Lessons on Successful Utilization of Forest Land for Crop Agriculture:

Evidence from Kenyan Community Forest Associations

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Outline

Introduction and Motivation

- Forests are critical for provision of ecosystem services and support of livelihoods of rural communities
- Threats to forests: advances in technology, rising population, increasing demand for agricultural land and other social hardships
- Initial efforts to tame degradation involved centralized administration
- This efforts were characterized by: High information costs; enforcement and monitoring costs etc
- Such institutional and policy failure led to a shift towards devolution of forest management to local communities (Gopalakrishnan, 2005)

Introduction and Motivation

- Hardin (1968) prediction of doom unless there is privatization or government intervention came to pass
- Hence increased trends in cooperation as a means to manage CPRs (Wade 1988; Ostrom 1990; Tang 1992)- but still no consensus
- Different approaches such as JFM and PFM therefore emerged: aimed at active involvement of locals and provision of alternative land for locals
- Developing countries are thus devolving forest management to local communities with due disregard for the drivers of success of these initiatives.
- However, the forest-adjacent communities are often poor, landless and with alternative sources of livelihoods- Threat to these forests

Introduction and Motivation

- In response to the potential CPR dilemma, and adverse effects of deforestation, the government introduced PFM through Forest Act (2016) and Forest act (2005)
- Under PFM, government retains ownership while forest adjacent communities organized in form of CFAs obtain user rights as they benefit from other incentives like PELIS in an effort to effectively and sustainably utilize forest land
- As at 2011 there was a total of 325 CFAs countrywide with Mau having the highest at 35
- The CFAs have had their share of challenges e.g. mismanagement, disintegration, heterogeneity and varying interests
- Varying levels of success in terms of ecological outcomes with increased degradation reported in some instances

Introduction and Motivation

- Mixed levels of success is a clear indication that devolution/PFM cannot be taken as a one size fits all solution
- There is also little understanding of the drivers of successful collective action. Does the level of household participation in CFA activities matter?
- The sustainability of forest management requires successful coordination
- Studies have employed different approaches to identify determinants of successful collective action, game theory (Baland et al 1996; Lise 2005) socio-anthropological case studies (Wade 1988; Ostrom 1990&1994;)

Introduction and Motivation

- Differences in applied definition, methodological approaches:Making comparison difficult
- Measurement error problems tied to singe case studies and bias towards Asian countries
- Different Models of PFM warrants the need for context specific analysis to guide policy
- especially within the context of indigenous communities reliant on agriculture with history of constant displacement by government or conflict
- The study therefore seeks to:
  - Identify factors influencing household level of participation in CFA activities
  - To identify the determinants of successful collective management of forest resources and the link between success and level of participation

