# COSTS AND BENEFITS OF CONSERVING KAKAMEGA FOREST UNDER THREE DIFFERENT MANAGEMENT APPROACHES

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# Forest biodiversity in Kenya

- Relatively small forest cover (<2%of the land cover)
- Reservoirs of biodiversity, ecosystem services, basic needs, commercial importance
- Types: Costal, dry zone, montane, **western rain forest**
- Management:-
  - Forest reserves – Kenya Forest Service (KFS) formerly *FD*
  - National reserves/parks –Kenya wildlife service (KWS),
  - Trust land -(local authorities),
  - Others -(private)
- High rates of deforestation & degradation

# Overview of the Study Area

- Kakamega forest-only patch of tropical rainforest in Kenya
- Diverse, unique and numerous flora and fauna
- Not a single block; main forest + three satellite fragments (~24,000 ha)
- Area around forest; conducive for agriculture, high pop. density, high pop. growth rate, high poverty rates
- Dependence on the forest for basic needs-fuel wood, thatch grass, grazing

*Study area*

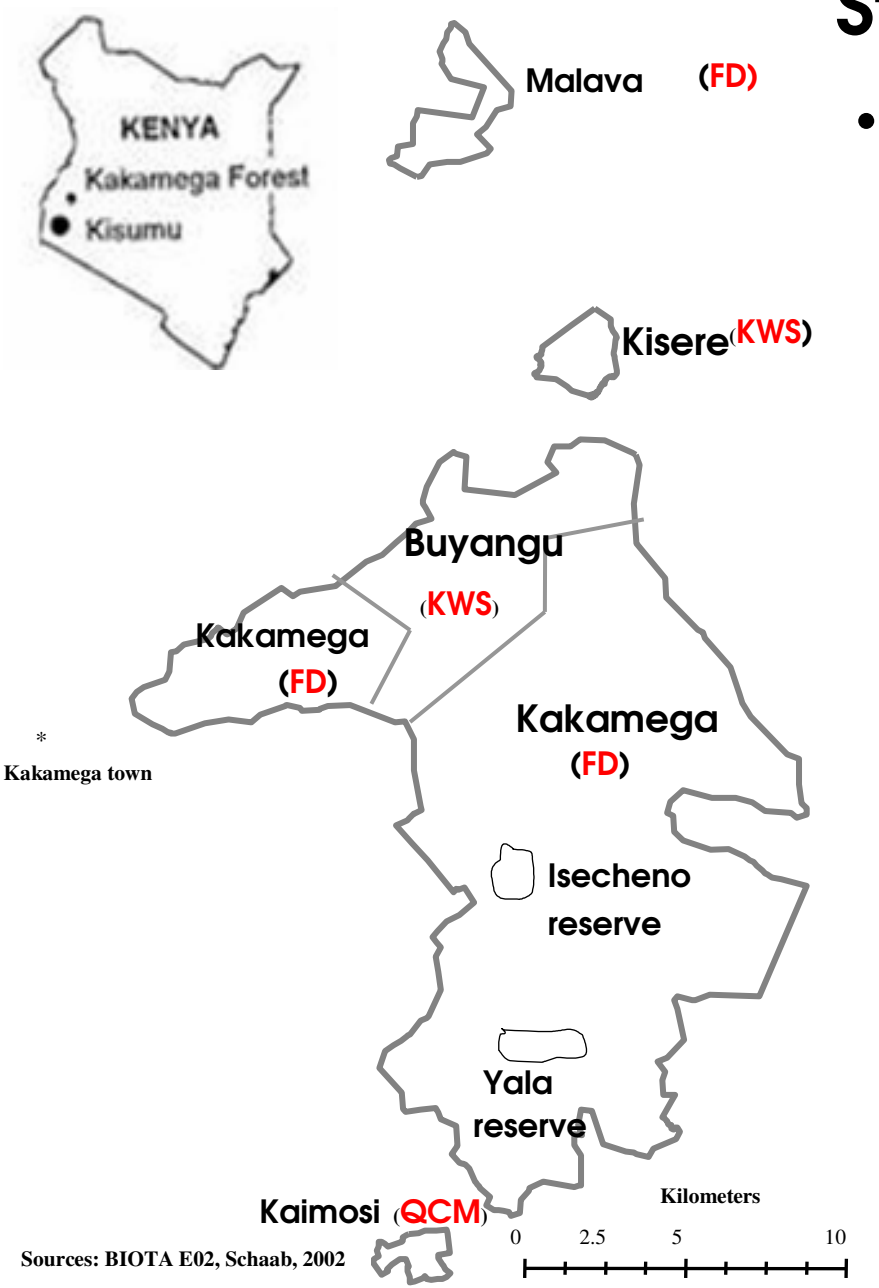


Figure 1-1: Map of Kakamega forest and its fragments

# Study Area Cont'd

- Kakamega forest is managed under three approaches;

