate successfully their role in PES schemes. This can be done by building capacity and strengthening local governance. It is noteworthy that these community institutions in the study site have some form of collaboration local or international. The collaboration can serve good in fundraising and providing a range of support services to PES schemes. For instance the institutions can come in handy in negotiations, collective action especially in biodiversity for small producers and for local resource management.

The community expectations for the PES schemes in the study area were diverse with preference for infrastructure, market for products, and additional income among others. The expectations are in line with PES project elsewhere like in Costa

Rica where PES projects provide compensations in terms of cash payments, in kind payments, technical assistance training and marketing, provision of social services or infrastructure among others. As per the community expectation of those schemes they could form community funds to administer the funds generated to be ploughed back to projects like community projects in health, agriculture and others they would like. This can be done through establishment of community fund to manage such projects such as those in infrastructure and markets for goods. PES projects experiences in other places like the RUPES (Rewarding Upland Poor For environmental services) in Asia has shown that achieving PES depend among other things on some possible rewards mechanism for the community which could be financial payment or input support. This expectation can be met when designing the PES project. PES in the area can help in contributing to the goal of poverty reduction through aligning it with wider national development goals and priorities such as poverty reduction strategy, Millennium Development Goals, Vision 2030 among others. This can be done by looking for ways of paying the poor for their stewardship of natural resources and making the PES to fit the larger rural development picture.

The other area where community institutions can play crucial in PES schemes in the region is through fostering collective action among the members of the community. Collective action is desired as most of the ecosystem services are common pool resources that cannot be managed individually. This is especially so in services such as watershed where when adopted require a threshold number of community members in a certain area to adopt the practices before the ecosystem service can be secured. Collective action by groups can also lower the transaction costs associated with PES such as contracts, monitoring, negotiations and conflict

resolutions. Operating together as a group can also ensure greater bargaining power and ensure pro poor arrangements are incorporated in PES schemes.

5.5 Barriers to Implementation

The implementation of PES schemes like many other new initiatives can face some challenges. From the perspectives of the majority of those interviewed there is lack of information and capacity. This can act as barrier to the community adopting such schemes. Generally implementation of PES schemes should require information about buyers and sellers, about how to design PES schemes among others. The lack of information can lead to confusion, uncertainties and suspicion of the PES mechanisms in the communities. If the barriers are overcome they can motivate the communities to adopt the schemes through fostering understanding of the PES mechanism. There is need to generate awareness among the community about the markets.

Besides lack of information, Lack of capacity as reported by respondents can act as a major barrier to the implementation of PES schemes in the area. The community providers of ecosystem services require skills to assess the market potential of their resources or implement resource management options that would focus on restoring and maintaining ecosystem services. The lack of capacity especially within the community institutions can impede the implementation of PES schemes.

The other barrier cited is lack of community organisation. This can harbour true participation and ownership of local people. Strengthening the capacities of the local institutions especially having a strong steering community committee is desired. The structure of PES schemes should also reflect local abilities and realities.

Communities and small holders require assistance for instance in creating links to markets, on how to improve ecosystem management techniques and learning monitoring techniques.

Lack of markets for ecosystems services could also be barrier. This could call for good community organization in approaching markets and also trying to cut on the transaction costs involved in such undertakings. This calls for various skills by the community to initiate such schemes.

Though all the barriers mentioned by respondents, PES projects elsewhere in Africa, Asia and Latin America shows the PES schemes overcoming some of the barriers and playing a key role in conservation, poverty alleviation among other roles. This is achieved through innovations, adaptive management and learning from successful case studies because the schemes are at early stages.

6 CONCLUSION

This study explored prospects and challenges community leaving adjacent to protected areas ecosystem have in implementing PES schemes. From the study there is a potential for implementation of PES in the area though with some challenges. The schemes could play a great role in the conservation of Kikuyu Escarpment forest protected areas as well as the livelihoods improvements of adjacent communities. The study outlines conclusions on the area concerning ecosystem services, benefit from PES, community perceptions and community institutions.