Description of Study Area

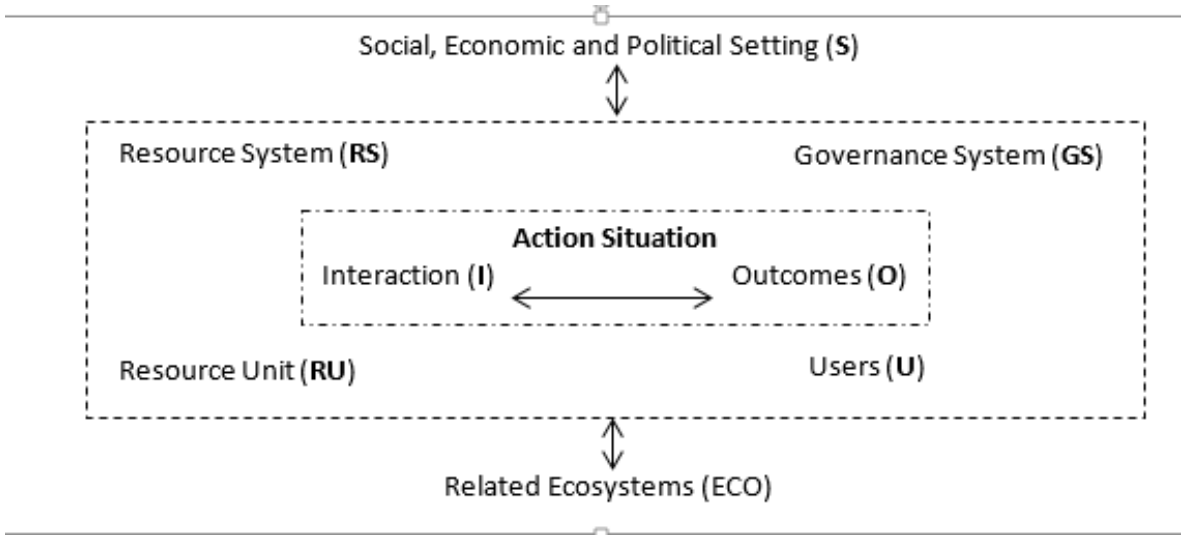
Mau forest conservancy

- Mau forest is the largest closed canopy forest among the five major Water Towers in Kenya that has lost over a quarter of its forest resources in the last decade.
- It covers approximately 416, 542 ha excluding the 2001 forest excisions. The original gazetted area was 452,007 ha.
- High susceptibility to degradation due to human encroachment; long history of community forestry and high level of biodiversity.
- The Mau ecosystem is the upper catchment of many major rivers
- Estimated hydro-power potential of the Mau forest is estimated to be about 535 MW, which contributes about 47% of the total installed electric power generation capacity in Kenya (UNEP 2008)

Methodological Framework

- We apply Ostrom (2007) Framework for analyzing Social-Ecological Systems depicted in figure 1. In the framework eight broad variables that affect the sustainability of SES and ability to self-organize are identified.

Figure: **A Framework for analyzing a Social-Ecological Systems**



Methodology

- **Factors influencing household level of participation in CFA activities:** Estimated using a standard logit model
- **Determinants of successful collective management of forest resources.**

$$\mathbf{Y_j} = \beta_0 + \beta_1 CFAPart + \beta_2 X_i + \beta_3 Z_j + \varepsilon_{ij} \quad (1)$$

Where, Y_j is a vector of two dependent variables namely percentage forest cover and reported cases of vandalism,

- CFAPart_Ht is the predicted probability of a household actively participating in CFAs activities respectively,
- X_i is a vector of household i characteristics and Z_j is a vector of CFA j characteristics and $\varepsilon_{ij}$is a random disturbance term.

Sampling and Data collection

- A pilot was conducted in Londiani CFA where a random sample of 44 households were interviewed
- Two stage sampling procedure employed, First stage 22 out of the 35 CFAs were purposively identified
- A total of 518 households were randomly sampled covering six counties
- CFA level data were collected through FGDs with CFA officials and some members
- To gauge the household head level of participation in CFA activities, respondents were assessed based on whether they were just present during decision making (nominal), merely attended, was present when decision was made and was informed but did not speak (passive), expressed an opinion whether sought or not (active), or whether felt she influenced the decision (interactive).

Descriptive statistics

Table: **Summary statistics of variables used**

variable	N	mean	sd	min	max
ForestCover	518	76.85	19.15	2	97.97
Vandalism	518	22.63	25.57	0	120
CFAParticipation	518	0.625	0.484	0	1
Numbhsehlds	518	10081	19667	100	100000
GrpStructure	518	0.492	0.500	0	1
Natives	518	74.64	27.64	0	100
FBudget	518	299305	404142	0	1.500e+06
VertInt	518	2.826	2.903	0	15
HorInt	518	4.396	6.834	0	22
GradChair	518	0.309	0.462	0	1
Competition1	518	0.759	0.428	0	1
SocInt	518	13.66	52.47	0.0350	251.0
MaritSta	518	0.863	0.344	0	1
hhsize	518	5.678	2.579	1	16
Education	518	0.371	0.483	0	1
LivesVal	518	134294	343074	0	5.600e+06
Employment t	518	0.253	0.435	0	1
Woodlots	518	0.847	0.360	0	1
Hlandsize	518	2.334	5.148	0	90
LandTitle	518	0.523	0.500	0	1
DistForest	518	1.443	1.526	0	10
DistMroad	518	2.034	2.789	0	20
DistMarket	518	3.580	3.605	0	20

Descriptive statistics..

