

FOREST COMMONS, REDD+ AND TENURE SECURITY IN AFRICA

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BACKGROUND

- The success of REDD+ will depend significantly on institutional arrangements governing forest commons, such as tenure.
- where tenure security over forest is weak, REDD+ can pose a risk for forest communities (Jindal et al. 2008).
- Commonly tenure security automatically equated with title holding.
- Only about 1% of land in Africa is registered and titled formally (Easterly 2008).
- Moreover, there is a growing skepticism about the common association of tenure security with the possession of statutory land titles (Roth et al. 1989; Schlager and Ostrom 1992).

AIM

- how variation forest tenure affects forest conservation outcomes, and therefore REDD+ suitability.
- We particularly synthesize lessons from two types of forest commons typically found in Africa:
 - 1) managed by migrants who occupy a *de facto open access forest*.
 - In Africa 83 % of the forest owned by central governments
 - inappropriate policies and regulations, weak institutional capacity
 - high population growth rates and civil unrests
 - *De facto open access an hence* creation of squatters.

Eg. Chyulu Hills in Kenya (Muriuki et al 2011) and Gokwe Village in Zimbabwe (Nyambara 2001)
 - 2) managed under customary tenure.

MOTIVATIONS

- **Observation #1:** a sharp contrast between the forest management in these two communities.
- **Observation #2:** squatters subject to exogenous eviction while customary authorities (if legally backed and considered legitimate) provide endogenously secure tenure.

Three key questions:

- 1) How does the exogenous risk of losing forest common affect a forest-dependent household's decision to manage this land?
- 2) Can endogenous tenure arrangements for forest commons affect this decision?
- 3) How do REDD+ contracts affect the household land management decision in these two different tenure settings?

MODELING

- Two modeling approaches :
 - 1) Barbier and Burgess (2001)
 - **Modify** to reflect the deforestation decision of migrants subject to an exogenous risk of eviction.
 - We then **extend** the model to the case of an indigenous community with customary tenure over forests.
 - 2) In the spirit of Alix-Garcia et al. (2004),
 - adopt a game theoretic approach to characterize the interaction between members of each community.
 - Simplify the interaction by applying a Markovian differential game framework

RESULTS

- All else equal, we find that an indigenous community with customary tenure generally chooses a lower deforestation rate than migrants facing an exogenous threat of eviction.
- for both migrants and an indigenous community with customary tenure, a REDD+ payment can increase the incentive to conserve more standing forest.
- REDD+ effective in the case of migrant community
- For a given level of avoided deforestation, migrant community require a higher REDD+ payment.
- REDD+ efficient in the case of customary tenure

MIGRANT MODEL: PROVISION AND APPROPRIATION

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Provision: agricultural conversion

- At time $t=0$, the migrant's discounted net benefit from agricultural conversion

$$B_{\frac{a}{t}}^a = p^f A_{t0} - c(A_{t0}) + \int_0^{\infty} e^{-\delta t} (p - c) Q(A_{t0}) dt = p^f A_{t0} - c(A_{t0}) + \frac{(p - c) Q(A_{t0})}{r + \lambda}$$

- Where $\delta = r + \lambda$ is the effective discount rate
- Λ = the probability of eviction, and it is exogenous
- Endogenous provision of a common:

$$F_0 = \bar{F} - \sum_{i=1}^n A_{t0}^* \geq 0$$

MIGRANT MODEL...

Appropriation: game in the forest common

- The optimization problem of individual i is to choose a time path of rate of deforestation $x(t) \in [0, 1 - (n-1)\gamma]$ that Maximize

- $$\int_0^{\infty} e^{-rt - z(t)} \{ [p^f x(t)F(t) - x(t)(x(t) + (n-1)\gamma)F(t) + B(F(t))] \} dt$$

Subject to $\dot{F} = -(x(t) + (n-1)\gamma)F(t)$, $F(0) = F_0$

Non-cooperative Nash results

- $\gamma = (p^f - \mu_1) / (n + 1)$
- Optimal deforestation is decreasing in the conditional shadow value (μ_1), increasing with the price of harvest but decreasing in the number of migrants.
- $[p^f \gamma - \gamma(n\gamma)] + B'(F) - \mu_1 \gamma = \mu_1 (r + \lambda + (n-1)\gamma)$
- the marginal benefits of holding on to forest (the LHS) equals the marginal costs (the RHS).
- a greater threat of eviction means that each harvester is likely to deforest more of the commons.

