

Tourism and Wildlife Conservation in Africa: Measuring the Impacts to Rural Households

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Outline

- Food Security Research Project
- Zambia and sustainable tourism
- Game Management Areas
- Data and Methods
- Results
- Next steps



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Food Security

- Food Security Research Project (FSRP)
- Objective: *to integrate research into policy dialogue and program design to promote sustainable agricultural growth as a means to cut hunger and poverty*
- Focus on individual and collective action
- Regional, village, household, gender-level impacts
- Impacts on policy analysis
- Partnerships with African institutions

Food Security (continued)

Research themes:

1. Improving food systems performance
2. Understanding household income and livelihood dynamics
3. ***Understanding food security and natural resource management interactions***

Sustainable Tourism

- Tourism increasingly important source of economic development
 - Dependent on wildlife, habitat, natural resources
 - Micro-level impacts (job creation, income)
 - Macro-level impacts (foreign exchange, GDP)
- Rural tourism
 - Potential impact on livelihoods and income
- Impact of policies on rural development
 - Wildlife conservation
 - Tourism development

Zambia

- Landlocked country in southern Africa
- Tropical climate
- Flat plateau (1000-1500 m)
- Nine provinces



Zambia (continued)

- GDP per capita: \$1,023
- Population living below \$1 per day: 64%
- Population living below \$2 per day: 87%
- Malnourished population: 46%

- Life expectancy at birth: 40.5 yrs (177/177)
- People without improved water: 42% (22/125)
- Illiteracy rate: 32% (33/164)
- Human development index: 0.43 (165/177)

UNDP, Human Development Report, 2005

Rural Development in Zambia



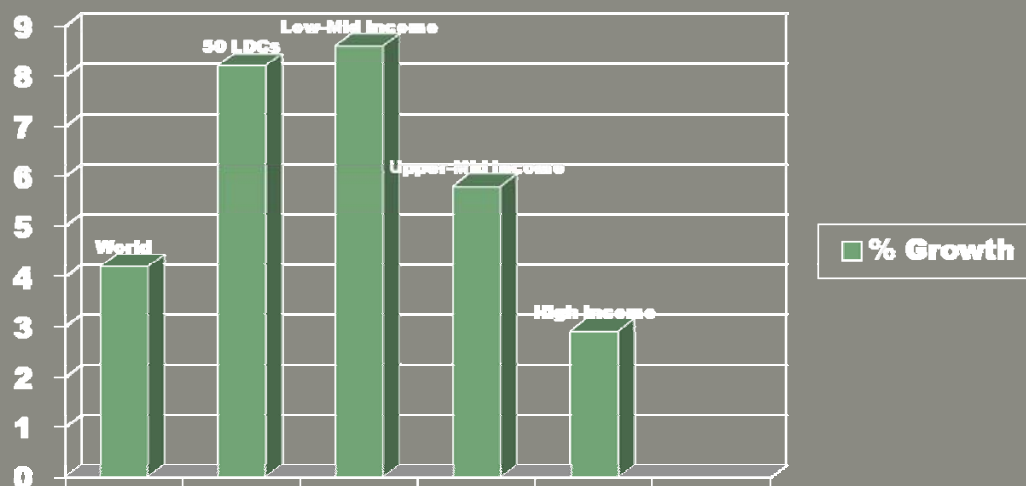
Tourism in Zambia

- International tourist arrivals
 - 1990: 141,000
 - 2000: 457,000
 - 2004: 515,000
 - 9.7% avg annual growth (1990-2004)
- Tourism receipts (US\$)
 - 1990: \$41 million
 - 2000: \$111 million
 - 2004: \$161 million
 - 9.8% avg annual growth (1990-2004)
 - 12.7% of exports
- One of three priority sectors in national development plan