Table: **Existing incentives within CFAs**

Incentive	N	mean	sd	min	max
PELIS	518	0.766	0.424	0	1
Grazing	518	0.932	0.251	0	1
Herbs	518	0.830	0.376	0	1
Fuel wood	518	0.952	0.215	0	1
Bee Keeping	518	0.909	0.288	0	1
Milling	518	0.143	0.350	0	1
Fodder	518	0.749	0.434	0	1
Thatching	518	0.459	0.499	0	1
Eco-tourism	518	0.309	0.462	0	1
Fish farming	518	0.156	0.364	0	1
Fetching Water	518	0.969	0.173	0	1

Descriptive statistics..

Table: **Scale of dependence on forest resources**

	Scale of Dependence (%)			
Resource	**Not dependent**	**Slightly dependent**	**Moderately dependent**	**Very dependent**
Wood fuel	4.83	0	22.78	**72.39**
Timber	95.17	4.83	0	0
Bee keeping	8.69	31.47	33.78	26.06
Herbs	5.02	41.12	30.89	22.97
Thatching	46.14	21.24	25.87	6.76
Fish farming	0	79.15	10.04	10.81
Water	3.09	4.83	5.02	**87.07**
Grazing	0	3.86	0	**96.14**
Poles harvesting	63.51	18.15	18.34	0
PELIS	23.36	4.83	8.11	**63.71**
Tree Nursery	92.28	2.90	0	4.83
Quarrying	92.28	7.72	0	0
Cultural activities	87.07	2.90	0	10.04

Descriptive statistics..

Table: **Major sources of Income within CFAs**

Source of Income	Percent	Cumulative
Farming	60.81	60.81
Livestock Keeping	30.50	91.31
Bee Keeping	3.86	95.17
Tree Nursery	4.83	100.00

Descriptive statistics..

Table: **Existence of rules**

Rules regarding	**N**	**mean**	**sd**	**min**	**max**
Forest access	518	0.759	0.428	0	1
Fire Management	518	0.938	0.241	0	1
Logging/charcoal burning	518	0.900	0.301	0	1
Punishment	518	0.448	0.498	0	1
Conflict Resolution	518	0.562	0.497	0	1
Role of EC/GR	518	0.965	0.183	0	1
Sharing benefits	518	0.550	0.498	0	1
Role of traditional	518	0.355	0.479	0	1
Conservation areas	518	0.961	0.193	0	1

Logistic regression Results

Table: **Results for Logistic Regression for Probability of active participation in CFA activities**

VARIABLES	(1) CFAParticipation	(2) Marginal Effects
hhsize	0.0805	0.0160
	(0.0429)	(0.00842)
Education	0.517**	0.102**
	(0.214)	(0.0417)
EmploymentStat	-0.902***	-0.179***
	(0.236)	(0.0444)
Woodlots	0.847***	0.168***
	(0.268)	(0.0513)
DistForest	0.103	0.0204
	(0.0699)	(0.0138)
DistMroad	0.113**	0.0224**
	(0.0499)	(0.00975)
DistMarket	-0.0815**	-0.0162**
	(0.0374)	(0.00731)
ResidStatus	-0.390	-0.0774
	(0.210)	(0.0412)
Precipitation	0.00229***	0.000455***
	(0.000663)	(0.000126)
Constant	-3.430***	
	(1.112)	
Observations	518	518