To day the promising success of PES compared to other conventional approaches in conservation tools point to change of degradation land use change in

and good future for ecosystem services in the world. Kikuyu Escarpment forest forms important catchments. In the region there is high community dependence on agriculture and subsistence as well as in Nairobi. Many people livelihood are vulnerable to resource degradation and any loss in productivity. Finding ways that can guarantee the maintenance of ecosystem services through sustainable resource management is therefore a major challenge for the Kikuyu escarpment area.

There is good prospects for PES in the region with favorable condition or factors and with some barriers to be overcome going from the local community perspective from the community perspectives gathered during the study.

The PES schemes in the region apart from supplementing other conservation initiatives can have impacts, which are both social and environmental in the area. First the projects can lead to community development through bringing potential funding. The schemes can lead to sustainable local development and ensure community gains in, training, and funds for ecosystem management. Potential funding from PES can go to community related activities in adjacent to protected areas such as water, education, health and enterprise development. This can ensure local community gain in economic terms from natural resources management. The potential funds can lead to improvement of community livelihoods especially given that most of them are rural poor and have the potential of providing the ecosystem services. The projects can further produce positive social outcomes e.g. participation, impacts in equity, improved tenures security of resources, community empowerment, organizational and social capital development.

Secondly PES in the area can lead to sustainable natural resources management at the local level. This is through devising mechanisms under which the

local can be paid for the stewardship of the natural resources at the local level. On this front PES will foster CBRNM. The communities adjacent to the reserve depend on the local resources for their livelihoods and other needs. There are benefits to be gained by local ecosystem services producers in implementing payment for ecosystem services schemes. In return this could improve the conservation of the Aberdare ecosystem and livelihood of the community living adjacent to the protected area. This could be through efficient use of resources and improved service deliveries for sellers for the community because they are providers and sellers. This also leads to improved delivery of services to the buyers of ecosystems services.

PES is also going to foster management of community institutions at local level through strengthening management of community institutions. This is important in bringing about development and overall growth or strengthening of community institutions through interactions. Strengthening of community capacity to participate and community organizational skills

A potential project in the region on PES should capture ecosystem services that are readily available such as water, carbon sequestration and biodiversity. This is because it has been shown in other regions that payment for water and carbon services is feasible and the communities can providers of such services.

In addition education programmes for PES and ecosystem services can be designed. This can raise awareness among the community and other ecosystem services providers of the benefits of using PES to protect and sustainably use natural resources in the area. This can contribute to sustainable protected financing in the protected areas and outside with people having incentives to conserve.

Further there is need to enhance capacity building for the community staying adjacent to the reserve. Engaging communities in areas will be critical to the success of PES in Kenya from the community perspective. Efforts to build local organisational capacity through skills and local governance systems can go a long way towards development of the programme.

While potential benefits look promising there are obstacles on to be overcome. There are some barriers to be overcome such as lack of information, capacity and organization. These can be overcome with some suggestions provided.

It is intended that the study project will inform local and national organisations to consider PES development and to gain knowledge on communities' perceptions and knowledge on PES and ecosystem services.

While restricted in geographic scope to Aberdare the study may help in the design of PES programs more in other areas. In particular the opportunities and challenges could equally apply to other forest adjacent communities in Kenya

These advantages lead to the conclusion that PES is good method of conservation in the region with community support and lead to a number of recommendations for the protected area.

7 RECOMMENDATIONS

PES is promising approach to conservation presents opportunities for rural communities and ensures achievement of both conservation and poverty alleviation goals. Suggested recommendations for the Kikuyu Escarpment Forest based on the study are made on management actions to secure ecosystem services, policy instruments to ensure way forward for PES schemes and further study.