1. **state-led protectionist**~4,000 ha by Kenya Wildlife Service (KWS )
2. **state-led incentive-based**~20,000 ha by Forest Department (FD)
3. **private incentive-based**~130 ha by Quakers Church Mission (QCM)

# Research problem

- Forest management involve;
  - Use of land, cash, capital, labor (Costs) and generation of benefits
- As economic resources, forests ought to be managed efficiently; net contribution to society (Kao *et al*, 1993)
- Distribution of costs & benefits among stakeholders- equity concerns (Ferraro, 2002 )
- Little information on economic efficiency & equity issues of the existing management approaches

# Study Objectives

- **Overall objective;**

  Analyze and compare three approaches in terms of economic efficiency& distribution of costs & benefits.

- **Specific objectives**;

I. Analyze distribution of different categories and magnitudes of costs and benefits-at local, national and global levels

II. Assess economic efficiency of the three approaches using CBA

# Data

- Target population; Forest adjacent communities (up to 10 km from forest boundary)
- A census of households (HHs) - about 34,000 from

  which a random sample of 378 HHs was generated
- Data collection-face-to-face questionnaire interviews
  - HH socio-economic characteristics, resource endowment, farming information, types and quantities of forest products extracted, costs incurred, satisfaction with forest management
- Final sample; 364 HH (220 FD,83 QCM and 61 KWS)
- Secondary & other sources;
  - Official records of forest management, government records, KFMP (1994), complimentary studies e.g. (Iason, forthcoming), Glenday (2006)

# Benefits of nature conservation

| Use Values | | | Non-use values | |
|---|---|---|---|---|
| Direct-use values | Indirect-use values | Option value | Bequest value | Existence Value |
| Outputs that are directly consumable Examples: Food, Recreation | Functional benefits Examples: Flood control, nutrient cycles | Future direct and indirect values | Use and non-use values of environmental legacy | Value of knowledge of continued existence |

**Source: Pearce and Moran, 1994**

# Costs of nature conservation

- Categories of costs;
  - Opportunity cost (value of forgone use)
  - Management costs (fixed and recurrent)
  - Extraction costs (labor)
  - Conservation activities-related costs
  - Transaction costs

# Valuation approaches

- Four distinct approaches (Pagiola *et al*, 2004);
  - Total value of flow from an ecosystem
  - **Net benefits of intervention in an ecosystem**
  - **Distribution of costs and benefits**
  - Identifying potential conservation financing
- At what level? Local, national or global
- Valuation methods;
  - Primary sources (revealed or stated preference methods)
  - Secondary sources (benefit transfer method)
- All benefits and costs were expressed in US$/ha of forest (for ease of comparison)

# Valuation of direct benefits

- From the sample household;
  - (Quantities extracted/yr) X (Market price)=Value extracted by a household (HHv)
  - ∑HHv)/number of extracting households = Average value of extracted product (Av.HHv)
- From sample to population (extrapolation);
  - (Av HHv) X extracting households in the population (extrapolated from the proportion extracting from the sample households)=**Total value of product extracted/yr**

*CBA-methods*

# Valuation of indirect benefits

| Benefits | Method & Source | Stakeholder |
|---|---|---|
| Soil conservation | WTP (Iason, forthcoming)<br>WTP (KFMP,1994) | Local<br>Nation |
| Tourism | Gate revenues<br>WTP (Pearce, 1996) | Nation<br>Global |
| Watershed protection | WTP (Iason, forthcoming)<br>WTP (KFMP, 1994) | Local<br>Nation |
| Carbon sequestration | Direct measurement (Glenday, 2006) | Global |
| Bequest values | WTP (Iason, forthcoming) | Local |
| *Pollination service** | Kasina (2007) | Local, Nation |

*Measured to capture the economic value of pollinators. Not a forest service but the forest could be viewed as a habitat, source of food e.t.c. for the pollinators-*challenge of attribution*

# Valuation of costs

| Category | Stakeholder | Method/Source |
|---|---|---|
| Opportunity cost | Local community | Gross margins (Ryaner, 1991) |
| Extraction labor | Local community | Own survey (extrapolation) |
| Conservation activities | Local community | Own survey (extrapolation) |
| Transaction costs | Local community | Own survey (extrapolation) |
| Management cost (fixed & recurrent) | Nation | Own survey |

# CBA-Empirical application

- Benefits and cost are realized over time
  - Time horizon set at 30 years
  - Future costs and benefits are discounted to obtain their present value
  - Discount rate (14% at local level; 12% at national and global levels)
- Future flows of benefits were approximated by rate of forest degradation/regeneration & other factors
- Future flows of costs were approximated
- Comparison; With and without proposed intervention
  - With forest vis a vis without forest (farming)
- Sensitivity analysis-capture different scenarios