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

OLS Regression results

Table: **OLS regression results**

VARIABLES	(1) **ForestCover**	(2) Vandalism	(3) IVforestcover	(4) **IVVandalism**	(5) **PCA1**
InstIndex	2.048*	-0.460	1.949***	0.984***	0.0968***
	(1.014)	(1.364)	(0.259)	(0.309)	(0.0264)
FBudget	1.73e-05**	-2.13e-05**	1.48e-05***	-5.09e-06*	4.26e-08
	(7.29e-06)	(9.03e-06)	(2.17e-06)	(2.85e-06)	(2.42e-07)
CFAPart_Ht	3.559**	-4.966**	3.377*	-3.441*	0.139
	(1.519)	(2.027)	(1.796)	(1.873)	(0.0844)
DistForest	-0.529*	0.639**	-0.494***	0.501***	-0.0108
	(0.269)	(0.251)	(0.157)	(0.183)	(0.00662)
Init_NGO	10.77	4.046	10.83***	10.19***	
	(6.804)	(11.47)	(1.647)	(3.572)	
Init_RegGov	-14.17**	49.71***	-13.88***	57.97***	
	(6.386)	(7.353)	(2.120)	(2.282)	
Init_NatGov	-19.53***	14.37	-19.23***	3.253	
	(6.735)	(8.992)	(1.883)	(2.392)	
GrpStructure	13.14**	-49.36***	11.24***	-46.92***	
	(5.845)	(9.063)	(2.119)	(2.104)	
Competition1	3.327	-21.01**	4.570***	-31.33***	
	(4.525)	(8.035)	(1.317)	(2.170)	
SocInt	0.206***	-0.327***	0.176***	-0.269***	
	(0.0291)	(0.0597)	(0.0167)	(0.0179)	
LandTitle	2.147**	-1.875**	2.242***	-1.845***	
	(0.816)	(0.694)	(0.575)	(0.682)	
ImprIndex	3.855**	-24.69***	2.133**	-18.71***	
	(1.815)	(2.604)	(0.929)	(1.278)	
VertInt			1.057*	-1.365***	0.0953*
			(0.592)	(0.523)	(0.0504)
HorInt			0.254**	-1.921***	0.0486***
			(0.111)	(0.211)	(0.0154)
ForestCover					-0.0130***
					(0.00405)
PELIS					0.526**
					(0.206)
Constant	279.1***	-504.6***	259.3***	-579.5***	-0.795
	(50.44)	(94.61)	(28.19)	(28.50)	(1.391)
Other Controls					
Climate & Geographic Variables	Yes	Yes	Yes	Yes	Yes
Asset Holdings	Yes	Yes	Yes	Yes	Yes
Observations	518	518	518	518	518
R-squared	0.895	0.907	0.897	0.923	0.830

Clustered robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Conclusions

- Factors influencing household level of participation include: employment status, education level, ownership of private woodlots, precipitation, distance to nearest main road and nearest market influence household level of participation in CFAs
- Success of collective action depends on: average age of household heads, distance an household is from the nearest edge of the forest, institutional quality, salience of the resource,
- In terms of the link, the higher the probability of households actively participating in CFA activities, the higher the likelihood of success in collective action activities.
- Number of households within a CFA area, Proportion of males in the executive committee, level of interaction with the various government departments in terms of frequency of meetings,

Conclusions..

- Intensity of social interaction and structure of the group, proportion of natives, ownership of land titles (property rights), whether officials are selected competitively.
- The results also suggest that CFAs are more likely to be successful in collective action if they are initiated by the communities themselves with little government oversight and regular meetings with government departments.
- Communities are more likely to self-organize in presence of incentives such as allocation of land through PELISand when the forest cover is low or when there is scarcity in supply of forest ecosystem services.

Policy Recommendations

- Need for a more robust diagnostic approach in devolution of forest management to local communities considering diverse socio-economic and ecological settings is therefore necessary
- Need for revival and re-institutionalizing existing CFAs in an effort to promote PFM within the Mau forest and other parts of the country.
- Policy makers also need to promote PFM in areas where the forest cover is low and communities have been reluctant to adopt the approach

Policy Recommendations..

- Design of a mix of incentive schemes to encourage active household participation in CFA activities
- The government should explore ways of allocating land rights to forest-adjacent communities to settle the thorny issue of land tenure security within the Mau.
- Public private partnership through NGOs could also play a role in strengthening and nurturing existing and infant CFAs and creating awareness among locals