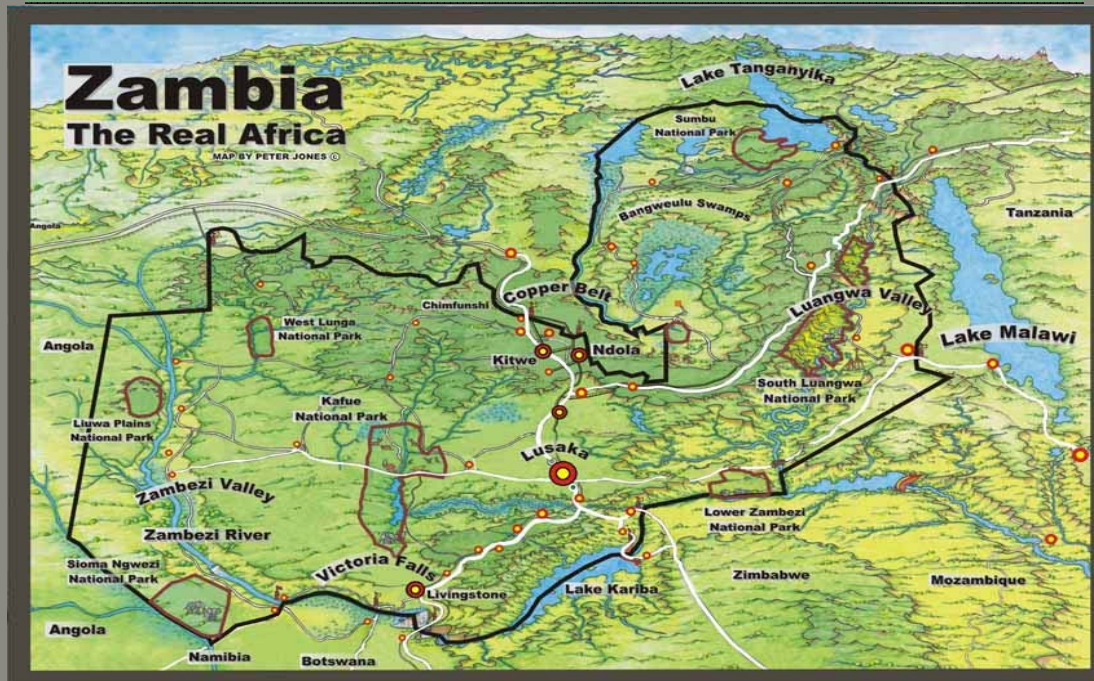
Average Annual Tourism Growth

(1990-2005)



Source: UN World Tourism Organization

Zambia Map



Game Management Areas (continued)



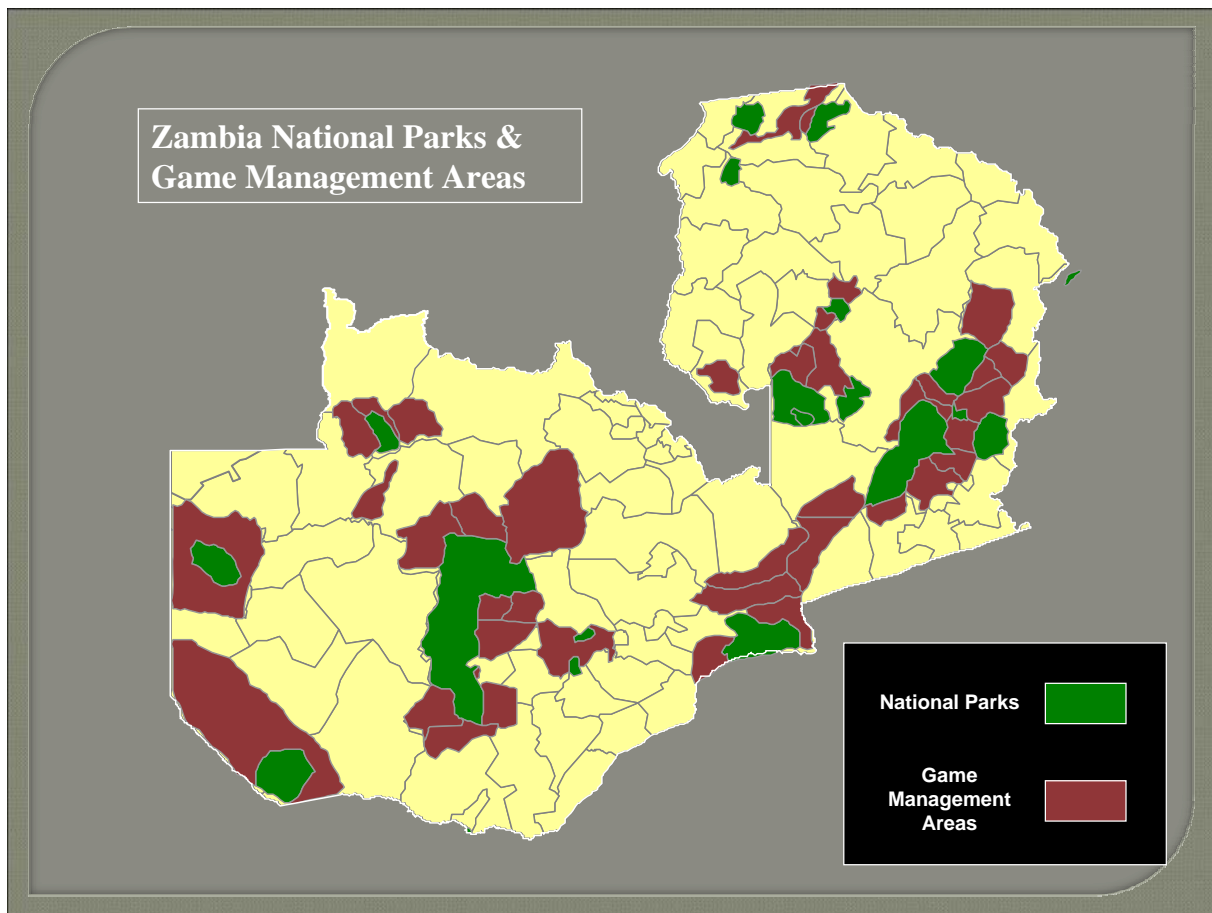
Community-Based Natural Resource Management