Firewood
24.08.2005


Grazing
21.08.2005


Thatchgrass
24.08.2005


Charcoal
09 08 16:32

# Direct benefits

| | Value (US $/ha/Yr) by Forest Mgt | | |
|---|---|---|---|
| ***Benefits*** | **FD** | **QCM** | **KWS** |
| Firewood | 33 | 384 | 10 |
| Grazing | 38 | 136 | 0 |
| Thatch grass | 7 | 0 | 0 |
| Charcoal | 1 | 0 | 0 |
| **TOTAL** | **79** | **520** | **10** |

QCM-highest direct benefits, KWS lowest

Inverse conservation status; QCM most degraded (Bleher *et al,* 2006)

Av. Value of NTFP = US $ 72/ha/yr

# Tourism


Camping site with traditional huts

In the year 2004/05 KWS earned the country a total of US $ 43,262 as gate fee collection

Isiukhu falls with KK forest

# Indirect benefits

| | Value (US $/Ha/Yr) by Forest Mgt | | |
|---|---|---|---|
| ***Benefit*** | **FD** | **QCM** | **KWS** |
| Soil conservation | 43 | 43 | 43 |
| Water regulation | 9 | 9 | 9 |
| Recreation | 5 | 0 | 10 |
| Bequest | 30 | 30 | 30 |
| Carbon sequestration# | *1060* | *795* | *1060* |

*#carbon stock + annual sequestration (+Ve or –Ve)*

# Pollination service

- Pollination increased crop yield; by 25% in tomatoes and 99% in squash
- Significant increase in the quality of seeds and fruit sizes
- Overall contribution; about 50% of the annual value of some selected crops or about 40% net benefit
- About 50% of farmers knew of the role of bee pollination in crop production.
- After being informed about the role of pollination, more than 98% were willing to pay an estimated US$ 90 per household annually for pollination of their crops by bees

# Costs (US $/ha)

| *Cost Category* | FD | QCM | KWS |
|---|---|---|---|
| **Local level** | | | |
| **Opportunity costs** | **148** | **148** | **148** |
| Extraction Labor | 32 | 29 | 0.1 |
| Transaction costs | 0.2 | 2 | 0.1 |
| Conservation activities | 0.1 | 0.4 | 0.3 |
| User/access Fees | 0.2 | 0 | 0 |
| Crop loss due to wildlife damage | 0.1 | 0.2 | 0.1 |
| **National level** | | | |
| Management costs | 13.5 | 0.1 | 16 |
| ***TOTAL*** | ***194.1*** | ***179.7*** | ***164.6*** |

*CBA-results*

# NPV's (US$/ha) at local level

| Approach | Opportunity costs excluded | Opportunity costs included |
|---|---|---|
| KWS | +128 | -905 |
| FD | +375 | -658 |
| QCM | +3,408 | **+2,375** |

QCM economically worthy FD and KWS not worthy Inverse relationship with forest degradation; QCM most degraded (Bleher *et al*, 2006)

*CBA-results*

# NPV's (US$/ha) at National level

| Approach | Opportunity costs excluded | Opportunity costs included |
|---|---|---|
| KWS | +1,039 | -261 |
| FD | +1,300 | -226 |
| QCM | +4,479 | **+3,180** |

Nation subsidizing conservation for the rest of the world

-Norton-Griffiths and Southey (1995)

*CBA-results*

# NPV's (US$/ha) at Global level

| Approach | Opportunity costs excluded | Opportunity costs included |
|---|---|---|
| KWS | +1,447 | +133 |
| FD | +1,447 | +147 |
| QCM | +4,271 | **+2,972** |

All profitable at the global level; opportunity for conservation esp. through an international compensatory mechanism

# Conclusions

- Management approach influence distribution of costs and benefit
- Local communities bear the largest share of costs but most benefits accrue at the global level
- Global perspective; all approaches are economically worthwhile

# Policy Implications

- Appropriate international financing/compensatory mechanisms are required
- Measures to increase profitability
  - eco-tourism should be promoted
  - Reduce costs e.g. standardizing units of forest products, information on prices e.t.c.

# Outlook

- Need for further ecological/economic studies to establish more accurate attribution of ecosystem services
- Tropical forests are increasingly becoming `global goods' in the provision of carbon sequestration service. The REDD mechanism offers an opportunity for tropical countries to gain from avoiding deforestation; an opportunity & a challenge
- Need to prioritise the need of the local communities in forest management

# THANK YOU ALL FOR LISTENING!