Awareness Creation

One of the recommendations arising from the study is the need to generate local awareness and interest in ecosystem market and ecosystem services for the local communities. Developing awareness on ecosystem services and the role PES can contribute to the halting of resources degradation in both the protected areas and in its vicinity. The local communities and their institutions should be aware of ecosystems services, their declining status and methods of sustaining the reserve. This market information can help link buyers and sellers (community providers) of ecosystem services. Sufficient information should be made available to the community in order to demonstrate the contribution they can make through sustainable land management. Awareness should also be directed towards engaging other stakeholders in the conservation of the ecosystem services. The awareness of PES schemes and ecosystem markets in the area should be carried out by the community institutions NGOs and government institutions already working in the region. Since most have been in the field they can formulate the activities that can go towards raising awareness such as workshops, meetings, rallies among others.

Strengthening the Community Institutions

Strengthening of community organizations to prepare them is important in enabling communities join ecosystem markets. Capacity building in natural resources management at local level can strengthen the community participation in PES. This can be achieved through training and information provision to the community. Trained community institutions are able to handle conflict resolutions and understanding of other by laws. For communities in Kikuyu Escarpment to engage in PES deals there is need for building the capacity of community based organisations

working in the area to address the awareness issues. capacity of community institutions can enable community groups and NGOs to have skills in PES project design and implementation . This also can be achieved by trainings especially for staff of these organizations and establishing relations between national and other international institutions interested in furthering PES.

Policy Issues

There is need to provide guidance on implementation of PES at community level through enabling policy. Though the government have tried to decentralize the management of natural resources through reforms in environment, water, wildlife, forestry and other sectors more should be done specifically in ecosystem services. More pro active efforts by government and NGOs to create a framework for Markets of ecosystem services embedded in the overall strategy of natural resources management is required. Additionally domestication of issues and relevant policies at global and national level to local level so that people can understand the changes taking place elsewhere in terms of ecosystem services emerging markets. The local authorities of the region should take into account ecosystem services in the region when doing planning processes inorder to foster their development. The stakeholders should participate in consultation to see who benefit from the Kikuyu Escarpment forests ecosystems services such as energy and water sectors, should contribute directly to its conservation in proportion to the benefits.

Pilot Project on the Site

Implementation of a demonstration project for the development of community-based PES in the Kikuyu Escarpment region is desirable to serve as learning tool. Such a project should include the available ecosystem services, their quantification, training

components and development of appropriate PES project design. The results of such as project should help to introduce and popularize PES schemes and facilitate their development at local scale. The project should include workshops to disseminate the knowledge and lessons learned from other developing regions such as Latin America with successful PES stories. The community perspectives could be taken into account to design a pilot PES scheme in the area starting with a limited number of actors. This would be useful to gain further experience and put PES concepts to practical tests. Such a pilot project should focus on ecosystem services such as carbon, water and biodiversity conservation with a view to mobilizing payment for these services by the beneficiaries. These still could be the role of NGOs and community groups to realize.

Further Study

It is recommended that for good prospects of PES at Kikuyu Escarpment there are some areas that deserve further investigation. The investigation is required to highlight specific areas where PES is likely to be promising, quantification of the value of ecosystem services in the area, identification of how ecosystem services in the region such as carbon sequestration, scenic beauty and others can be linked to specific payment system for the protection of the protected area and the necessary community institutions adaptations required for successful implementation. There is also need to identify the beneficiaries willingness to pay. These investigations should help in strengthening PES programs and making it more promising in the area.

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APPENDIX

Questionnaire

Introduction and Explanation of the Survey

The current study is part of a research project of the University of Klagenfurt (Austria). I am currently collecting data and I would be grateful if you could provide me with important information that both could be of very practical use and of scientific benefits.

The overall objective is to explore the potential of a payment for ecosystem services (PES) scheme in Aberdare region and the likelihood of the community adopting them. The specific objectives are:

- To identify the key ecosystem services provided by the Aberdare region that can potentially benefit from payments for these ecosystem services.
- To assess the local community's perceptions, awareness and expectations on such PES schemes
- To identify the community institutions that can assist in the PES scheme adoption.
- To use findings to make recommendations on suitable design PES scheme to the community and resource managers

The answers provided will be kept confidential and used only for scientific purposes. No unauthorised person will gain access to the information. The information will be available only to researchers of the University of Klagenfurt in Austria, Europe.