- Natural resource management historically “top-down”
- CBNRM – complement to wildlife management programs since 1980s
 - Importance of engaging local communities
- 1. Natural resource conservation
 - Wildlife, habitat
- 2. Rural development
 - Empowerment, decision-making opportunities
 - Livelihoods, household income

Game Management Areas

- Buffer zone around national parks
- Licensed safari and subsistence hunting are controlled by permit
- Protected Area system covers about 30% of Zambia
 - 19 national parks
 - 35 game management areas (GMAs)





Game Management Areas (continued)

- Zambia Wildlife Authority (ZAWA)
- Shares hunting license revenues and wildlife management responsibilities with communities
 - Community Resource Boards (CRBs)
 - Village Action Groups (VAGs)
- Dual objectives of wildlife conservation and rural development
 - Employment of village scouts
 - Development projects

Impact of Game Management Areas

- Benefits
 - Rural employment
 - Revenue sharing
 - Meat distributed after hunting
 - Development projects
- Crop damage
- Opportunity cost of alternative land uses



Preliminary Findings: GMA Households

- Heads of households
 - Younger, likely to be female
- Household members
 - Likely to be less educated
- Fewer assets
 - Land, consumer durables
- Isolated, more distant from main roads
- Higher levels of consumption expenditures
 - Not distributed equally



Research Questions

- How do GMAs affect household welfare?
 - Household income
 - Comparison with findings using consumption expenditures?
 - Income by type
- What are the marginal effects of GMAs on crop damage?



Data and Methods

- Stratified two-stage cluster sampling
- 139 statistical enumeration areas (SEAs) adjacent to four national park systems
- Rural household survey (cross-sectional data)
 - Household income – amount, sources
 - Participation in community-based organizations
- 2,800 households selected
 - About half GMA and non-GMA (control)
 - Only about 32 non-response (1.1%)
- Measure the impact of wildlife conservation on household income, rural livelihoods

Analysis

Two stages

1. Ordinary least squares regression
 - Determinants of household income
2. Probit regression
 - Probability of crop damage

Theoretical Model: First Stage

- Welfare measured as total household income
- OLS regression

$$\ln \text{inc} = \alpha + \beta'x + \gamma G + \varepsilon$$

- inc = total household income
- x = vector of household and community characteristics (education, size of household, assets, infrastructure)
- $G = 1$ if household lives in a GMA

Empirical Model

- OLS estimation
 - Welfare regression (determinants of income)
- Independent variables
 - Age, sex of head of household
 - Maximum education of household
 - Size of household (# males, females, children)
 - Remoteness (distance to main road)
 - Assets – durable assets, land holdings, livestock
 - Population density, infrastructure
 - GMA classification (stocking levels, diversity)

Descriptive Statistics

	Full Sample	GMA	Non-GMA	
Number of sample households	2,716	1,574	1,142	
Total household income (Kw)	4,235,210	3,591,253	5,122,766	
Age of household head (in years)	42.46	41.00	44.48	***
Sex of household head (=1 if male)	0.74	0.73	0.76	**
Maximum education (in years)	6.78	6.42	7.27	***
Number of children (< 15 years)	2.55	2.46	2.67	***
Number of female adults (15-60 years)	1.10	1.08	1.12	
Number of male adults (15-60 years)	1.03	1.00	1.07	**
Distance to nearest main road (km)	5.08	6.09	3.76	***
Cropped area (hectares)	0.92	0.93	0.92	