CUSTOMARY TENURE

- in most rural Africa access to forest is *de facto* customary
- African states are at different point with respect to recognizing customary right.
- Model deforestation of an agent under a well-functioning, and legally backed customary tenure arrangement (e.g. Duru-Haitemba village in Tanzania, Konso Ethiopia).
- **Caution:** doesn't represent the reality in Cameroon (lacks legal backing), DR Congo(chiefs lost their legitimacy)

CUSTOMARY...

Provision

- Customary authorities administer settlements by granting permission to move in and clear a specific plot of land
- Exogenous provision of forest common
- endogenous forest tenure: $h(t) = \lambda(F(t))$, and $\lambda'(F(t)) < 0$.
- e.g. Duru-Haitemba village in Tanzania, Gambia, and Madagascar customary authorities close off degraded forests to all use, to allow for forest recovery (Wily 2004).

Appropriation: interaction in the forest

- Lower TC+ Reciprocity  cooperation likely
- Symmetric Markov-Perfect Nash equilibrium (for direct comparison against migrant model).

CUSTOMARY

Symmetric Markovian Nash Equilibrium

- $[p^f \gamma - \gamma(n\gamma)] + B'(F) - \mu_1 \gamma + \mu_2(t) \lambda'(F) = (r + \lambda + (n - 1)\gamma)\mu_1$
- all else equal, an agent facing customary forest tenure chooses a lower deforestation rate than that in the case of a migrant with exogenously insecure tenure.
- The result is intuitive as endogeneity of tenure implies that one would want to avoid deteriorating the forest common because it would increase the risk of eviction.

REDD+

- o projects implemented on forest commons can significantly reduce transaction costs such as negotiating, contracting, implementing and monitoring costs.
- o suppose that a community can provide carbon sequestration forestry service through REDD+.
- o most common practice in payment for environmental services is to pay a flat fee per hectare of standing forest
- o Symmetric agents. Thus reasonable to assume payment is equally divided $\frac{1}{n}\theta F(t)$.

REDD+

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- o **optimization problem:** chose the time path of rate of deforestation $x(t)$ that maximizes the discounted aggregate net benefit from the forest common, **which now includes the additional benefit from REDD+ contract**, given all relevant constraints.

- o symmetric Markovian-Nash equilibrium

Migrant:

➤
$$\left[p^f \gamma - \gamma(n\gamma) + B'(F) + \frac{1}{n} \theta - \mu_1 \gamma \right] = (r + \lambda + (n - 1)\gamma) \mu_1$$

Indigenous

$$\left[p^f \gamma - \gamma(n\gamma) \right] + B'(F) + \frac{1}{n} \theta - \mu_1 \gamma + \mu_2(t) \lambda'(F(t)) = (r + \lambda + (n - 1)\gamma) \mu_1$$

REDD+

- the imputed value of forest cover $\mu_1(t)$
- $$\frac{[p^f \gamma - \gamma(n\gamma) + B'(F) + \frac{1}{n}\theta + \mu_2(t)\lambda'(F(t))]}{(r + \lambda + n\gamma)} > \frac{[p^f \gamma - \gamma(n\gamma) + B'(F) + \frac{1}{n}\theta]}{(r + \lambda + n\gamma)}$$
- the imputed value of forest cover $\mu_1(t)$, under customary tenure arrangement is larger than that under exogenous threat of eviction.
- **Implication:** a REDD+ contract can only become equally attractive for migrants as those under customary tenure if and only if the former get a higher REDD+ payment.
- customary tenure arrangement offers a least cost way of conserving a forest cover

POLICY IMPLICATIONS

- Only about 1% of land in Africa is registered and titled formally
- Imposing formal tenure security, commonly associated with possession of land title, as a requirement for communities participation in REDD+ projects tends to exclude millions of indigenous people in Africa where customary tenure without clear titles prevails.
- accommodating the characteristics of African tenure systems is the way forward to promote successful REDD+ programs in Africa
- Properly designed scheme can both increase carbon forestry on customary land and improve the livelihood of millions of African farmers.

THANK YOU



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