I General

Interviewer.....

Date.....

Area.....

II Identification of the Ecosystem services from the region Ecosystem services

1. Do you own land? Yes No
2. What is the size of the land in acres 0- 5 6- 10 11- 15 16 and over
3. Who owns the land Individual Communal Family Other (Please specify).....
4. Is there presence of the following in the farm?
 - Agro forestry,
 - Eco-tourism,
 - Forest
 - Sustainable agriculture
 - Other (Please specify)
5. Indicate Presence of Woodlots Indigenous Fruits Other (Please Specify).....
6. Land use Idle Leased Crop Livestock Forest Other (Please specify).....
7. Land degradation threats in the farm?
 - a. Overstocking and overgrazing Yes Partly No Don't Know
 - b. Overexploitation of forests Yes Partly No Don't Know

- c. Cultivation on steep slopes Yes Partly No Don't Know
- d. Loss of soil and soil productivity Yes Partly No Don't Know
- e. Loss of biodiversity Yes Partly No Don't Know
- f. Effect on Hydrological regime Yes Partly No Don't Know
- g. Other (Please specify).....

In the next section I would like to ask you several questions on how you perceive the ecosystem services.

III Ecosystem services as perceived by community farmers

8. Please indicate the extent of your agreement or disagreement with each of the following statements

	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
Global warming is an Environmental problem	1	2	3	4	5
There is increasing decline in Stream and river flows	1	2	3	4	5
Temperatures have become more in the recent past	1	2	3	4	5
Degradation of forests and other natural resources is increasing	1	2	3	4	5
There is frequent floods incidences	1	2	3	4	5

- 9. How important is environmental conservation to you Very important Important Moderately important of little important Not important
- 10. What ecosystem services are you familiar with? Tick all that you are familiar with Regulation of climate water flow and purification Watershed protection Nutrient cycling Biodiversity protection (swamps, forests, savannah grasslands) Carbon Sequestration and storage (Forests, grassland, swamps) Landscape beauty (hills, ridges and highlands with grass cover, forests) Pollination services to agriculture Other (Please specify).....
- 11. Which of the above environmental services do you produce?
- 12. Regulation of climate water flow and purification Watershed protection Nutrient cycling Biodiversity and protection (swamps, forests, savannah grasslands) Carbon Sequestration and storage (Forests, grassland, swamps) Landscape beauty (hills, ridges and highlands with grass cover, forests) Pollination services to agriculture other (Please specify).....
- 13. Are you willing to produce more environmental services? Definitely Probably Undecided Probably not Very probably not
- 14. Which scenario best describes your situation in maintaining or improving ecosystem services? Under Voluntary implementation Implementation with compensation

Other arrangements

15. Who do you think are the potential beneficiaries of environmental services produced here? Local community Conservation and development Ngos Government Private sector World Other (Please specify).....

16. Do you think the environmental services here can be enhanced? If yes by changing

- Changing production services practices e.g. agro forestry
- Changing land use e.g. reforestation, afforestation
- Not changing land use e.g. reducing deforestation
- Other (Please specify).....

IV Community Awareness on biodiversity and ecosystem services

18. Do you have any knowledge about Aberdare forest ecosystem? Yes No

19. Do you believe this is an area of special interest Yes No

20. If yes which is the most important issue of conserving the area?

- Agriculture
- Tourism development
- Plant and animals
- Aesthetics
- History, heritage and culture
- Scientific value
- Other (Please specify).....

22. Are you engaged in conservation activities? Yes Partly No

23. If yes what activities? Tree planting Soil conservation Membership to conservation organisation other (Please specify).....