Significance based on t-test of unequal variance: * 10% significance, ** 5% significance, *** 1% significance

Descriptive Statistics: *(continued)*

	Full Sample	GMA	Non-GMA	
Value of consumer assets (Kw)	399,888	285,362	557,737	**
Value of productive assets (Kw)	616,219	256,729	1,111,697	***
Population density (per sq km)	35.20	41.41	26.97	***
Infrastructure (excluding CRB-funded projects)	3.62	3.64	3.59	
Tourist lodge in SEA (=1)	0.07	0.10	0.02	***
GMA-1 classification (=1 if primary)	0.18	0.30	n.a.	
GMA-2 classification (=1 if secondary or specialized)	0.20	0.35	n.a.	

Significance based on t-test of unequal variance: * 10% significance ** 5% significance *** 1% significance

Wake Up! (Getting to the good stuff)



OLS Regression: Impact on Total (ln) Household Income

Variable	Coeff (std error)	Sig.
Intercept	13.073(0.12)	***
Age of household head (in years)	- 0.003 (0.00)	*
Sex of household head (=1 if male)	0.068 (0.06)	
Maximum education (in years)	0.044 (0.01)	***
Number of children (< 15 years)	0.019 (0.01)	
Number of female adults (15-60 years)	0.115 (0.03)	***
Number of male adults (15-60 years)	0.066 (0.03)	**
Distance to nearest main road (km)	- 0.004 (0.00)	**
Cropped area (hectares)	0.036 (0.02)	
Log of consumer assets (Kw)	0.020(0.00)	***
Log of productive assets (Kw)	0.010 (0.00)	***
Population density (per sq km)	0.001 (0.00)	***
Infrastructure (excluding CRB-funded projects)	0.033 (0.01)	***
Tourist lodge in SEA (=1)	0.186 (0.10)	*
GMA-1 classification (=1 if primary GMA)	0.165 (0.08)	**
GMA-2 classification (=1 if secondary or specialized GMA)	0.015 (0.07)	

OLS Regression (*continued*)

Number of observations	2,267	R-Squared	0.213
F (15, 2251)	40.60	Adjusted R-Squared	0.208
Prob > F	0.00	Root MSE	1.176

- Education, number of adults, value of assets – positively associated with income
- Population density, infrastructure – significant positive association
- Remoteness, age of hh head – negatively associated with income
- Well-stocked GMAs – positively associated with income

Theoretical Model: Second Stage

- Impact of GMA and household characteristics on crop damage

$$\text{prob CD} = \beta'x + \gamma G + \varepsilon$$

- CD = 1 if crop damage
- x = vector of household and community characteristics (education, size of household, assets, infrastructure)
- G = 1 if household lives in a GMA



Probit Model on Crop Damage

Variable	Coeff (std error)	Sig.
Age of household head (in years)	-0.000 (0.00)	
Sex of household head (=1 if male)	-0.013(0.02)	
Household size (#)	-0.004 (0.00)	
Distance to nearest main road (km)	0.001 (0.00)	**
Cropped area (hectares)	0.032 (0.01)	***
Log of consumer assets (Kw)	-0.00006 (0.00)	
Log of productive assets(Kw)	-0.00006 (0.00)	
Population density (per sq km)	-8.90e-09 (0.00)	
Infrastructure (excluding CRB-funded projects)	-0.003 (0.00)	
Number of scouts in community (#)	0.005 (0.00)	*
Log of total value of harvest (Kw)	0.002 (0.00)	***
GMA-1 classification (=1 if primary GMA)	0.182(0.03)	***
GMA-2 classification (=1 if secondary or specialized GMA)	0.081 (0.02)	***

Probit Model: *(continued)*

- Distance to main road - Positively associated with crop damage
- Number of scouts employed - Positively associated with crop damage (probably an indication of wildlife population)
- GMA (primary) - Positively associated with crop damage
- GMA (secondary and specialized) - Positively associated but to a lesser extent than primary GMAs

Next Steps

- Impact of GMA on probability and value of wage and self-employment earnings
- Impact of GMA on probability and value of crop damage
- Corner solution model: Cragg estimation
 - Allows for the probability of $y > 0$ and values of y to be determined by separated processes

Implications for Policy

- Is tourism a viable sector to generate pro-poor growth?
 - Preliminary results show a positive association between GMAs and income
- How do GMAs affect household welfare?
 - Access to wage earnings and self-employment
 - Crop damage
 - Measurement will help identify opportunities and threats for the success of CBNRM programs

Thank You!