24. How well do you feel informed about the environmental resources from the reserve?

- Fully informed Partly Informed Not informed

25. Is the supply or continued existence of the resources secure? Yes No

26. Do you know the producers of such services? Yes Partly No

27. Do you know the beneficiaries of such services?

Carbon emission reduction:

- Polluters under regulation (Kyoto)
- Voluntary buyers

Watershed benefits:

- Hydroelectric facilities
- Municipal water facilities (consumers)

Biodiversity conservation:

- Consumer of eco-labelled products
- NGOs

29. Do you belong to any conservation or social group? Yes No

Payment for ecosystem services (PES) is a mechanism through which beneficiaries of the ecosystem service reward the providers financially or in kind. PES is a voluntary transaction where a well-defined environment service is being bought from a service provider if the service provider secures service provision. Ecosystem service paid for

includes biodiversity conservation, carbon sequestration, watershed protection and maintenance of landscape beauty.

30. Are you familiar with this concept of PES?
 - Very familiar Familiar Heard of it once not familiar at all
31. Would you like to be involved in the project design of such a scheme? Definitely
 - Probably Undecided Probably not Very probably not
32. What would be your expectations for such schemes?

Tick all that apply

 - Less Taxes
 - Additional income
 - More infrastructure
 - Markets for products with environmental labels
 - International markets for environmental services
 - Technical assistance
 - Other (Please specify).....
33. What do you consider the hindrance to you from adapting such schemes?
 - Lack of markets information
 - Lack of capacity
 - Lack of Community organization
 - Other (Please specify).....
34. Can you convert to unused land or any other land to forest? Yes Partly No
35. Would you be willing to adopt any other land use if complementable with agriculture for instance eco-tourism, non-timber products, Agroforestry or other activities?
 - Definitely Probably Undecided Probably not Very probably not

V Institutional organization activities capacity

36. What services do you know from environment? Regulation of climate
 - Water flow and purification Watershed protection Nutrient cycling Biodiversity protection (swamps, forests, savannah grasslands Carbon Sequestration and storage (Forests, grassland, swamps) Landscape beauty (hills, ridges and highlands with grass cover, forests) Pollination services to agriculture other (Please specify).....
37. Do you value the forest and other natural resources around you? Yes No
38. Are you involved in community activities, Yes No
39. If yes what kind of institution Community based organization NGO Self help group other (Please specify).....
40. What activities are you involved in? Eco-tourism Education and awareness Beekeeping Capacity building other (Please specify).....
41. Which projects have been/are/will be conducted in your institution? Eco-tourism Community education and awareness Agriculture other (Please specify).....
42. Do you have local and foreign institutions that you collaborate with? Yes No
43. In which areas do you collaborate? Community development Conservation Funding other (Please specify).....
44. Which are the most important issues to you in ecosystem conservation/use Farming Industry Tourism development Aesthetic Scientific value Cultural value other (Please specify).....
45. Do you know of any community-based initiatives or other institutions involved in Biodiversity protection Carbon sequestration Eco-tourism Other environmental friendly production? other (Please specify).....

46. Do you know of any markets for ecosystem services? Yes No
47. Is there available source of information? Yes No
48. Who is creating and disseminating information? Community based organization Ngos Private sector Government Other (Please specify).....
49. Do you wish to know more on environmental services? Yes No
50. Which organizations would you recommend to lead or initiate the schemes? NGOs Community based organizations Private sector Government Other
51. Do you think there is potential in this region for PES schemes? Totally Agree Partially Agree Neither Agree or Disagree Partially disagree Totally disagree

Finally I would like to ask a few question about you to assist in interpreting the results

VI Personal information

52. Age category: 18-26 27 - 35 36 - 44 45 - 53 54 and above
53. Marital status: Married Single Windowed Divorced
54. Sex: Male Female
55. Education Level: Primary Secondary Tertiary None
56. How many household members live here? 1-2 3-5 6-10 Over 10
57. Occupation: Farmer Manufacturing Service Industries recreation activities Scientific education and research Other (Please specify).....
58. You main source of income Livestock Crop Employment Business Other (Please specify).....
59. Monthly annual income Kshs 0 - 1000 1001- 5000 5001- 10000 10001 - 20000 20001 - 50000 Over 50000

Thank you for taking part in the Interview